

USER MANUAL

V2.0

ESS Alpha Series Storage System

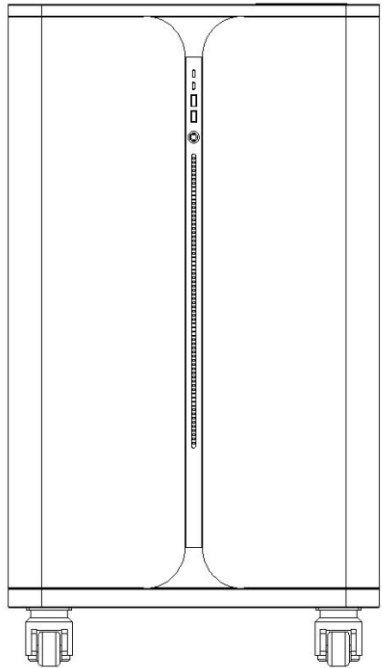
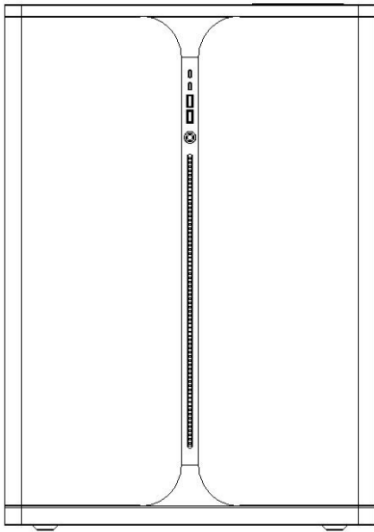


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ABOUT THIS MANUAL

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 LiFePO4 lithium ion 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 wires 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. 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.

7. 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.

8. **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.

9. **NEVER** cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.

10. **Warning !!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.

11. **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.

INTRODUCTION

This energy storage system can provide power to connected loads by utilizing PV power, utility power and battery power and store surplus energy generated from PV solar modules for use when needed. When the sun has set, energy demand is high, or there is a black-out, you can use the energy stored in this system to meet your energy needs at no extra cost. In addition, this energy storage system helps you pursue the goal of energy self-consumption and ultimately energy-independence.

Features

- . Pure sine wave inverter
- . Auto restart while AC is recovering.
- . Built-inLiFePO4lithiumbatterypack.
- . Overload/ Overtemperature/ Shortcircuitprotection.
- . Configurable input voltage ranges for home appliances and personal computers via LCD control panel.
- . Configurable output usage timer and prioritization.
- . Configurable charger source priority via LCD control panel.
- . Configurable battery charging current based on applications via LCD control panel.

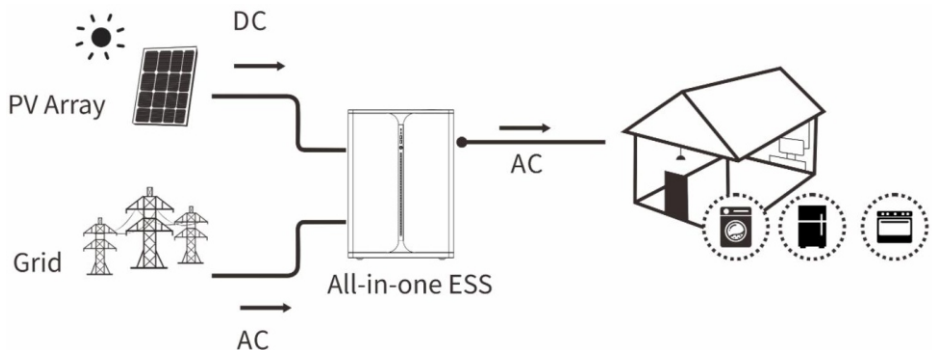
Basic System Architecture

The following illustration shows basic application for this unit. It also required the following devices to have a complete running system:

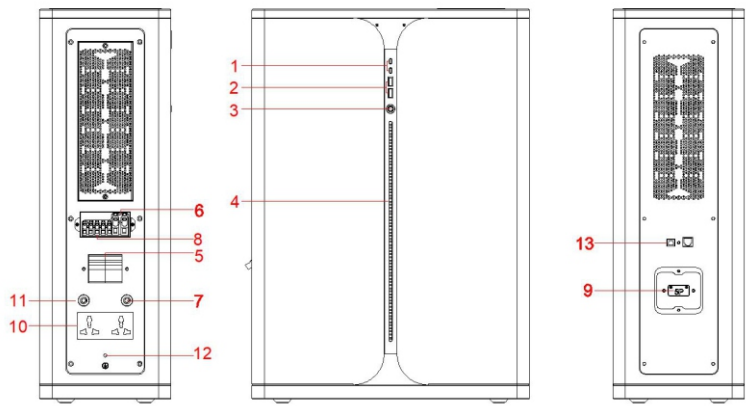
- . Generator or Utility mains.
- . PV modules

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

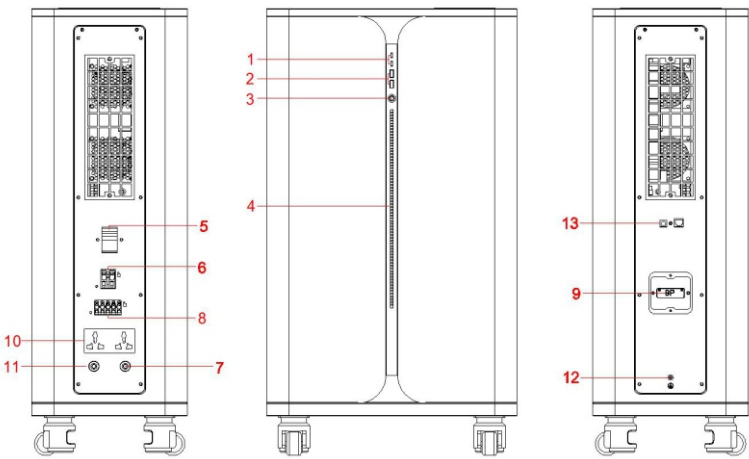
This inverter can power various appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioners.



Product Overview



Model:1.5KW



Model:2KW,3KW

1. USB-C 30W fast charge interface

2. USB-A 18W fast charge interface

3. Power on/off button

4. RGB indicator light

5. Built-in battery pack breaker

6. PV input

13.Communication port
7. AC input breaker

8. AC input

9. Battery maintenance interface

10. AC output socket

11. AC output breaker

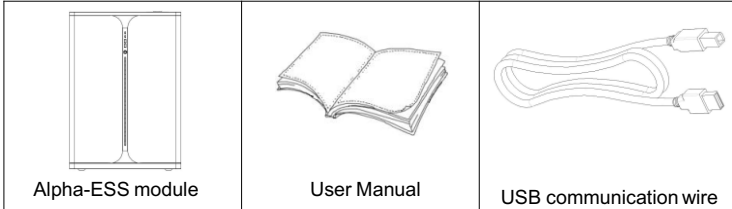
12. Ground wire screw hole

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:

You should receive the following items inside of package:



Mounting the Unit

Selecting Mounting Location

Consider the following points to install the energy storage system:

- . Do not mount the unit on flammable construction materials.
- . Mount on a solid surface
- . This unit might make noises during operation which may be perceived as a nuisance in a living area.
- . Install this unit at eye level in order to allow the readability of LCD display at all times.
- . For proper air circulation to dissipate heat and further maintenance, allow a clearance of approx. 75 cm to the sides of the unit.
- . To avoid battery falling, be sure to leave around 30cm distance between battery modules installed in parallel.
- . Dusty conditions on the unit may impair the performance of this inverter.
- . The ambient temperature should be between 0°C and 40°C and relative humidity should be between 5% and 85% to ensure optimal operation.
- . The recommended installation is vertical adherence.
- . For proper operation of this unit, please use appropriate cables for grid connection.
- . The pollution degree of the energy storage system is PD2. Select an appropriate mounting location.
- . Install the All-in-one modules in a protected area that is dry, free of excessive dust and with adequate air flow. Do NOT operate it in the place where the temperature and humidity is beyond the specific limits. (Please check the specs for the limitations.)
- . The ESS should be installed in the position where the disconnection means is easily accessible.
- . This unit is designed with IP20 protection for indoor applications only.
- . Regularly clean the fan filter.

Mounting the Unit

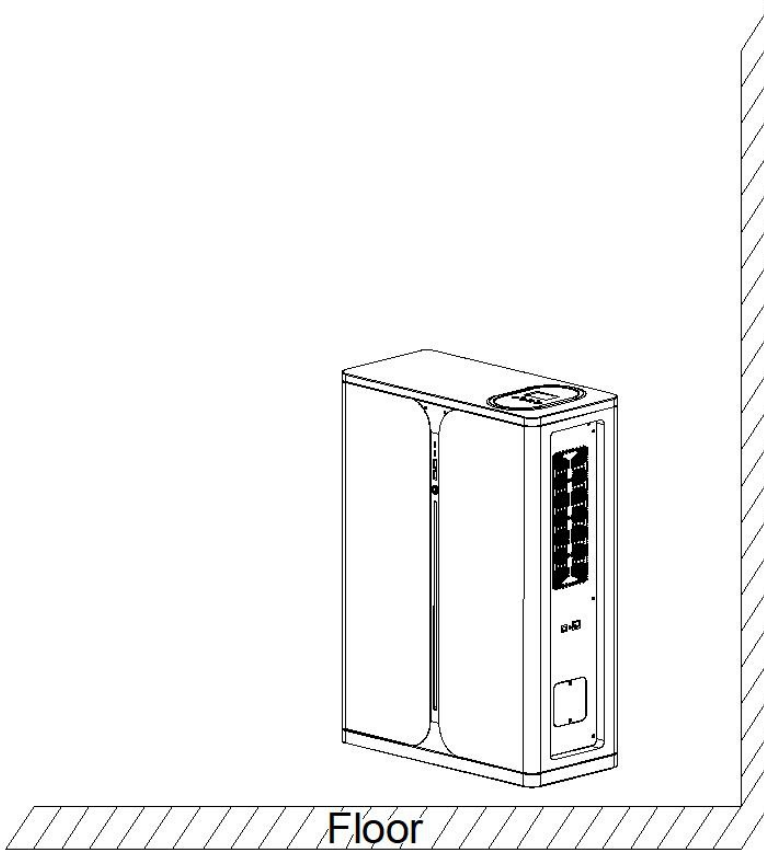
WARNING!! Remember that this inverter is heavy so please be careful when removing it from the package.

The unit can only operate in a CLOSED ELECTRICAL OPERATING AREA. Only service personnel can enter this area.

WARNING!! FIRE HAZARD.

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

This energy storage system should be installed battery modules first on the bottom and then inverter module on the top.



Connection

PV Connection

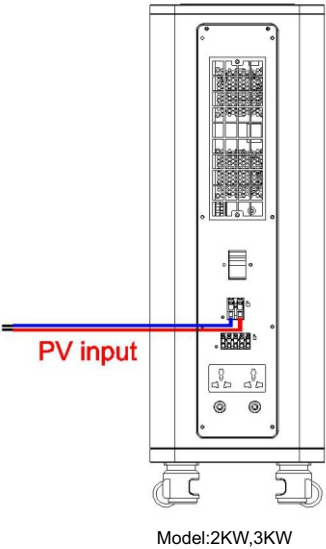
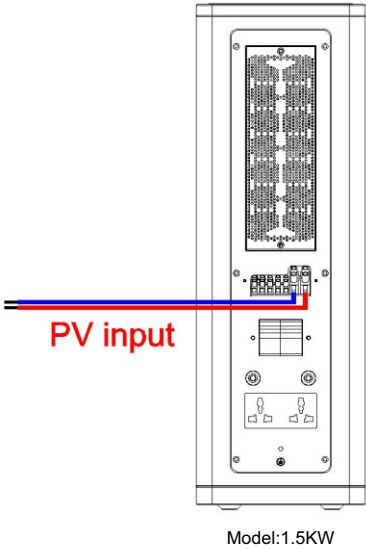
WARNING! It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size shown below.

WARNING: Because this inverter is non-isolated, only two types of PV modules are accepted, single crystalline, poly crystalline with class A-rated and CIGS modules. To avoid any malfunctions, 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 connection.

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.

Suggested cable requirement for PV wire:

Model	Solar input rated power	PV input voltage	Solar panel specification	Wire Size	Cable(mm ²)
1.5KW	1500W	400Vdc Max.	450W for 5S/1P or 550W for 4S1P	11AWG	4.0mm ²
2KW	2000W	400Vdc Max.	450W for 5S/1P or 550W for 4S1P	11AWG	4.0mm ²
3KW	3000W	400Vdc Max.	450W for 7S/1P or 550W for 6S1P	11AWG	4.0mm ²



AC Input Connection

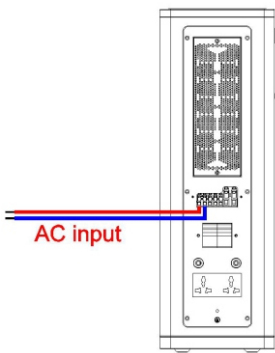
CAUTION: Before connecting to AC input power source, please install a separate AC circuit breaker between inverter module and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.

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

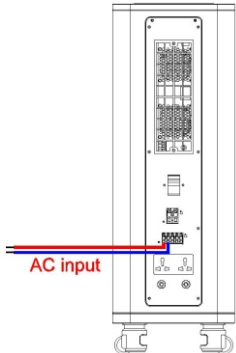
WARNING! For safety and efficiency, it's very important to use appropriate cables for AC input and output connection. To reduce risk of injury, please use the proper cable size recommended below.

Suggested cable requirement for AC wire:

Model	AC input	Wire Size	Cable(mm ²)
1.5-3KW	15A 250VAC	13AWG	2.5mm ²



Model:1.5KW

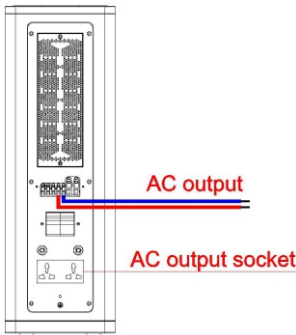


Model:2KW,3KW

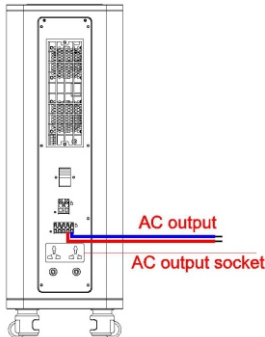
AC Output Connection

Suggested cable requirement for AC wire:

Model	Number of AC output socket	Socket specification	output Wire Size	Output Cable(mm ²)
1.5-3KW	2 channel	10A 250VAC	13AWG	2.5mm ²



Model:1.5KW



Model:2KW,3KW

Quick Charger Connection

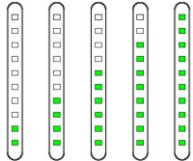
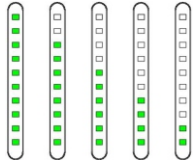
CAUTION: After the lithium battery breaker is turn on, the quick charger will be in standby state. At the same time,the remaining battery RGB indicator will lighten. If you don't use ESS system for a long time, disconnect the battery circuit breaker.

Quick charger output specification:

Model: 1.5KW 2KW		
Socket	Number of channel	Specification
USB-A	2 channel	5V2.4A 9V2.0A 12V1.5A Maximum power of 18W per channel
USB-C	2 channel	5V/9V/12V2.5A Maximum power of 30W per channel

Model: 3KW		
Socket	Number of channel	Specification
USB-A	2 channel	5V2.4A 9V2.0A 12V1.5A 15V1.2A 20V0.9A Maximum power of 18W per channel
USB-C	2 channel	5V/9V/12V15V/20V2.5A Maximum power of 30W per channel

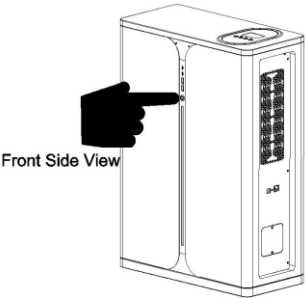
RGB Indicator status:

Status	Operation	Display Icon
Charging	RGB Indicator lighten and increase one by one	
Discharging	RGB Indicator lighten and decrease one by one	
Standby	RGB Indicator is according to the SOC value	

OPERATION

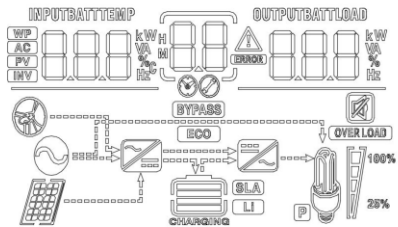
Power ON/OFF

Once the unit has been properly installed and the batteries are connected well, simply press power switch 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	Lighten	Output is powered by utility in Line mode
		Flashing	Output is powered by battery or PV in battery mode
CHG	Green	Lighten	Battery is fully charged
		Flashing	Battery is charging
FAULT	Red	Lighten	Fault occurs in the inverter
		Flashing	Warning condition occurs in the inverter

Function key

Function keys		Description
	ESC	Exit the setting
	Up	To last selection
	Down	To next selection
	Enter	To confirm/enter the selection in setting mode

In AC mode, it will present battery charging status.

Status	Battery Voltage	LCD Display
Constant current mode /Constant voltage mode	<12V / <24V	4 bars will flash in turns
	12~12.5V / 24~25V	Bottom bar will be on and the other three bars will flash in turns
	12.5~13V / 25~26V	Bottom two bar will be on and the other two bars will flash in turns
	>13V / >26V	Bottom Three bar will be on and the top bars will flash
Floating mode,battery are fully charged		4 bars will be on

In battery mode, it will present battery capacity.

Load Percentage	Battery Voltage	LCD Display
Load >50%	<11.1V / <22.2V	
	11.1~11.6V / 24~25V	
	12.5~13V / 25~26V	
	>13V / >26V	
Load <50%	<11.4V / <22.8V	
	11.4~11.9V / 22.8~23.8V	
	11.9~12.4V / 23.8~24.8V	
	>12.4V / >24.8V	

Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
05	Output short circuited or over temperature is detected by internal converter components	
06	Output voltage is too high	
07	Overload time out	
08	Bus voltage is too high	
09	Bus soft start failed	
51	Over current or surge	
52	Bus voltage is too low	
53	Inverter soft start failed	
55	Over DC voltage in AC output	
57	Current sensor failed	
58	Output voltage is too low	
59	PV voltage is over limitation	

Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on	Beep three times every second	
03	Battery is over-charged	Beep once every second	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	
10	Output power derating	Beep twice every 3 seconds	
12	Solar charger stops due to low battery		
15	PV energy is low	Beep twice every 3 seconds	
E9	Battery equalization	None	

SPECIFICATIONS

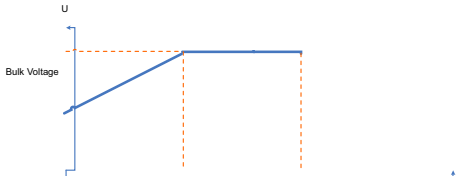
Table 1 Line Mode Specifications

Inverter Power Rating	1.5KW	2KW	3KW
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		
Max AC Input Current	10A	15A	15A
Nominal Input Frequency	50Hz / 60Hz (Auto detection)		
Low Loss Frequency	40± 1Hz		
Low Loss Return Frequency	42± 1Hz		
High Loss Frequency	65± 1Hz		
High Loss Return Frequency	63± 1Hz		
Output Short Circuit Protection	Line mode: Circuit Breaker;Battery mode: Electronic Circuits		
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)		
Transfer Time	10ms typical (UPS);20 ms typical (Appliances)		
Output power de-rating: When AC input voltage under 170V the output power will be de-rated.	The graph illustrates the output power de-rating characteristics. The x-axis represents Input Voltage with key points at 90V, 170V, and 280V. The y-axis represents Output Power with markers for 50%Power and RatedPower. The power is zero for input voltages below 90V. At 90V, the power is 50% of the rated power. Between 90V and 170V, the power increases linearly to reach the full RatedPower. From 170V to 280V, the power remains constant at the RatedPower level. Beyond 280V, the power drops to zero.		

Table 2 Inverter Mode Specifications

Utility Inverter Mode			
Rated Output Power	1500W	1600W	2700W
Output Voltage Waveform	Pure Sine Wave		
Output Voltage Regulation	230Vac $\pm$ 5%		
Output Frequency	60Hz or 50Hz		
Peak Efficiency	93%	94%	94%
Overload Protection	100ms@ $\geq$ 205% load;5s@ $\geq$ 150% load; 10s@110%~150% load		
Surge Capacity	2* rated power for 5 seconds		
Low DC Warning Voltage	Setting of Program 29 + 10%		
Low DC Cut-off level	Setting of Program 29		
High DC Recovery Voltage	15.0Vdc	15.0Vdc	30.0Vdc
High DC Cut-off Voltage	17.0Vdc	17.0Vdc	34.0Vdc
DC Voltage Accuracy	+/-0.3V@ no load		
THDV	<5% for linear load,<10% for non-linear load @ nominal voltage		
DC Offset	= 100 mV		
No Load Power Consumption	<25W	<25W	<35W

Table 3 Charge Mode Specifications

Utility Charging Mode			
Charging Current (UPS) @ Nominal Input Voltage	20A (@V _{I/P} =230Vac)	60A (@V _{I/P} =230Vac)	60A (@V _{I/P} =230Vac)
Bulk Charging Voltage	14.4Vdc	14.4Vdc	28.8Vdc
Floating Charging Voltage	14.0Vdc	14.0Vdc	28.0Vdc
Overcharge Protection	14.6Vdc	14.6Vdc	29.2Vdc
Charging Algorithm	3-Step		
			

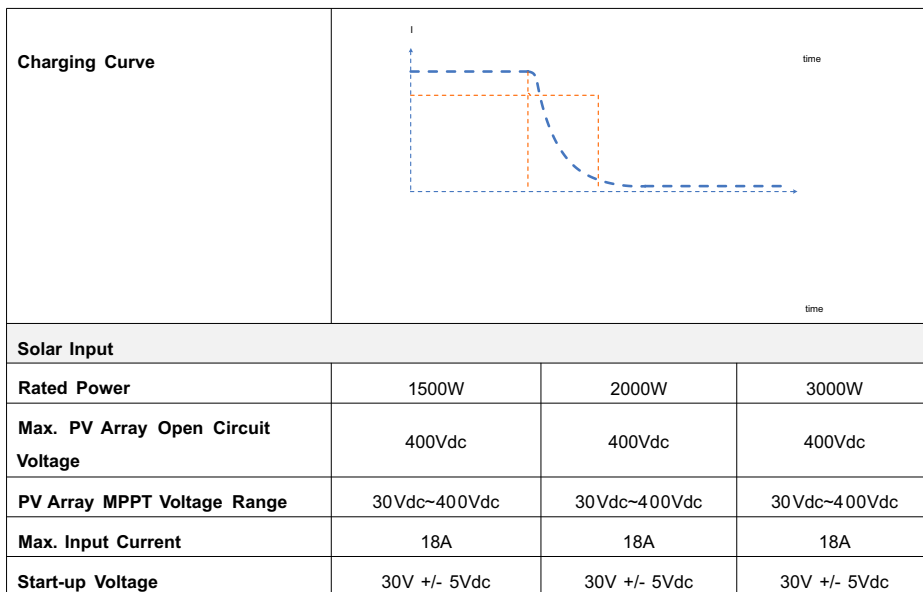


Table 4 General Specifications

Safety Compliance	CE
Operating Temperature Range	-10°C to 50°C
Storage temperature	-15°C~ 60°C
Humidity	5% to 95% Relative Humidity (Non-condensing)

Table 5 1.5 KW/12.8V100Ah Module Specifications

Nominal Voltage	12.8 VDC
Typical Capacity	100 Ah
Max Discharging Current	100A
Max Charging Current	50A
Protection	BMS, breaker
Dimension, H x W x D (mm)	637 x 450 x 213
Net Weight (kgs)	30.7

Table 6 2KW/12.8V350Ah Module Specifications

Nominal Voltage	12.8 VDC
Typical Capacity	350 Ah
Max Discharging Current	150A
Max Charging Current	150A
Protection	BMS, breaker
Dimension, H x W x D (mm)	837 x 560 x 279
Net Weight (kgs)	69.0

Table 7 3KW/25.6V100Ah Module Specifications

Nominal Voltage	25.6 VDC
Typical Capacity	100 Ah
Max Discharging Current	100A
Max Charging Current	50A
Protection	BMS, breaker
Dimension, H x W x L (mm)	737 x 450 x 279
Net Weight (kgs)	48.0

Table 8 3KW/25.6V200Ah Module Specifications

Nominal Voltage	25.6 VDC
Typical Capacity	200 Ah
Max Discharging Current	100A
Max Charging Current	100A
Protection	BMS, breaker
Dimension, H x W x D (mm)	872 x 479 x 274
Net Weight (kgs)	63.8

Table 9 3KW/25.6V350Ah Module Specifications

Nominal Voltage	25.6 VDC
Typical Capacity	350 Ah
Max Discharging Current	100A
Max Charging Current	100A
Protection	BMS, breaker
Dimension, H x W x L (mm)	837 x 560 x 279
Net Weight (kgs)	79.0

TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LED and buzzer will be active for 3 seconds and then complete off.	The lithium battery voltage is too low (<2.5V/Cell).	Re-charge lithium battery.
No response after power on.	No indication.	1.The lithium battery voltage is too low. (<2.5V/Cell) 2.Battery polarity is connected reversed.	1.Check if batteries and the wiring are connected well. 2.Re-charge lithium 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 LED 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.
		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 the operating voltage of the lithium battery.
	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.
Buzzer beeps continuously and red LED is on.	Fault code 51.	Over current or surge.	Restart the unit, if the error happens.
	Fault code 52.	Bus voltage is too low.	
	Fault code 55.	Output voltage is unbalanced.	
	Fault code 56.	PV input voltage is beyond the specification.	Reduce the number of PV modules in series.

