MAGNIZON
GREEN ENERGY

USER MANUAL

HG-PV Series Inverter / Charger

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PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLATION

General Precautions

1. Before using HG-PV, read all instructions and cautionary markings on :
   (1) HG-PV (2) AC Input cable (3) User manual

CAUTION --To reduce risk of injury, charge only lead-acid rechargeable batteries. If customer use flooded batteries, they must maintain them usually. Other types of batteries may cause damage and injury.

2. Do not expose HG-PV to rain, snow or liquids of any type. HG-PV is designed for indoor.
3. Do not disassemble HG-PV Take it to a qualified service center when service or repair is required.
4. To prevent the risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. **WARNING:** Provide ventilation to outdoors from the battery compartment. The battery enclosure should be designed to prevent accumulation and concentration of hydrogen gas at the top of the compartment.
6. **NEVER** charge a frozen battery.
7. Input/output AC wiring must be no less than 18 AWG gauge copper wire and rated for 75˚C or higher. Battery cables must be rated for 75˚C or higher and should be no less than 6AWG gauge.
8. Be extra cautious when working with metal tools around batteries. Short-circuiting the batteries could cause an explosion.
9. Read the battery manufacturer's installation and maintenance instructions prior to operating.

Personnel Precautions

1. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
2. Avoid touching eyes while working near batteries.
3. NEVER smoke or allow a spark or flame in vicinity of a battery.

4. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with batteries. Batteries can produce short-circuit current high enough to make metal melt , and could cause severe burns.
5. If a remote or automatic generator start system is used, disable the automatic starting circuit or disconnect the generator to prevent accident during servicing.

1.Introduction

HG-PV is a DC-to-AC inverter with auto line-to-battery transfer and integrated charging system, serving as an extended run UPS, a standalone power source or an automotive inverter.

HG-PV supplies power from AC power and DC source. When AC cable is connected to a wall socket, utility power goes to connected equipment(s) and/or charges the battery set via charging system. In battery mode, HG-PV automatically converts battery energy into AC power for backing up the connected devices.

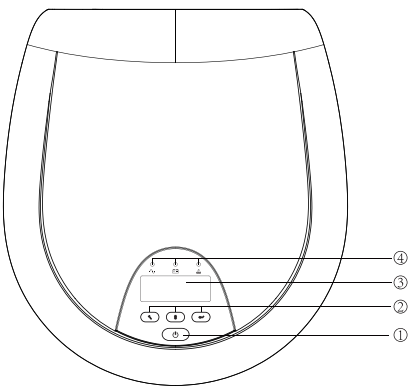
Features:

- Automatic line-to-battery switchover
- Configurable Input voltage ranges via LCD setting
- High efficient DC-to-AC conversion, minimizing energy loss
- Rack design & wall-mounted design for flexible installation
- Built-in enhanced charger
- Built-in solar charger controller up to 40A
- Intelligent 3-stage charger control for efficient charging and preventing overcharge
- Auto restart while AC recovery
- Multiple protection: low battery alarm, low battery shutdown, over charger protection, overload protection, over temperature protection, short circuit protection
- With the environmental temperature control charge management

2.Operation

2.1Top Panel Controls and LCD Indicators

Shown below are the controls, LCD and LED on the top panel of HG-PV.



①Power ON/OFF button

②Setting function button

③LCD

④LED indicators

Figure 1: Top Panel

2.2Power On/Off

Power on/off button is shown as above. Once HG-PV has been properly installed and batteries are connected, press this button and HG-PV will turn on automatically, and works in mains mode or inverter mode according to input AC source's status. When press this button again, HG-PV will turn off automatically.

2.3Operation and Display Panel

The Operation and display panel, shown in below chart, is on the top panel of the HG-PV. It includes three LED indicators, four function keys and LCD display, indicating the operating status and input/output power information.

2.4LED Indicators

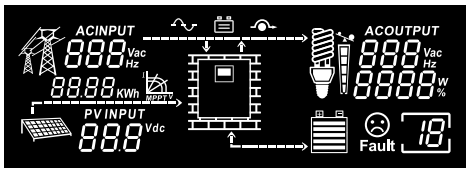
LED indicators			Information
	Green	Line Mode 1 (charge curent >3A)	Green flashing every 2 seconds
		Line Mode 2 (charge current≦3A)	Green solid lighting
		Off-charge mode	Green flashing as cycle: 0.5s On→0.5s Off→0.5s On→4s Off
	Yellow	Battery mode	Yellow solid lighting
	Red	Overload	Red flashing every 0.5 second
		Fault	Red lighting

Function Keys

Function Keys	Description
	To power on/off
	To enter the setting mode or exit setting mode
	To go to the next selection page
	To confirm the selection in setting mode

2.5LCD Display

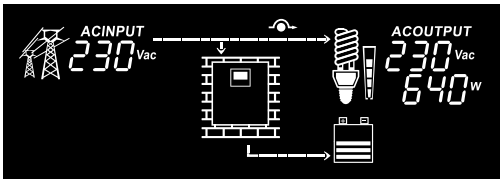
LCD displays the power flow and input/output readings in a visualized graphic design which allows the user to understand the operation status easily. The backlight of LCD remains on whenever the inverter is working (including Standby Charging Mode and Fault Mode).



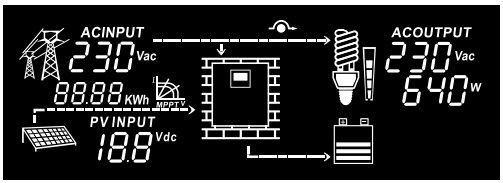
Icon	Description
	This icon is showed when AC input presents. Input voltage level can be told by the numeric reading.
	This icon is showed when PV (solar) system presents. Input voltage level can be told by the numeric reading.
	This icon is showed total PV generating capacity .
	Level of remaining battery capacity
	Inverter is operated under over-loading condition
	The icon and level bar indicates the loading level (0~100%)
	Line Mode is enabled
	Backup Mode is enabled
	Standby Charging Mode is enabled
	This icon is showed when there is a fault event. The number is the fault code which can be referred to specific fault event (please refer to Section “Troubleshooting”).

2.5.1Standby Charging Mode

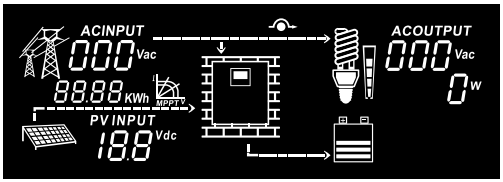
The battery can be charged without switching on the inverter, and such operation is called Standby Charging Mode. When AC input cable and battery is connected, the inverter will enter into Standby Charging Mode and LCD will be turned on with the following display.



If PV string is also connected with enough voltage, the display will be as shown below to indicate the power flow from PV string.



Even if AC input is absent, PV power can still charge the battery and the display will be as shown below.



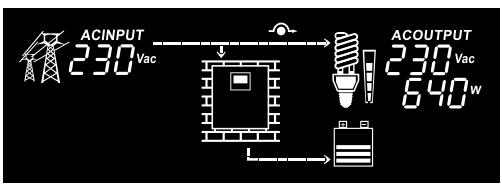
2.5.2Operation Modes (after powered on)

Press the Power ON/OFF button to power on the inverter and the inverter will automatically enter into either of the operation mode according to the condition of AC input and PV input as shown in the table below,

	PV Power present	Less PV Power	No PV Power
AC Input Power Present	LINE MODE 2		LINE MODE 1
AC Input Power Absent	BACKUP MODE 3	BACKUP MODE 2	BACKUP MODE 1

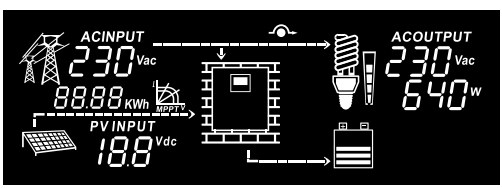
LINE MODE 1

AC input power is present but there is no PV power (e.g. night time). Load is supplied by AC input power directly.



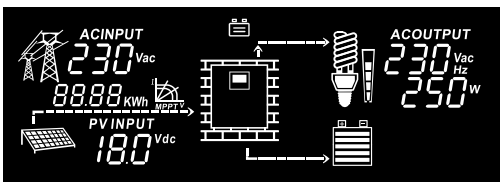
LINE MODE 2

Both AC input and PV input are present. Load is supplied by either AC input or PV input depending on the priority switch's setting.



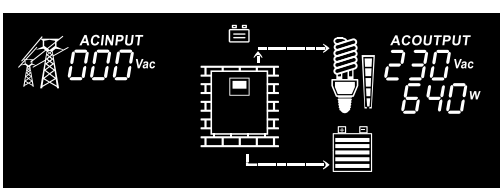
2.5.3Priority Setting

In LINE MODE 2, if priority setting is set to give PV priority and PV power is also strong enough to support load, the AC input will not be consumed even though it is present. This is deemed an energy-saving operation.



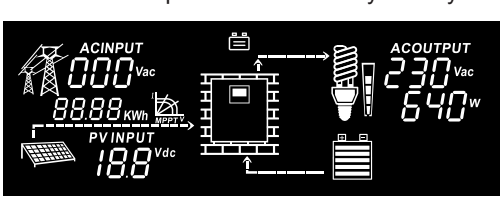
BACKUP MODE 1

Both AC input and PV input are absent. The backup power to load comes only from battery. The backup time is determined by the capacity of battery.



BACKUP MODE 2

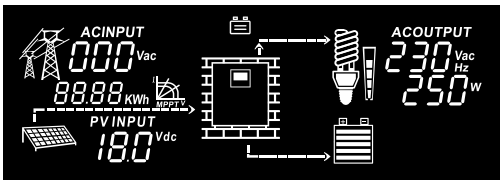
AC input is absent and PV power is not enough to support loads completely. The insufficient power is covered by battery.



The larger the PV power, the less consumption from battery and therefore the longer backup time.

BACKUP MODE 3

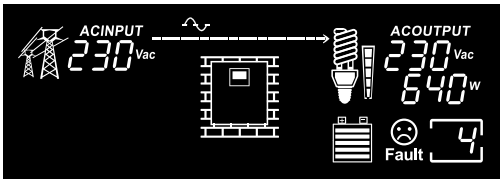
AC input is absent and PV power is strong enough to not only support the load but also charge the battery.



As long as the PV power persists, the load can be powered continuously without consuming power from battery.

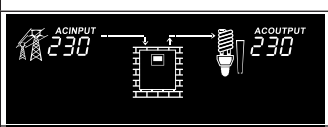
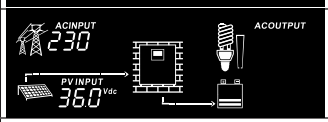
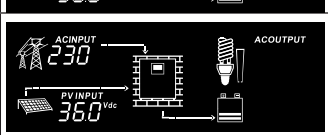
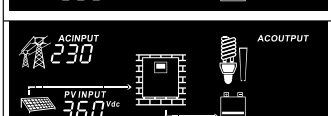
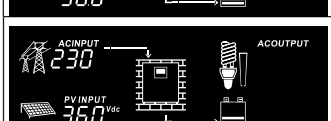
Fault Mode

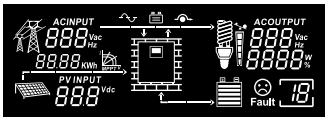
Inverter enters into Fault Mode when there is a fault event. The fault icon will be shown with a fault code. Please refer to fault code table in “Trouble shooting” section.



2.6LCD Setting

After pressing and hold the " " button for 3 seconds, the unit will enter setting mode. Press" " button to select programs. And then, press the" " button to confirm the selection. If want exit the setting mode, press and hold the" " button for 3 seconds.If want initialization settings, pressing and hold the" "+" " button together for 3 seconds.

Setting Items	Icons	Description
AC input voltage rang		If selected, acceptable AC input voltage will be within 170-280VAC
		If selected, acceptable AC input voltage will be within 90-280VAC (default)
Priority Setting		Line priority
		PV priority
AC/PV charger ON/OFF Setting		AC charger ON/ PV charger ON
		PV charger ON/ AC charger OFF
		AC charger ON/ PV charger OFF

The mood LED on/off/flashing setting		If selected, the mood LED solid lighting (default)
		If selected, the mood LED is off status
Initialization settings		If pressing and hold the“ ” + “ ” button together for 3 second, It represents the initialization settings, the all customer’s setting cleaned and restore factory settings,

2.6.1Battery Segments Display

1. When in charging mode, the battery segments will display as below.

HG-PV1K-12 & HG-PV1.2K-12

Status	Battery voltage				
		1	2	3	4
Floating	Any battery voltage	Solid on	Solid on	Solid on	Solid on
CV	Any battery voltage	Solid on	Solid on	Solid on	Flashing
CC	Bat>13.5V	Solid on	Solid on	Flashing	Flashing
	13.5>=Bat>13.0V	Solid on	Flashing	Flashing	Flashing
	Bat<=13.0V	Flashing	Flashing	Flashing	Flashing

Remark: Off mode charging is same.

HG-PV2K-24

Status	Battery voltage				
		1	2	3	4
Floating	Any battery voltage	Solid on	Solid on	Solid on	Solid on
CV	Any battery voltage	Solid on	Solid on	Solid on	Flashing
CC	Bat>27V	Solid on	Solid on	Flashing	Flashing
	27>=Bat>26V	Solid on	Flashing	Flashing	Flashing
	Bat<=26V	Flashing	Flashing	Flashing	Flashing

Remark: Off mode charging is same.

2. When battery low, the mark  will flicker every 1second.

3. Keystroke board's LCD Display:**When switch ON,the LCD lighting.**

3.Back Panel Description

Shown below are the components on the back of HG-PV.

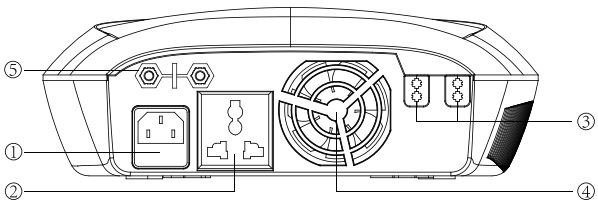


Figure 2 Back Panel

① AC input receptacle
② AC output receptacle
③ DC input wire
④ Cooling Fan
⑤ PV input

A. Configure LCD to **'Narrow'** setting for general electrical appliance: If you select this mode, the HG-PV operating voltage in Line mode is within 170~280Vac with the same output voltage. The line sensitivity is higher.

B. Select **'Wide'** setting to save energy:

If you select this mode, the HG-PV operating voltage in Line mode will be extended within 90~280Vac with the same output voltage. The HG-PV is with the lower line sensitivity. Moreover, there will be taking a long transfer time when the HG-PV transfer from line mode to Battery mode during power failure. Hence, you can connect the home equipments, such as light bulb, fan, fluorescent tube, or TV when you select this mode.

Caution!! If you connect the computer to the output of HG-PV, the computer may reboot if the input voltage is too low to be accepted. In addition, the long transfer time will happen when power failure makes the computer reboot.

4.Wall-Mount Instructions

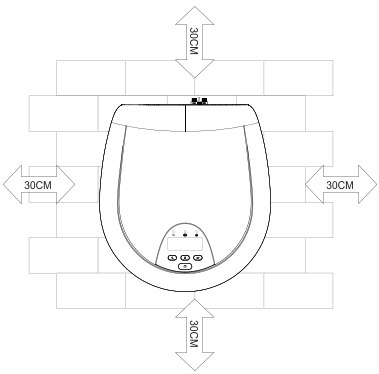


Figure 3 mounting to the wall

1. Choosing a location to install, the place should be in a well-ventilated room protected against rain, vapour, moisture and dust.
2. **NEVER** install HG-PV at a location where there is danger of gas or dust explosions.
3. **DON'T** mount HG-PV straight above the batteries because of possible corrosive fumes.
4. Mount HG-PV as figure 3 direction and so that airflow through the ventilation openings is guaranteed. No objects must be located **within a distance of 30cm** around the HG-PV.
5. Use 2 screws to mount HG-PV to a solid surface, recommended screw size is M4*50~65mm.

5.Battery Connection

Connect battery cables to your batteries

For the user operation safety, we strongly recommend that you should isolate the battery terminals before you start to operate the unit. Please refer to below instruction for further information. If you parallel more batteries to extend the backup time, please make sure that you already use tapes to isolate the rest battery terminals before you start to operate the unit.

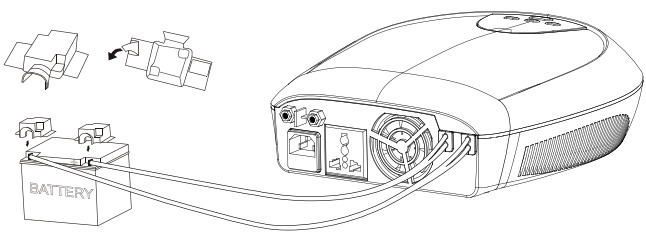
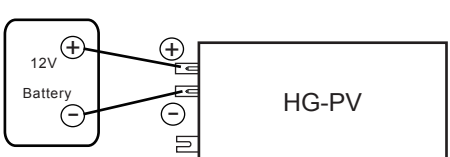


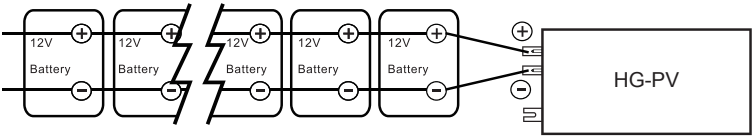
Figure 4 battery connection

Caution! **DO NOT** places anything between battery cable ring terminals and battery terminals. The terminal stud is not designed to carry current. Apply Anti-oxidant paste to terminals after terminals have been torqued.

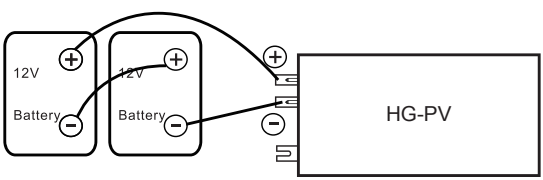
- Series battery connection: When using single battery it voltage must be equal to the voltage of HG-PV Nominal Input Voltage(Apply to HG-PV1K-12 & HG-PV1.2K-12 models)



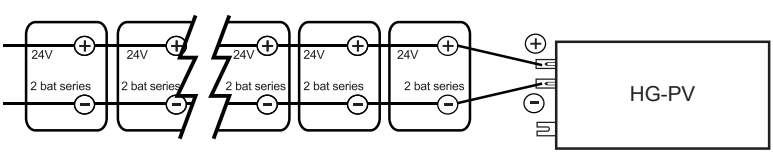
- Parallel battery connection: When using multiple batteries in parallel, each battery's voltage must be equal to the voltage of HG-PV1K-12 & HG-PV1.2K-12 Nominal Input Voltage



- Series battery connection: When using multiple batteries in series, all batteries must be equal in voltage and amp hour capacity, and the sum of their voltages must be equal to the voltage of HG-PV2K-24 Nominal Input Voltage



Parallel battery connection: When using multiple batteries in parallel, each battery's voltage must be equal to the voltage of HG-PV 2K-24 Nominal Input Voltage



6.Specification

MODEL		HG-PV 1K-12	HG-PV 1.2K-12	HG-PV 2K-24
*1 CAPACITY	VA/W	1000VA/750W	1200VA/900W	2000VA/1500W
BATTERY	VDC	12VDC		24VDC
INPUT	Nominal Voltage	220/230/240VAC		
	Voltage Range	170-280VAC (Narrow Range)		
		90-280VAC (Wide Range)		
OUTPUT	Voltage	230VAC		
	Voltage Regulation (Bat. Mode)	10% / -18%		
	Frequency	50Hz or 60Hz		
	Frequency Regulation (Bat. Mode)	+/-1 Hz		
	Output Waveform	Modified Sine-wave		
BATTERY & CHARGER	Charger Current	20Amp		15Amp
	Overcharge Protection	16V		32V
TRANSFER TIME	Typical	15ms Typical, 40ms Max.		
EFFICIENCY	AC to AC	>95%		
	DC to AC	>80%		
DISPLAY INDICATOR	AC Mode	Display output power, output voltage		
	Battery Mode	The mark  will flicker every 1second.		
	Battery Charging Mode	Display the Battery capacity		
	Fault	Display fault		
SOLAR BATTERY CHARGER	Max. Input Power	450W		900W
	Charging Current	40Amp		
	Nominal Batery Voltage	12V		24V
	Optimal Work Voltage Range	15V~18V		30V~36V
	Max.PV Input Voltage	55V		
PROTECTION	Full Protection	Discharge, overcharge, overload, over temperature protection.		
PHYSICAL	Dimension (DxWxH) mm	373mm(D)*121mm(W)*305mm(H)		
	Net Weight (kgs)	2.18kg	2.49kg	2.37kg
ENVIRONMENT	Operating environment	0- 50°C, 5%-90 % relative humidity (non-condensing)		
	Storage Environment	-15°C to 55°C, 5% to 95% humidity (non-condensing)		
	Noise Level	Less than 50dB		

*1: Suggest the total load that you connect to HG-PV is better to be less the 80% of the unit's capacity.

7.Troubleshooting

Problem	Possible Cause	Remedy
No LCD display	1.Battery Weak	1. Re-charge battery, Check DC input connection.
	1.Battery defect	2. Battery replacement.
	1. Power switch is not pressed	3. Press and hold power switch.
Mains normal but works in inverter mode	1. AC Input is missing	1. Check AC input connection.
	2. Input fuse is broken	2. Reset the input fuse.
Back up time is shorten	1. Overload	1. Remove some non-critical load.
	2. Battery voltage is too low.	2. Charge battery for 8 hours or more.
Alarm buzzer beeps continuously	Units enter fault mode, the buzzer beeps continuously for one minute, and the buzzer beeps time as next table for each fault reason.	1. Refer to next table to identify the unit fault reason. 2. Recode the fault reason and work condition, report them to a qualified service center to get further help.

8. Alarm Behavior Table

Fault Description	Line Mode		BackupMode		Fault Code
	No. of Beeps	AC Output	No. of Beeps	AC Output	
Overload 1 (V_{out}<195V)	/	/	0	OFF	0
Output RMS voltage low	/	/	2	OFF	2
Over temperature/Short-circuited	/	/	3	OFF	3
Fan locked	4	ON	4	OFF	4
Battery voltage high	5	ON	/	/	5
Overload 2 (V_{out}≧195V; P_{out}>80% rated half-wave load)	6	ON	6	OFF	6
AC output abnormal	/	/	7	OFF	7
Output voltage RMS high	/	/	8	OFF	8
Peak output voltage high	/	/	8	OFF	8
Utility connection error	9	OFF	9	OFF	9
PV current high	1BP/s	ON	1BP/s	ON	11
Solar charger over-temperature	1BP/s	ON	1BP/s	ON	12
Battery voltage high for Solar charger	1BP/s	ON	1BP/s	OFF	13
PV over-voltage	1BP/s	ON	1BP/s	ON	14
NTC opened	1BP/s	ON	1BP/s	ON	15
Solar charger MOSFETs /Relay damaged	1BP/s	/	1BP/s	/	16

Note: please contact your service representative in the event the alarm behavior is not included in the table above.

9.Appendix A

Model	Input/output cables (gauge copper wire)	Battery cables (gauge copper wire)
HG-PV1K-12	At least 18AWG	At least 6AWG
HG-PV1.2K-12	At least 18AWG	At least 6AWG
HG-PV2K-24	At least 18AWG	At least 6AWG

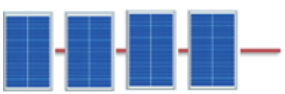
10.Appendix B

How to Select and Configure PV Panels panel's specification:

- P_{max}: Max output power (W)
- V_{oc}: open-circuit voltage (V)
- I_{sc}: short-circuit current (A)
- V_{mp}: max power voltage (V)
- I_{mp}: max power current (A)

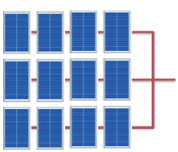
PV panels can be connected in series or parallel in order to obtain the desired output voltage and current which meets the inverter's allowed range.

When connecting PV panels in series, the max voltage and current of the string is



V_{string} = V1+V2+V3+V4…
I_{string} = I1=I2=I3=I4…

When connecting the above PV string in parallel, the max voltage and current of the total string is



$V_{total} = V_{string1} = V_{string2} = V_{string3} = V_{string4}$…

$I_{total} = I_{string1} = I_{string2} = I_{string3} = I_{string4}$…

In either case, the total output power is P_{total} = P_{panel} X Number of PV panel The guideline to select and configure PV string is

- P_{total} shall be equal or slightly larger than the max. capacity of solar battery charger (450W for 1000VA model and 900W for 2000VA model). Surplus capacity of PV string does not help the solar charger's capacity and only result in higher installation cost.
- Total V_{mp} of the string shall be within the operating voltage range of solar battery charger (15~18V for 1000VA model and 30~36V for 2000VA modelare recommended).
- Total I_{mp} of the string shall be less than the max. charging current of the solar battery charger (40A for both 1000VA and 2000VA model)

- Total V_{oc} of the string shall be less than the max. PV input voltage of the solar battery charger (55V for both 1000VA and 2000VA model).
- Total I_{sc} of the string shall be less than the max. PV input current of the solar battery charger (40A for both 1000VA and 2000VA model).

Example 1 – How to connect 1000VA model to PV panels with the following parameters?

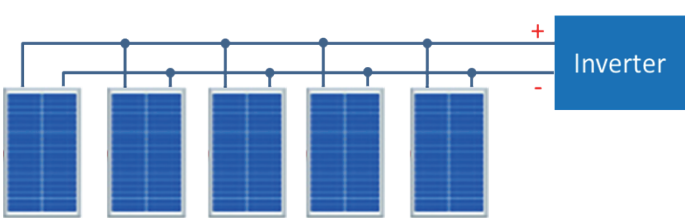
- P_{max}: 80W
- V_{oc}: 21.6V
- I_{sc}: 5.17A
- V_{mp}: 17.2V
- I_{mp}: 4.65A

(1) The max. PV input power for 1000VA model is 450W,
450W / 80W = 5.6⇒max. 5 PV panels shall be connected.

(2) Operating Voltage Range is 15~18V,
18V/17.2V = 1.04 ⇒ max. number of PV panel in series is 1.

(3) Max. charging current is 40A,
40A/5.17A = 7.7 ⇒ max. number of PV panel in parallel is 7.

(4) Taking (1)~(3) into consideration, the optimized configuration is 5 PV panels in parallel, as shown below



(5) Check again the V_{oc} and I_{sc} of PV string,
V_{oc} of string is 21.6V < 55V (Max. PV Input Voltage) ⇒ OK
I_{sc} of string is 5 x 5.17A = 25.9A < 40A (Max. PV Input Current)

⇒OK

Example 2 – How toconnect 2000VA model to PV panels with the following parameters?

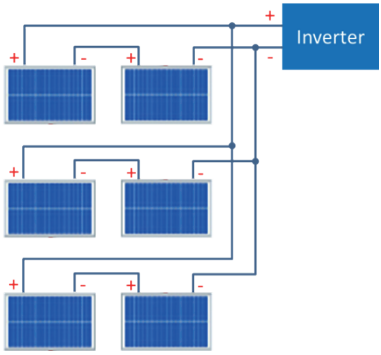
- P_{max}: 120W
- V_{mp}: 17.45V
- V_{oc}: 21.7V
- I_{mp}: 7.01A
- I_{sc}: 8.76A

(1) The max. PV input power for 2000VA model is 900W,
900W / 120W = 7.5 ⇒max. 7 PV panels shall be connected.

(2) Operating Voltage Range is 30~36V,
36V/17.45V = 2.1 ⇒ max. number of PV panel in series is 2.

(3) Max. charging current is 40A,
40A/7.01A = 5.7 ⇒ max. number of PV panel in parallel is 5.

(4) Taking (1)~(3) into consideration, the optimized configuration is 2 PV panels in series as a string, and 3 strings in parallel (as shown below).



(5) Check again the V_{oc} and I_{sc} of PV string,
V_{oc} of string is 2 x 21.7V = 43.4V < 55V (Max. PV Input Voltage)
⇒ OK
I_{sc} of string is 3 x 8.76A = 26.3A < 40A (Max. PV Input Current)
⇒ OK

11.DISPOSAL

In the event the product reaches the end of its service life, please contact the local dealer for disposal instructions.

The product must not be disposed of with the household waste.

Disposal of the product at the end of its service life shall be done in accordance with applicable disposal regulations for electronic waste.

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