maximo

USER'S MANUAL
SOLAR INVERTER

PV4048 HM &
PV5048 HM

Version 10 August 2018

Appliances

PC   TV   Air-conditioning   Fridge   Washing machine

Table of 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 installing the inverter, read all instructions and cautionary markings on the inverter, the batteries and all appropriate sections of this manual.
2. **CAUTION** – Only use rechargeable deep-cycle lead acid type flooded, AGM or GEL batteries. or Lithium batteries. Other types of batteries may burst, causing injury and damage.
3. Do not disassemble the inverter. 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 should install this inverter and connect batteries.
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.
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. A Battery Isolator of appropriate size needs to be installed as over-current protection between the inverter and the battery.
11. GROUNDING INSTRUCTIONS- This inverter 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 should service this inverter. If errors persist after following the troubleshooting table, please send this inverter back to local dealer or service center for maintenance.

INTRODUCTION

This is a multi-function inverter/charger, combining the functions of inverter, MPPT solar charger and battery charger to offer uninterruptible power supply. 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, with built-in MPPT solar charge controller

Built-in automatic generator start function, 2-wire start

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 a basic application for this inverter/charger. It also includes following devices to have a complete running system:

Generator

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.
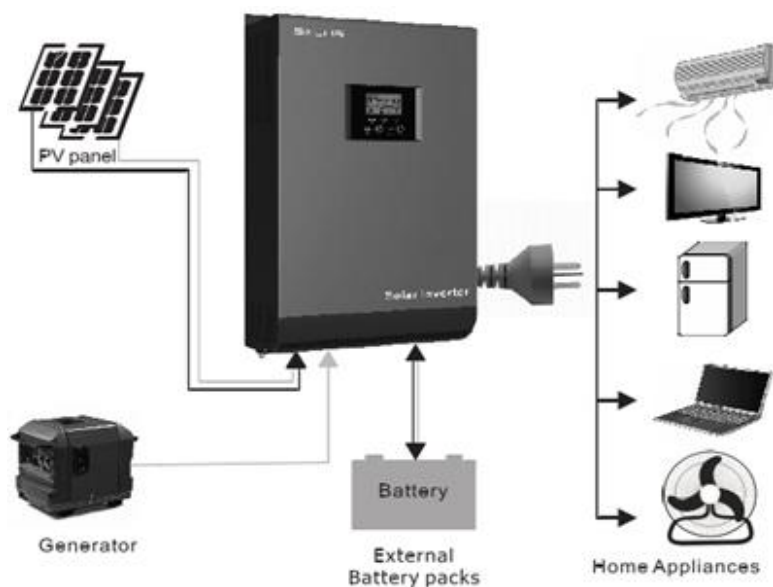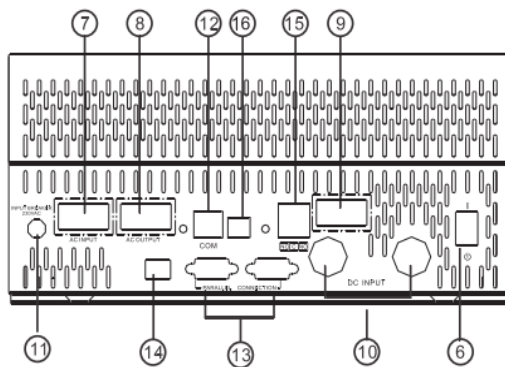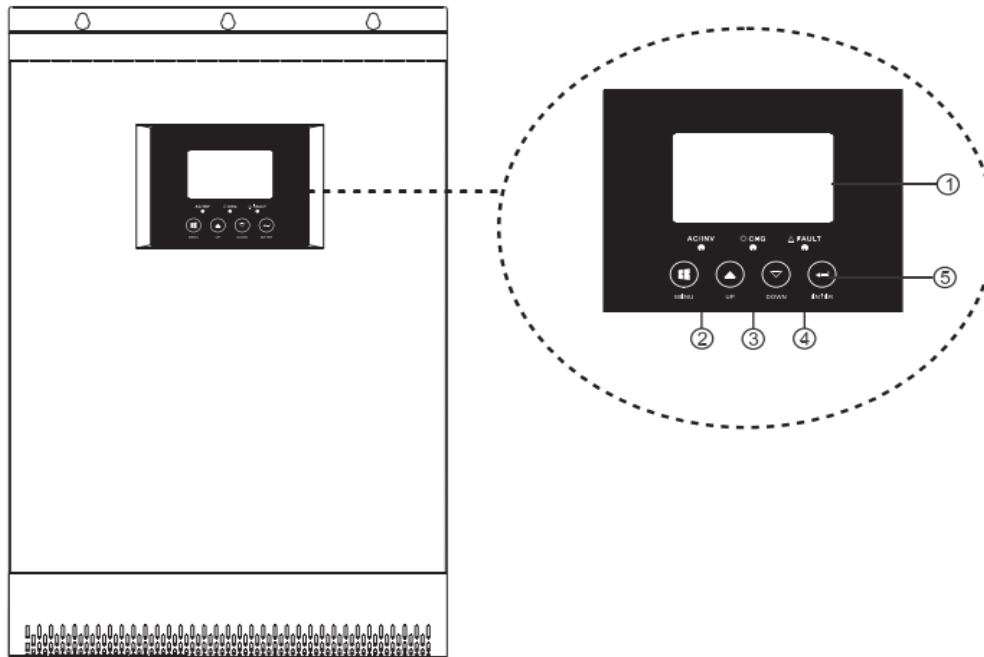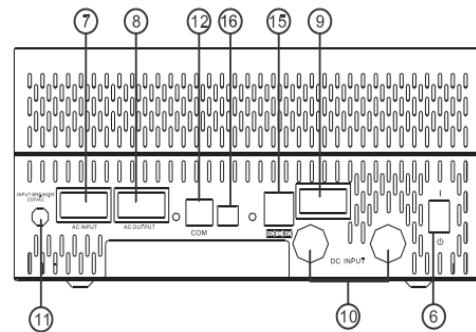

Figure 1 Hybrid Power System

Product Overview

4KVA-5KVA parallel model

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

4KVA-5KVA single model

1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons
6. Power on/off switch
7. AC input
8. AC output
9. PV input
10. Battery input
11. Circuit breaker
12. RS485 communication port
13. Parallel communication port (only for parallel model)
14. Parallel switch
15. Dry contact
16. USB

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 x 1

    User manual x 1

    Communication cable x 1

    USB cable x 1

    Software CD x 1

Preparation

To be able to connect all wiring, take off bottom cover by removing four screws as shown below.
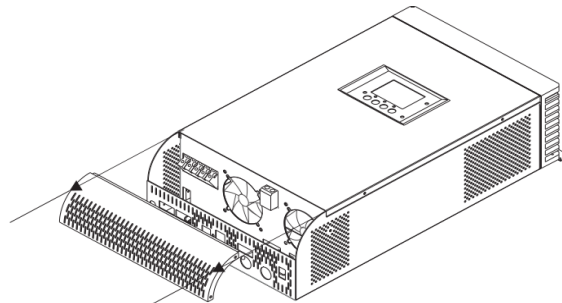
Mounting the Unit

Consider the following points before selecting where to install:

- Do not mount the inverter on flammable construction materials.
- Indoor use only, IP 20 rated, avoid direct sunlight
- 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. 30 cm above and below the unit.
- The ambient temperature should be between 0℃ and 55℃ to ensure optimal operation.
- The recommended installation position is vertically to the wall.
- Be sure to keep other objects away as shown in the diagram to guarantee sufficient heat dissipation and to have space for removing wires
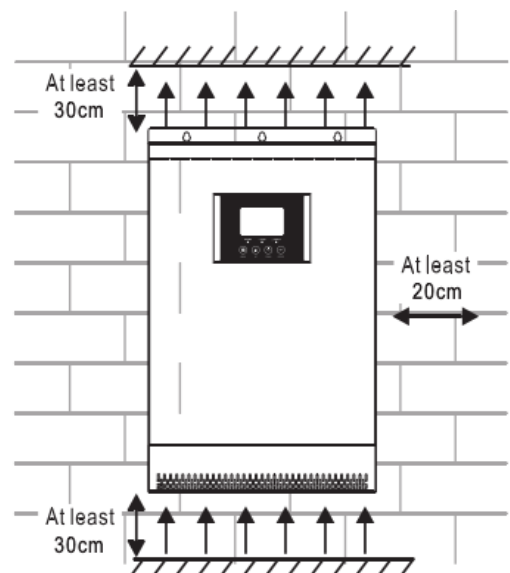
⚠ **SUITABLE FOR MOUNTING ON NON-COMBUSTIBLE SURFACE ONLY.**

Install the unit by screwing three screws
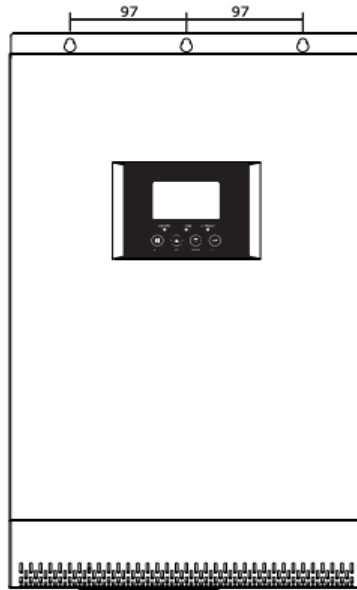
Battery Connection

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

Ring terminal:

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. In a parallel system (two or three units) make the battery cables the same length.
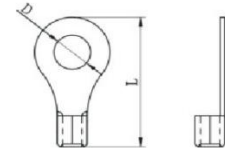

Model	Typical Amperage	Battery Capacity	Wire Size	Ring Terminal			Torque Value
				Cable mm²	Dimensions		
					D(mm)	L(mm)	
4048	66A	200AH	1*4AWG	22	6.4	33.2	2~3Nm
			2*8 AWG	14	6.4	29.2	
5048	87A	200AH	1*4AWG	22	6.4	33.2	2~3Nm
			2*8 AWG	14	6.4	29.2	

Please follow below steps to implement battery connection:

1. Fit recommended cable lugs to battery cables.
2. Connect batteries to make a 48V battery bank. Suggested battery capacity is at least 200Ah for the 4KVA/5KVA inverter model.

NOTE: Only use Deep Cycle Flooded/GEL/AGM lead acid battery or approved Lithium batteries.
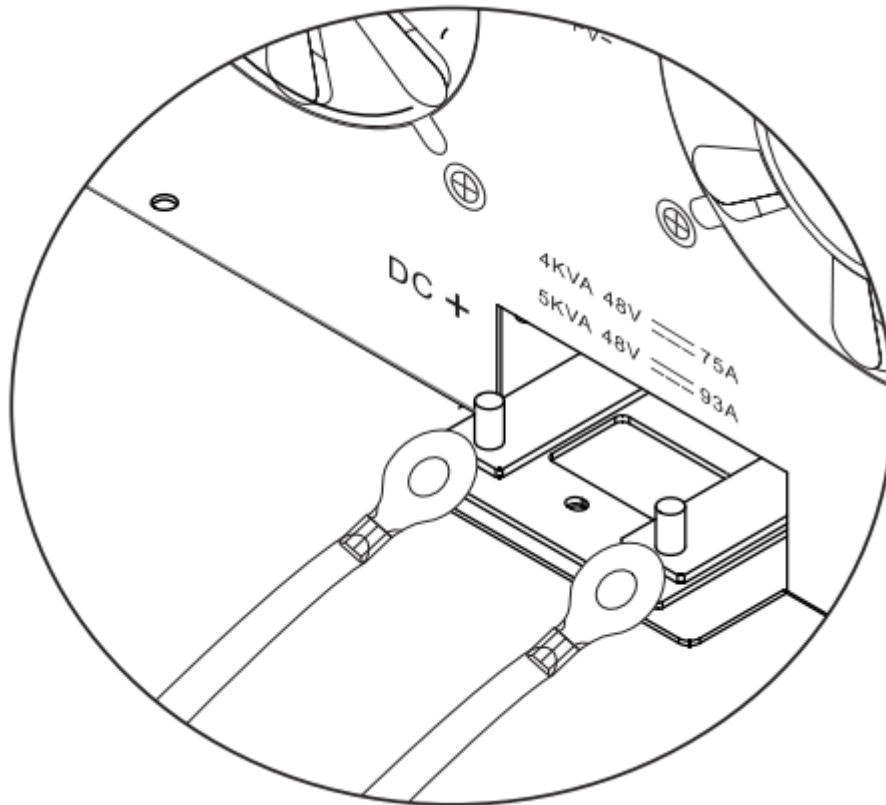
3. Insert the cable lugs of battery cable flatly into the M6 battery connector of the inverter and make sure the nuts are tightened with a torque of 2-3 Nm. Making sure polarity at both the battery/battery isolator and the inverter is correctly connected.

⚠	**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/isolator, 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 40A for 4KVA and 50A for 5KVA.

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

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 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
4KVA	10AWG	1.4~1.6Nm
5KVA	8AWG	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 disconnector 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)**
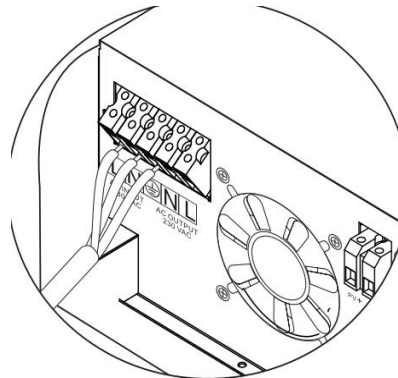
⚠	**WARNING:** Be sure to that AC power source is disconnected before attempting to hardwire it to the unit.

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)**
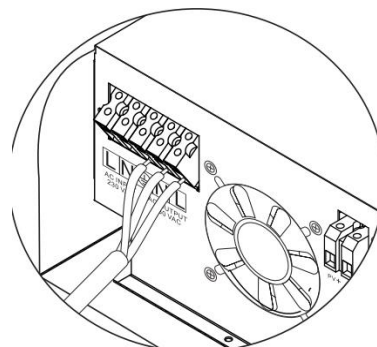
5. Make sure the wires are securely connected.

> CAUTION: Important
> Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause AC 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 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 a DC circuit breaker or DC isolator of appropriate size between inverter and PV modules.
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 size for PV module connection.

Model	Typical Amperage	Cable Size	Torque
4048/60A 5048/60A	60A	8 AWG	1.4~1.6Nm
4048/80A 5048/80A	80A	6 AWG	2.0~2.4Nm

PV Module Selection:

When selecting PV modules, please be sure to consider below parameters:
1. Open circuit Voltage (Voc) of PV array can not exceed 145Vdc in the coldest condition.
2. Open circuit Voltage (Voc) of PV array needs to be higher than minimum battery voltage

Solar Charging Mode		
INVERTER MODEL	**4048/60A** **5048/60A** **4048/80A** **5048/80A**	
Max. PV Array Open Circuit Voltage	145Vdc	
PV Array MPPT Voltage Range	64~130Vdc	
Min. battery voltage for PV charge	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 from PV array to PV input
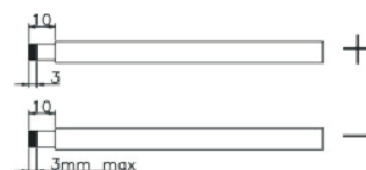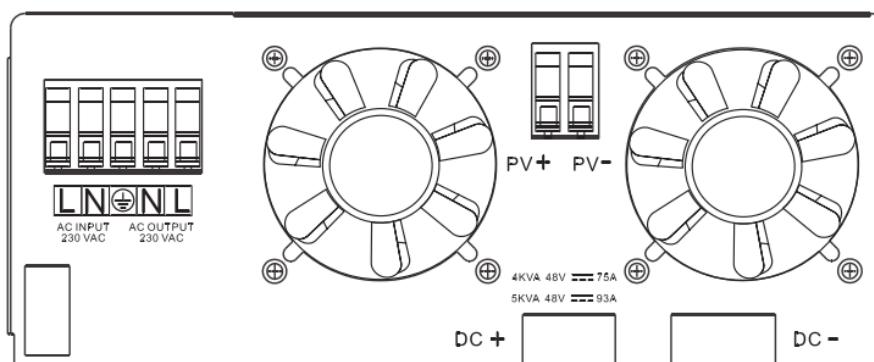
3. Make sure the wires are securely connected

Recommended PV module configuration

PV Module Spec.（reference）	Inverter Model	Q'ty of modules	Array output
Risen Energy RSM60-6-270P -270W -Vmp:30.67Vdc -Imp:8.79A -Voc:37.88Vdc -Isc:9.31A	**4048/60A** **5048/60A**	3S 5P 15 Panels 4050 Watt	Voc 113.64 V Isc 46.55 A
	4048/80A **5048/80A**	3S 6P 18 Panels 4860 Watt	Voc 113.64 V Isc 55.86 A

Example: Array Voc 113.64V, coldest temperature -10°, Correction Factor 1.14, effective Voc_max 129.5V. Use table below to find the appropriate Correction Factor

Voltage Correction Factors for Crystalline and Multi-Crystalline Silicon PV Modules

Lowest expected operating temperature (°C)	Correction Factor
24 to 20	1.02
19 to 15	1.04
14 to 10	1.06
9 to 5	1.08
4 to 0	1.10
-1 to -5	1.12
-6 to -10	1.14
-11 to -15	1.16
-16 to -20	1.18
-21 to -25	1.20
-26 to -30	1.21
-31 to -35	1.23
-36 to -40	1.25

(Source: *AS/NZS 5033:2014* Table 4.1)

Communication Connection

Please use supplied communication cable to connect inverter to 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. It could be used to deliver a signal to an external device when the battery voltage reaches warning levels to start a generator.

Unit status	Condition			Dry contact port:	
				NC&C	NO&C
Power Off	Unit is off and no output is powered.			Close	Open
Power On	output is powered from "AC in"			Close	Open
	Output is powered from Battery or Solar.	Program 01 set as "AC in"	Battery voltage<Low DC warning voltage	Open	Close
			Battery voltage>Setting value in Program 21 or battery charging reaches floating stage	Close	Open
		Program 01is set as SBU, SUB, solar first	Battery voltage<Setting value in Program 20	Open	Close
			Battery voltage>Setting value in Program 21 or battery charging reaches floating stage	Close	Open
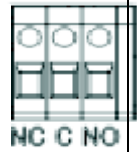
Connecting the CAN Cable

The CAN cable enables communication between the inverter and Li-ion batteries with a CAN ports. The RS485 port on the inverter is used to communicate with the battery. Below chart shows the pin configuration of the inverter.

Below chart is showned RJ45 Pins define

Pin	Define
1	RS-485-B
2	RS-485-A
3	GND
4	
5	CANL
6	CANH
7	
8	
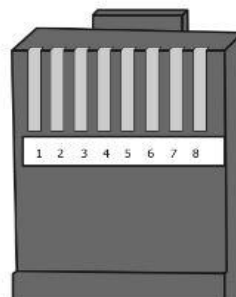
OPERATION
Power ON/OFF
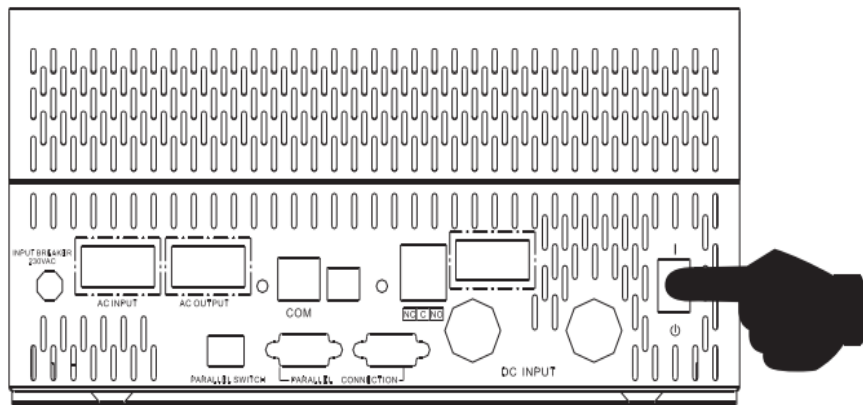
Once the unit has been properly installed and the batteries connected, flick the On/Off switch (located on the right hand bottom corner of the case) to the ON position to turn the inverter on.

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.
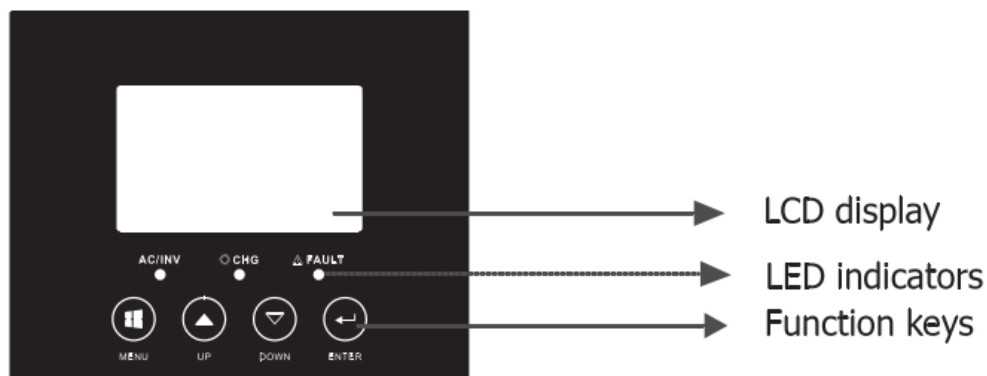
LED Indicator

LED Indicator			Messages
AC/INV	Green	Solid On	Output is powered by AC in Line mode.

		Flashing	Output is powered by battery or PV in battery mode.
☀ CHG	Yellow	Flashing	Battery is charging or discharging.
⚠ FAULT	Red	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

Function Keys

Function Keys	Description.
MENU	Enter or exit setting mode go to previous selection.
UP	Increase the setting data.
DOWN	Decrease the setting data.
ENTER	Hold 2s to enter setting mode. Press to confirm the selection and move to next selection.

LCD Display Icons
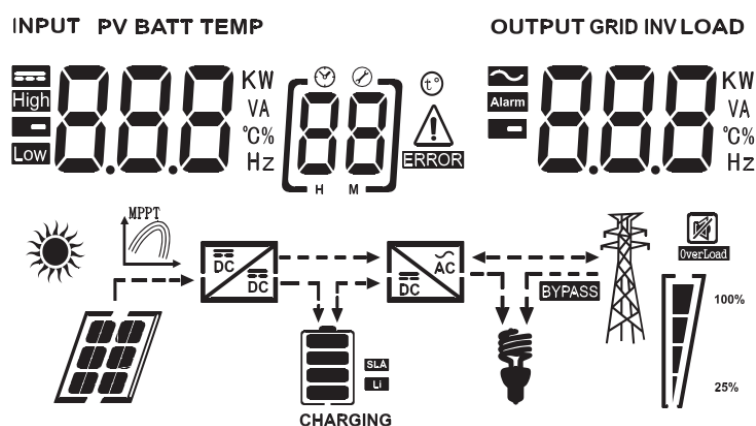
Icon	Function description
Input Source Information and Output Information	
∼	Indicates the AC information
▭	Indicates the DC information
8.8.8 KW VA °C% Hz	Indicate input voltage, input frequency, PV voltage, battery voltage and charger current. Indicate output voltage, output frequency, load in VA, load in Watt and discharging current.
Configuration Program and Fault Information	
[88]	Indicates the setting programs
88 ⚠ ERROR	Indicates the warning and fault codes. Warning: 88 ⚠ flashing with warning code. Fault: 88 ▭ lighting with fault code.
Battery Information	
▭ SLA Li CHARGING	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.

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 solid, three top bars flashing.
	2.083~2.167V/cell	Bottom two bars solid, two top bars will flash in turns.
	>2.167V/cell	Bottom three bars solid, top bar will flash.
Batteries are fully charged.		4 bars solid.

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 V/cell ~1.983V/cell	
	>1.983 V/cell	
Load<20%	<1.867V/cell	
	1.867V/cell~1.95V/cell	
	1.95V/cell~2.033V/cell	
	>2.033 V/cell	

Load Information

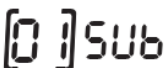| OVER LOAD	Indicates overload.			
	Indicates the load level by 0-24%, 25-50%, 50-74% and 75-100%.			
	0%~25%	25%~50%	50%~75%	75%~100%

Mode Operation Information

(pylon icon)	Indicates unit connects to the mains.
(PV panel icon)	Indicates unit connects to the PV panel.
BYPASS	Indicates load is supplied by "AC in" power.
(DC/DC icon)	Indicates the solar charger circuit is working.
(DC/AC icon)	Indicates the DC/AC inverter circuit is working.
Mute Operation	
(mute icon)	Indicates unit alarm is disabled.

LCD Setting

After holding the "ENTER" button for 2 seconds, the unit will enter setting mode. Press "UP" or "DOWN" to select the correct setting. Press "ENTER" to confirm the selection and move to the next step.

Setting Programs:

Program	Description	Selectable option	
00	Exit setting mode	Escape [00]ESC	
01	Output source priority selection	(default) [01]SUb	Solar provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, AC energy will supply power to the loads at the same time. The battery energy will supply power to the load only if AC power is unavailable. If solar power is unavailable, AC will charge the battery until the battery voltage reaches setting in point 21. If solar power is available, but the battery voltage is lower than the setting in point 20, AC will charge the battery until the battery voltage reaches the setting in point 20.
		[01]SbU	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, the battery will supply power to the loads at the same time. AC provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting in point 20 or solar and battery is not sufficient. The battery energy will supply power to the load in the condition of the AC is unavailable or the battery voltage is higher than the setting in point 21

			(when BLU is selected in point 5) or program 20(when LBU is selected in point 5). If solar power is available, but the battery voltage is lower than the setting in point 20, the AC will charge the battery until the battery voltage reaches the setting point in program 20.
		[01] SOL	Solar energy provides power to the loads as first priority. If battery voltage has been higher than the setting point in program 21 for 5 minutes, and the solar energy has been available for 5 minutes too, the inverter will turn to battery mode, solar and battery will provide power to the loads at the same time. When the battery voltage drops to the setting in point 20, the inverter will turn to bypass mode, AC will provides power to the load only, and solar power will charge only the battery.
		[01] Uti	AC will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when AC power is not available.
02	AC input voltage range	Appliances (default) [02] APL	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS [02] UPS	If selected, acceptable AC input voltage range will be within 170-280VAC.
		GEN [02] GEN	When the user uses the device to connect the generator, select the generator mode.
		VDE [02] ᵛdE	If selected, acceptable AC input voltage range will conform to VDE4105 (184VAC-253VAC)
03	Output voltage	[03] 230ᵥ	Set the output voltage, (220VAC-240VAC)
04	Output frequency	50HZ (default) [04] 50.0	60HZ [04] 60.0
05	Solar supply priority	(default) [05] bLU	Solar energy provides power to charge battery as first priority. When AC is available, if the battery voltage is lower than the setting in point 21, solar energy will not supply to the load it will only charge the

			battery. If the battery voltage is higher than the setting point in program 21, the solar energy will supply to the load and recharge the battery.
		[05]LbU	Solar energy provides power to the loads as first priority If the battery voltage is lower than the setting in point 20, solar energy will not supply power to the load, it will only charge the battery. If the battery voltage is higher than the setting in point 20, solar energy will supply to the load and recharge the battery.
06	Overload bypass: The unit will transfer to line mode if overload occurs in battery mode.	Bypass disabled [06]bYd	Bypass enabled (default) [06]bYE
07	Auto restart when overload occurs	Restart disabled [07]Lrd	Restart enabled [07]LrE
08	Auto restart when over temperature occurs	Restart disabled [08]trd	Restart enabled [08]trE
10	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:	
		Solar first [10]CSO	Solar energy will charge battery as first priority. AC will charge the battery only when solar energy is not available.
		Solar and "AC in" [10]SnU	Solar energy and AC will charge battery at the same time.
		Only Solar [10]OSO	Solar energy will be the only source to charge the battery
		If this inverter/charger is working in Battery mode or Power saving mode, only solar energy can charge the battery. Solar energy will charge battery if it's available and sufficient.	
11	Maximum total charging current: Solar and AC input	60A model (default) [11] 60 ∧	Setting range is from 1 A to 120A. Increment of each click is 1A.

		80A model (default) [i] 80ᴬ	Setting range is from 1 A to 140A. Increment of each click is 1A.
13	Maximum AC charging current	30A model (default) [i3] 30ᴬ	Setting range is from 1A to 60A. Increment of each click is 1A.

14	Battery type	AGM (default) [14]AGn Flooded [14]FLd
		GEL [14]GEL LEAD [14]LEA
		Lithium Ion [14]Li User-Defined [14]USE
		If "User-Defined" or "LI" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 17, 18 and 19.
17	Bulk charging voltage (C.V voltage)	48V model default setting: 56.4V [17]CV 56.4ᵛ
		If self-defined is selected in program 14, this program can be set up. Setting range is from 48.0V to 58.4V for 48Vdc model. Increment of each click is 0.1V
18	Floating charging voltage	48V model default setting: 54.0V [18]FLV 54.0ᵛ
		If self-defined is selected in program 14, this program can be set up. Setting range is from 48.0V to 58.4V for 48Vdc model. Increment of each click is 0.1V
19	Low DC cut off battery voltage setting	48V model default setting: 40.8V [19]COV 40.8ᵛ
		If self-defined is selected in program 14, this program can be set up. Setting range is from 40.0V to 48.0V for 48Vdc model. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.
20	Battery stop discharging voltage when AC is available	Available options for 48V models:
		46.0V (default)	Setting range is from 44.0V to 58.0V. Increment of each click is

		![20] 46.0 v	0.1V
21	Battery stop charging voltage when AC is available	Available options for 48V models:	
		54.0V (default) ![21] 54.0 v	Setting range is from 44.0V to 58.0V. Increment of each click is 0.1V

22	Auto turn page	(default) ![22] PtE	If selected, the display screen will auto turn the display page.
		![22] Ptd	If selected, the display screen will stay at latest screen user finally switches.
23	Backlight control	Backlight on ![23] LON	Backlight off (default) ![23] LOF
24	Alarm control	Alarm on (default) ![24] bON	Alarm off ![24] bOF
25	Beeps while primary source is interrupted	Alarm on ![25] AON	Alarm off (default) ![25] AOF
27	Record Fault code	Record enable(default) ![27] FON	Record disable ![27] FOF

After pressing and holding "MENU" button for 6 seconds, the unit will enter reset model. Press "UP" and "DOWN" button to select programs. And then, press "ENTER" button to exit.

	(default) ![dt] nrt	Reset setting disable

		Reset setting enable
SEt	[dt] ⊢St	

Fault Reference Code

Fault Code	Fault Cause	LCD Indication
01	Fan is locked when inverter is off	[01] ⚠ ERROR
02	Inverter transformer over temperature	[02] ⚠ ERROR
03	battery voltage is too high	[03] ⚠ ERROR
04	battery voltage is too low	[04] ⚠ ERROR
05	Output short circuited	[05] ⚠ ERROR
06	Inverter output voltage is high	[06] ⚠ ERROR
07	Overload time out	[07] ⚠ ERROR
08	Inverter bus voltage is too high	[08] ⚠ ERROR
09	Bus soft start failed	[09] ⚠ ERROR
11	Main relay failed	[11] ⚠ ERROR
21	Inverter output voltage sensor error	[21] ⚠ ERROR
22	Inverter "AC in" voltage sensor error	[22] ⚠ ERROR
23	Inverter output current sensor error	[23] ⚠ ERROR
24	Inverter "AC in" current sensor error	[24] ⚠ ERROR
25	Inverter load current sensor error	[25] ⚠ ERROR

26	Inverter AC over current error	$\boxed{26}_{\triangle\text{ERROR}}$
27	Inverter radiator over temperature	$\boxed{27}_{\triangle\text{ERROR}}$
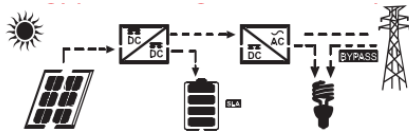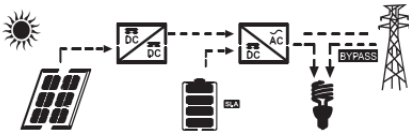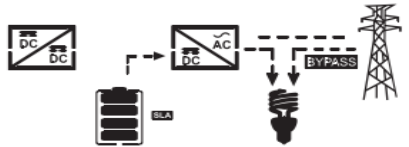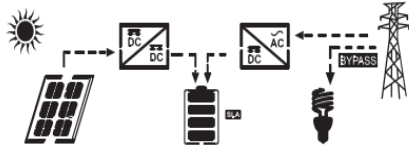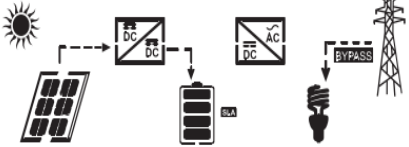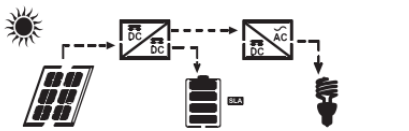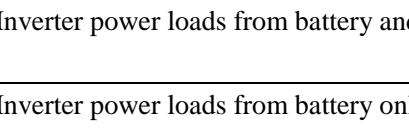
31	Solar charger battery voltage class error	$\boxed{31}_{\triangle\text{ERROR}}$
32	Solar charger current sensor error	$\boxed{32}_{\triangle\text{ERROR}}$
33	Solar charger current is uncontrollable	$\boxed{33}_{\triangle\text{ERROR}}$
41	Inverter "AC in" voltage is low	$\boxed{41}_{\triangle\text{ERROR}}$
42	Inverter "AC in" voltage is high	$\boxed{42}_{\triangle\text{ERROR}}$
43	Inverter "AC in" under frequency	$\boxed{43}_{\triangle\text{ERROR}}$
44	Inverter "AC in" over frequency	$\boxed{44}_{\triangle\text{ERROR}}$
51	Inverter over current protection error	$\boxed{51}_{\triangle\text{ERROR}}$
52	Inverter bus voltage is too low	$\boxed{52}_{\triangle\text{ERROR}}$
53	Inverter soft start failed	$\boxed{53}_{\triangle\text{ERROR}}$
55	Over DC voltage in AC output	$\boxed{55}_{\triangle\text{ERROR}}$
56	Battery connection is open	$\boxed{56}_{\triangle\text{ERROR}}$
57	Inverter control current sensor error	$\boxed{57}_{\triangle\text{ERROR}}$
58	Inverter output voltage is too low	$\boxed{58}_{\triangle\text{ERROR}}$

Warning Indicator

Warning Code	Warning Event	Icon flashing
61	Fan is locked when inverter is on.	$\boxed{61}_{\triangle\text{ERROR}}$

62	Fan 2 is locked when inverter is on.	[62] ⚠ ERROR
63	Battery is over-charged.	[63] ⚠ ERROR
64	Low battery	[64] ⚠ ERROR
67	Overload	[67] ⚠ 🔆🔋 100% 25%
70	Output power derating	[70] ⚠ ERROR
72	Solar charger stops due to low battery	[72] ⚠ ERROR
73	Solar charger stops due to high PV voltage	[73] ⚠ ERROR
74	Solar charger stops due to over load	[74] ⚠ ERROR
75	Solar charger over temperature	[75] ⚠ ERROR
76	PV charger communication error	[76] ⚠ ERROR
77	Parameter error	[77] ⚠ ERROR
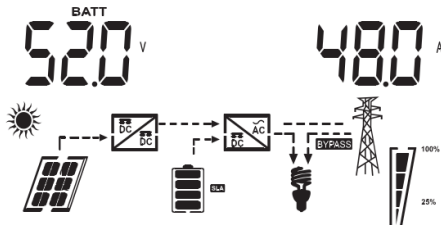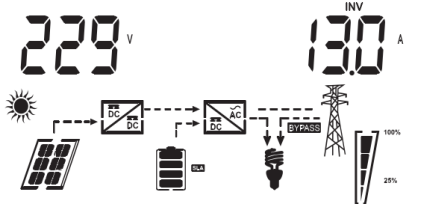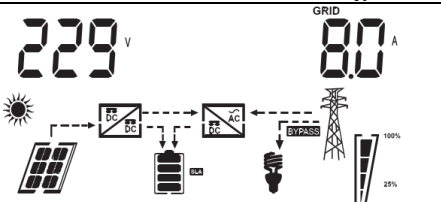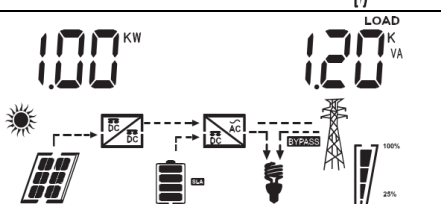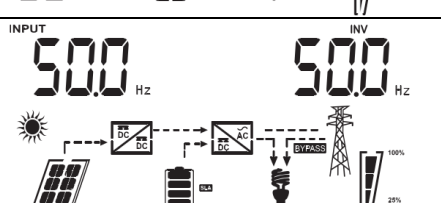
Operating State Description

Operation state	Description	LCD display
Match load state Note: DC power produced from your solar array is converted by the inverter into AC power, which is then sent to your main electrical panel to be used by your household appliances. Any excess power generated stored in the battery.	PV energy is charging the battery and providing AC power to the load	PV energy power is larger than inverter power PV energy power is smaller than inverter power PV is off
Charge state	PV energy and generator are charging the batteries.	
Bypass state	Error are caused by inside circuit error or external reasons such as over temperature,	
Off-Grid state	The inverter will provide output power from battery and PV power.	Inverter power loads from PV energy. Inverter power loads from battery and PV energy. Inverter power loads from battery only.

Stop mode	The inverter stopped working. Turn off the inverter by the soft key and turn it back on.

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: battery voltage, battery current, inverter voltage, inverter current, "AC in" voltage, "AC in" current, load in Watt, load in VA, "AC in" frequency, inverter frequency, PV voltage, MPPT charging power, MPPT charging output voltage, MPPT charging current.

Selectable information	LCD display
Battery voltage/DC discharging current	
Inverter output voltage/Inverter output current	
"AC in" voltage / "AC in" current	
Load in Watt/VA	
AC frequency/Inverter frequency	

PV voltage and power	120 V 2.00 KW
PV charger output voltage and MPPT charging current	51.0 V OUTPUT 40.0 A

SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	4048/60A 4048/80A 5048/60A 5048/80A
Input Voltage Waveform	Sinusoidal
Nominal Input Voltage	230Vac
Low Loss Voltage	90Vac±7V(APL、GEN);170Vac±7V(UPS) 186Vac±7V(VDE)
Low Loss Return Voltage	100Vac±7V(APL、GEN);180Vac±7V(UPS) 196Vac±7V(VDE)
High Loss Voltage	280Vac±7V(UPS、APL、GEN)253Vac±7V(VDE)
High Loss Return Voltage	270Vac±7V(UPS、APL、GEN)250Vac±7V(VDE)
Max AC Input Voltage	300Vac
Nominal Input Frequency	50HZ/60HZ (Auto detection)
Low Loss Frequency	40HZ±1HZ(UPS、APL、GEN) 47.5HZ±0.05HZ(VDE)
Low Loss Return Frequency	42HZ±1HZ(UPS、APL、GEN) 47.5HZ±0.05HZ(VDE)
High Loss Frequency	65HZ±1HZ(UPS、APL、GEN) 51.5HZ±0.05HZ(VDE)
High Loss Return Frequency	63HZ±1HZ(APL、GEN、UPS) 50.05HZ±0.05HZ(VDE)
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、VDE) 20ms typical (APL)
Output power derating: When AC input voltage drops	230Vac model:

to 95V or170V depending on models, the output power will be de-rated.	
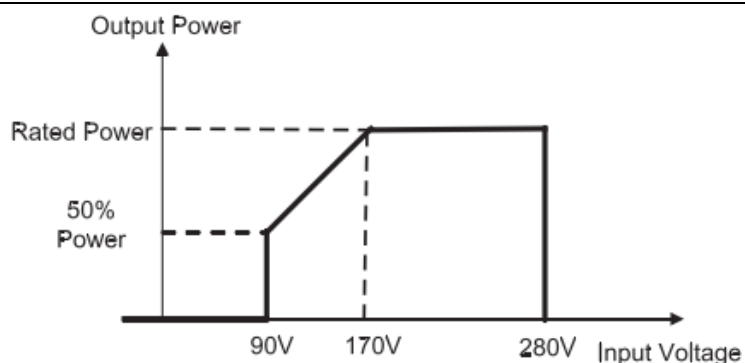
Table 2 Inverter Mode Specifications

INVERTER MODEL	4048/60A 4048/80A 5048/60A 5048/80A
Rated Output Power	4KVA/3.2KW 5KVA/4KW
Output Voltage Waveform	Pure Sine Wave
Output Voltage Regulation	230Vac±5%
Output Frequency	60Hz or 50Hz
Peak Efficiency	90%
Overload Protection	5s@>150% load;l0s@110%~150% load
Surge Capacity	2* rated power for 5 seconds
Nominal DC Input Voltage	48Vdc
Cold Start Voltage	46.0Vdc
Low DC Warning Voltage @load<20% @ 20%≤load<50% @load≥50%	 44.0Vdc 42.8Vdc 40.4Vdc
Low DC Warning Return Voltage @load<20% @ 20%≤load<50% @load≥50%	 46.0Vdc 44.8Vdc 42.4Vdc
Low DC Cut-off Voltage @load<20% @ 20%≤load<50% @load≥50%	 42.0Vdc 40.8Vdc 38.4Vdc
High DC Recovery Voltage	58Vdc
High DC Cut-off Voltage	60Vdc
No Load Power Consumption	<50W

*4KVA/5KVA only supports 230VAC system.

Table 3 Charge Mode Specifications

"AC in" Charging Mode		
INVERTER MODEL		**4048/60A** **4048/80A** **5048/60A** **5048/80A**
Charging Current @Nominal Input Voltage		1~60A
Absorption Voltage	**SEALED-LEAD AGM/GEL Battery**	50
	Flooded battery	50
Refloat Voltage	**SEALED-LEAD AGM/GEL Battery**	54.8
	Flooded battery	54.8
Float Voltage	**SEALED-LEAD AGM/GEL Battery**	57.6
	Flooded battery	56.8
Charging Algorithm		3-Step(Flooded Battery、Sealed-Lead、AGM/Gel Battery),4-Step(LI)
Solar Charging Mode		
INVERTER MODEL	**4048/60A** **5048/60A**	**4048/80A** **5048/80A**
Rated Power	3000W	4000W
Solar Charging Current	60A	80A
Efficiency	98.0%max.	
Max. PV Array Open Circuit Voltage	145Vdc max	
PV Array MPPT Voltage Range	64~130Vdc	
PV Array Isc	60A	80A
Min battery voltage for PV charge	34Vdc	
Standby Power Consumption	2W	
Battery Voltage Accuracy	+/-0.3%	
PV Voltage Accuracy	+/-2V	
Charging Algorithm	3-Step(Flooded Battery、Sealed-Lead、AGM/Gel Battery),4-Step(LI)	

Charging algorithm for lead acid battery	
Charging algorithm for Lithium battery	

Joint "AC in" and Solar Charging

INVERTER MODEL	4048/60A 5048/60A	4048/80A 5048/80A
Max Charging Current	120A	140A
Default Charging Current	60A	80A
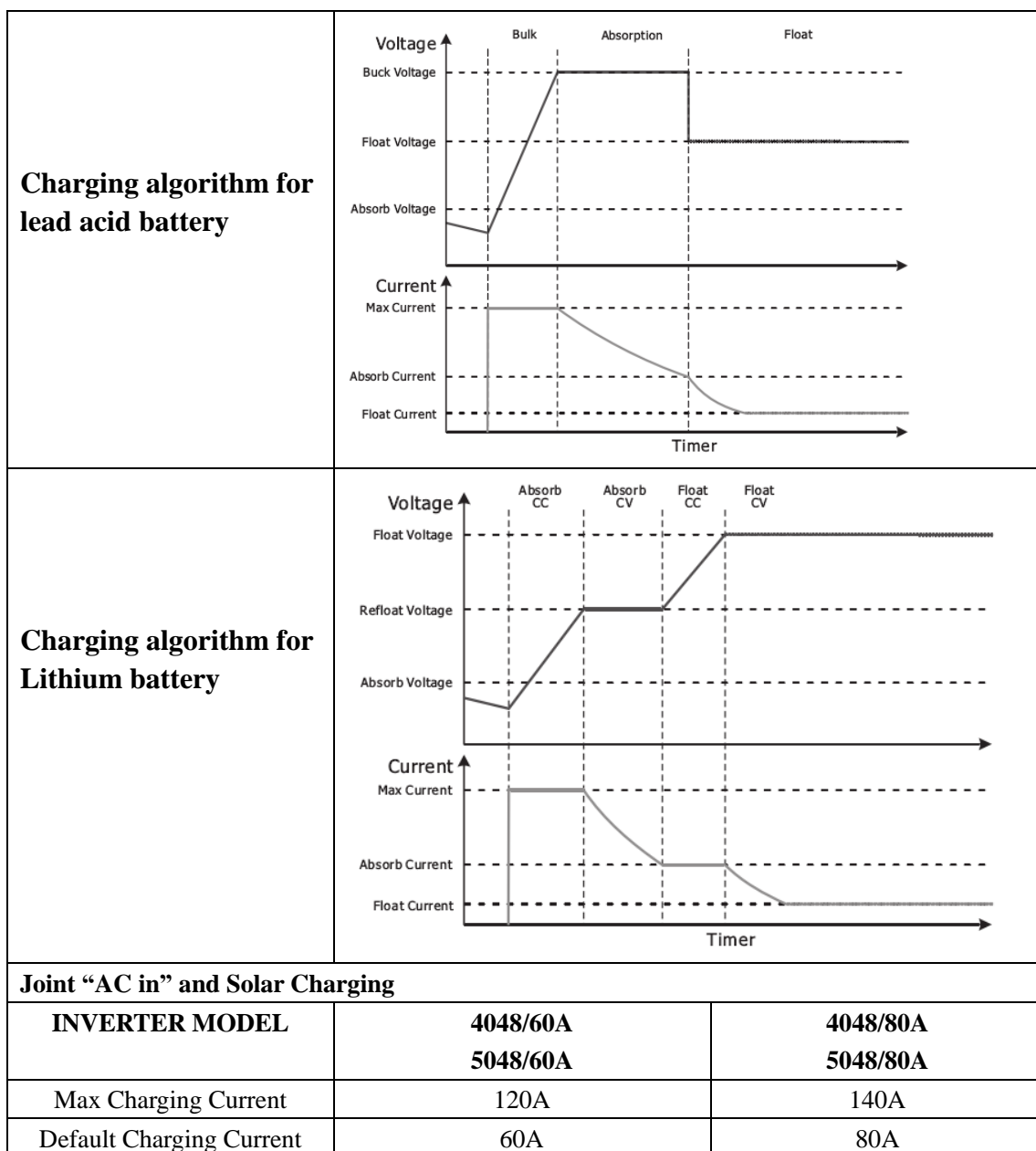
Table 4 General Specifications

INVERTER MODEL	4048/60A 5048/60A	4048/80A 5048/80A
Certification	IEC62109-1, IEC62109-2, SAA180814, CE	
Operating Environment	IP20 Indoor use only, avoid direct sunlight	
Operating Temperature Range	0℃ to 55℃	
Storage temperature	-15℃ to 60℃	
Back feed current to array	No back feed	
Inrush current	40A	40A
Max output fault current	20.9A	26A
Max output overcurrent protection	15.3A	19.1A
Dimension (D*W*H), mm	354 x 272 x 128	528 x295 x141
Net Weight, kg	12.5	13.5

TROUBLE SHOOTING

Problem	LCD/LED/Buzer	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 the wiring are connected and 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	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. (Appliance=>wide)
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 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
		Internal temperature of inverter component is over 90℃.	
	Fault code 02		Check whether the air flow of the unit is blocked or whether 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 01	Fan fault	Replace the fan.
	Fault code 06/58	Output abnormal (Inverter voltage below than 202Vac or is higher than 253Vac)	1. Reduce the connected load. 2. Return to repair center
	Fault code	Internal components filed.	Return to repair center

	08/09/53/57		
	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, or fuse is faulty.	If the battery is connected correctly, please return the unit to the repair center.

Appendix: Approximate Back-up Time Table

Model	Load(VA)	Backup Time@48Vdc 100Ah(min)	Backup Time@48Vdc 200Ah(min)
4KVA	400	766	1610
	800	335	766
	1200	198	503
	1600	139	339
	2000	112	269
	2400	95	227
	2800	81	176
	3200	62	140
	3600	55	125
	4000	50	112
5KVA	500	613	1288
	1000	268	613
	1500	158	402
	2000	111	271
	2500	90	215
	3000	76	182
	3500	65	141
	4000	50	112
	4500	44	100
	5000	40	90

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.

420-00286-01