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Safety Instructions



WARNING!

Before install and use Your Inverter, read the safety instructions.

A. General Safety Precautions

A-1. Do not expose the Inverter to rain, snow, spray, bilge or dust. To reduce risk of hazard, do not cover or obstruct the ventilation openings.

Do not install the Inverter in a zero-clearance compartment. Overheating may result.

A-2. To avoid a risk of fire and electronic shock, make sure that existing wiring is in good electrical condition, and that wire size is not undersized. Do not operate the Inverter with damaged or substandard wiring.

B. Explosive Gas Precautions

This equipment contains components, which can produce arcs or sparks. To prevent fire or explosion, do not install in compartments containing batteries or flammable materials or in locations which require ignition protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connection between components of the fuel system.

C. Precautions When Working With Batteries

If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 20 minutes and get medical attention immediately.

- C-1. NEVER smoke or allow a spark or flame in vicinity of battery or engine.
- C-2. Do not drop a metal tool on the battery. The resulting spark or short-circuit on the battery or other electrical part may cause an explosion.
- C-3. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery produces a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.

FEATURES

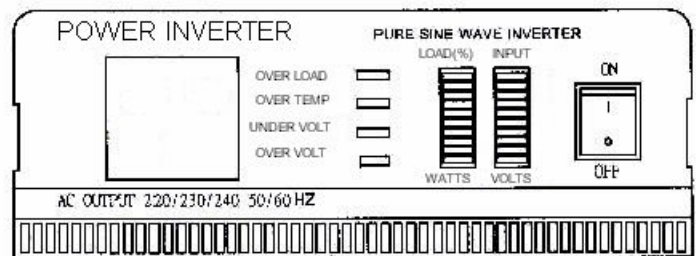
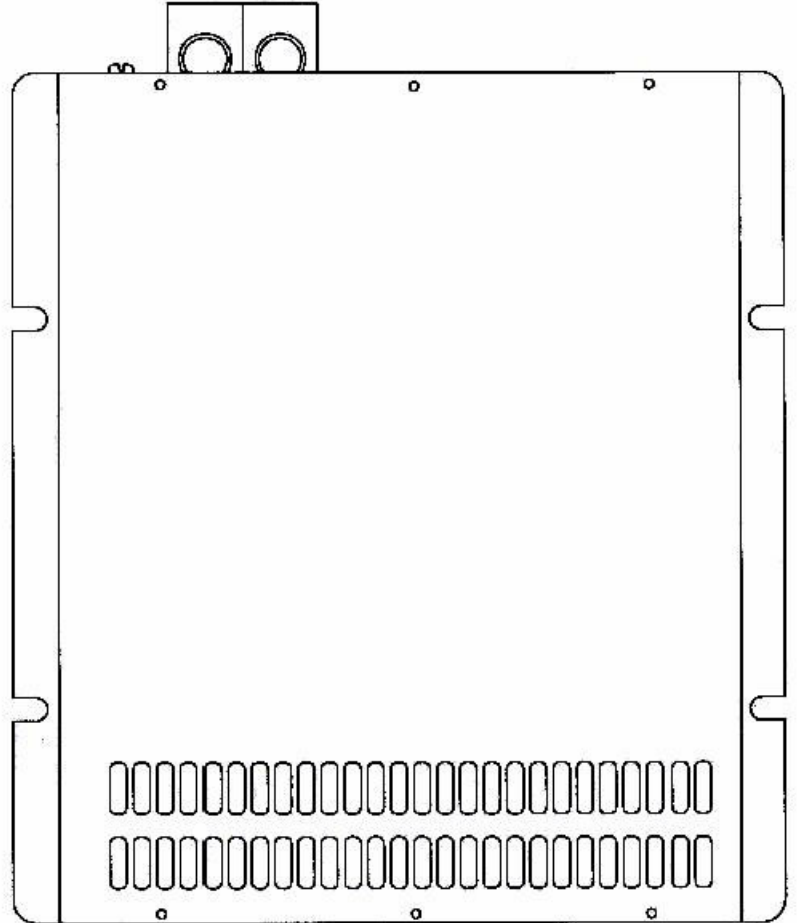
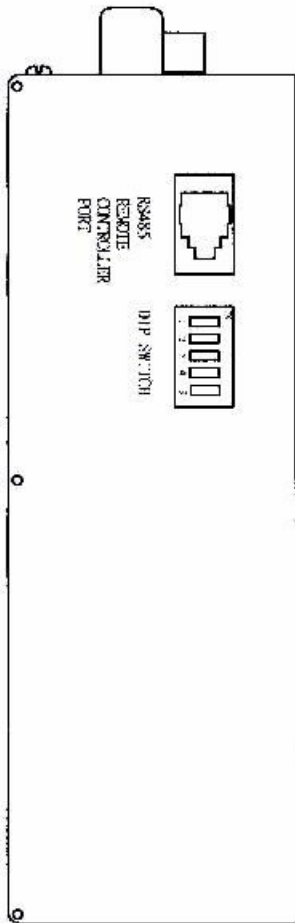
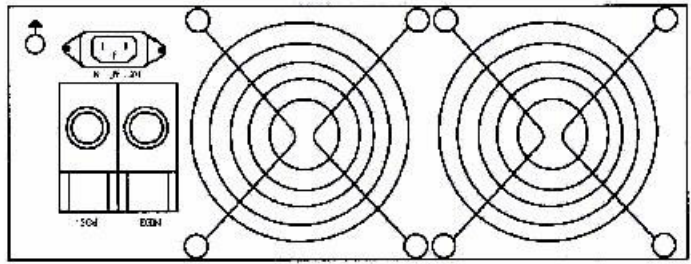
- Microprocessor based design with absolutely accurate and stable frequency
- Switch selectable 50 or 60 Hz output, all models
- Very low harmonic distortion, THD<3%
- Standard inputs 12V,24V & 48V
- Standard outputs 110V / 220V, 50~60Hz
- Remote control unit (optional extra)
- Green Power
- Panel indicators for battery voltage & load level (%)
- Compact and light weight, yet rugged and vehicle rated, 83-90% efficient
- Built-in fast acting AC synchronized transfer switch (<10msec)

D. Introduction:

The power inverter series are the member of the most advanced line of mobile AC power systems available.

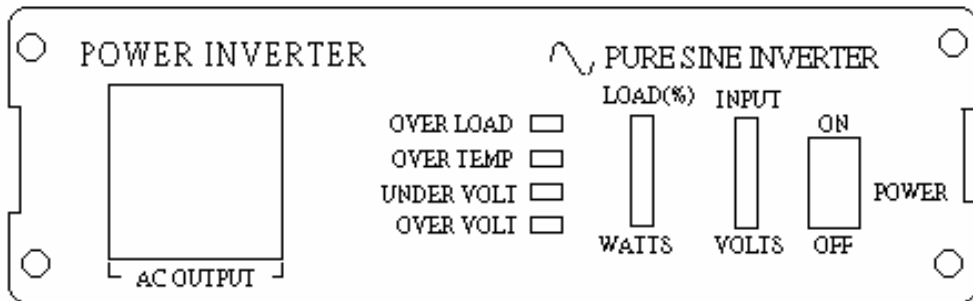
To get the most out of the power inverter, it must be installed and used properly.

Please read the instructions in this manual before installing and using this model.



E. Name and Main Function:

E-1. Front view :



E-1-1. ON / OFF switch:

Power ON/OFF switch, leave in the OFF position during installation.

E-1-2. GREEN POWER: Power energy saving enable.

OVER VOLT: Over Voltage Protection.

UNDER VOLT: Under Voltage Protection.

OVER TEMP: Over Temperature Protection.

OVER LOAD: Over Load Protection.

INPUT VOLTS: Display Input Voltage.

LOAD WATTS: Display AC Load Watts.

E-1-3. AC outlet (Outlet sockets available) :

North America (GFCI)

North America

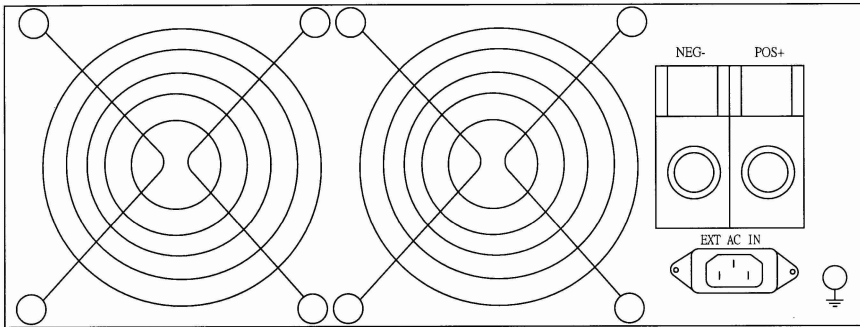
Continental European (Schuko)

Australia / New Zealand

United Kingdom

Universal Socket

F. Rear view :



F-1. Ventilation window :

Do not obstruct; allow at least 1 inch for air flow.

F-2. Battery terminals :

Connect to 12V / 24V / 48V battery or other 12V / 24V / 48V power source.

【 + 】 is positive, 【 - 】 is negative. Reverse polarity connection will blow internal fuse and may damage inverter permanently.

F-3. RS-485

Connect to remote control unit (option accessory) or taken remote controlled working status by computer.

F-4. Chassis ground or to vehicle chassis using # 8 AWG wire.



WARNING!

Operation of the inverter without a proper ground connection may result in an electrical safety hazard.



WARNING!

Shock Hazard. Before proceeding further, ensure that the Inverter is NOT connected to any Batteries, and that all wiring is Disconnected from any electrical Sources.



Do not connect the output terminals of the Inverter to an incoming AC sources.

G. Quick hook – up and testing:

If you would like to quick hook-up the power inverter and check its performance before going ahead with your installation, please follow these guidelines:

G-1. Unpack and inspect the power inverter and check to see that the power switch is in the OFF position.

G-2. Connect the DC NEGATIVE cable to the Negative (NEG-) terminal of the battery, next connect the cable to the negative terminal of the inverter.

The connection to the negative terminal of the Inverter should be the last connection made. A spark when making this final connection is normal.



WARNING!

Make sure all the DC connections are tight (torque to 9-10 ft-lbs, 11.7-13Nm). Loose connections will overheat and could result in a potential hazard.

G-3. Before proceeding further, carefully check that cable you have just connected from the negative terminal of inverter to the negative output terminal of power source.



CAUTION!

Reverse polarity connection will blow a fuse in Inverter and may permanently damage the inverter. Damage caused by reverse polarity connection is not covered by our warranty.

G-4. Connect the cable from the positive terminal of inverter to the positive terminal of the power source. Make secure connection.



WARNING !

You may observe a spark when you make this connection since current may flow to charge capacitors in the power inverter. Do not make this connection in the presence of flammable fumes, explosion or fire may result.

G-5. Set the power switch to the ON position. Check the meters and indicators on the front panel of the inverter. The voltage bar graph indicates depending on the voltage of the power

source. If not, check your power source and the connections to the inverter. Other indicators should be off.

G-6. Set power inverter switch to the OFF position, the indicator lights may blink and the internal alarm may sound momentarily. This is normal. Plug the test load into the AC receptacle on the front panel of the inverter.

Leave the test load switch off.

G-7. Set power inverter switch to the ON position and turn the test load on, the inverter should supply power to the load. If you plan to measure the true output r.m.s. Voltage of inverter, the meter such as FLUKE 45 BACKMAN 4410 or TRIPLETT 4200 must be used.

H. Installation:

H-1. Where to install

The power inverter should be installed in a location that meets the following requirements:

H-1-1. Dry – Do not allow water to drip or splash on the inverter.

H-1-2. Cool – Ambient air temperature should be between 0°C and 40°C, the cooler the better.

H-1-3. Safe – Do not install in a battery compartment or other areas where flammable fumes may exist, such as fuel storage areas or engine compartments.

H-1-4. Ventilated – Allow at least one inch of clearance around the inverter for air flow. Ensure the ventilation openings on the rear and bottom of the unit are not obstructed.

H-1-5. Dust-free – Do not install the Inverter in a dusty environment where either dust, wood particles or other filings/shavings are present. These can be pulled into the unit when the cooling fan is operating.

H-1-6. Close to battery/batteries –

Avoid excessive cable lengths but do not install the Inverter in the same compartment as batteries. Use the recommended wire lengths and sizes (see section 7.3). Also do not mount the Inverter where it will be exposed to the gases produced by the battery. These gases are very corrosive and prolonged exposure will damage the Inverter.

H-2. AC safety Grounding :

During the AC wiring installation, AC input and output ground wires are connected to the inverter. The AC input ground wire must connect to the incoming ground from your AC utility source.

The AC output ground wire should go to the grounding point for your loads (for example, a distribution panel ground bus).

H-2-1. Neutral Grounding :

H-2-1-1.

120V models: The neutral conductor of the AC output circuit of the Inverter is automatically connected to the safety ground during inverter operation. This conforms to National Electrical Code requirements that separately derived AC sources (such as inverter and generators) have their neutral conductors tied to ground in the same way that the neutral conductor from the utility is tied to ground at the AC breaker panel. For models configured with a transfer relay, when AC utility power is present and the Inverter is in bypass mode, this connection (neutral of the Inverter's AC output to input safety ground)is not present so that the utility neutral is only connected to ground at your breaker panel, as required.

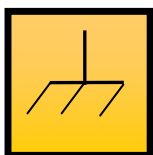
H-2-1-2.

230V models: There is no connection made inside the Inverter from either of the line conductors (line or neutral) to the safety ground.

Ground Fault Circuit Interrupters (GFCI'S):

Installations in Recreational Vehicles (for North American approvals) will require GFCI protection of all branch circuit connected to the AC output of the hardwire terminal equipped Inverter. In addition, electrical codes require GFCI protection of certain receptacles in residential installations. While the true sine wave output of the Inverter is equivalent to the waveform provided by utilities, compliance with UL standards requires us to test and recommend specific GFCI's. State power has tested the

following GFCI-protected 15A receptacles and found that they functioned properly when connected to the output of the Inverter.



WARNING!

Do not operate the power inverter without connecting it to ground.

Electrical shock hazard may result.

H-3. Making DC Wiring Connections :

Follow this procedure to connect the battery cables to the DC input terminals on the Inverter. Your cables should be as short as possible (ideally, less than 10 feet / 3 meters) and large enough to handle the required current, in accordance with the electrical codes or regulations applicable to your installation. Cables that are not an adequate gauge (too narrow) or are too long will Cause decreased inverter performance such as poor surge capability and frequent low input voltage warnings and shutdowns.

These low input voltage warning is due to DC voltage drop across the cables from the inverter to the batteries. The longer and narrower these cables, the greater the voltage drop.

I. Operation:

To operate the power inverter, turn it on using the ON/OFF switch on the front panel. The power inverter is now ready to deliver AC power to your loads. If you are operating several loads from the power inverter, turn them on separately after the inverter has been turned on. This will ensure that the power inverter does not have to deliver the starting currents for all the loads at once.

I-1. Controls and indicators :

The ON/OFF switch turns the control circuit in the power inverter on and off.

It does not disconnect power from the power inverter.

The Inverter operates from an input voltage ranging from :

10 to 16 VDC for 12V models

20 to 32 VDC for 24V models

42 to 62 VDC for 48V models

Peak performance for these inverter occurs when DC input voltage is in the Range of 10 volts to 16 volts for 12V models and 20 volts to 32 volts for 24V Models, and 42 volts to 62 volts for 48V models. From 600Watts up to 3000Watts.

I-2. Battery voltage indicator :

The battery voltage bar graph indicates the voltage at the input terminals of the power inverter at low input current, this voltage is very close to the battery voltage. At high input current, this voltage will be lower than the battery voltage because of the voltage drop across the cable and connections. Ideally, the voltage should remain in the green Area of the bar graph. If the voltage goes into the red area at top and bottom of the graph, inverter may shut – down.

I-3. Load watt indicator :

The AC load watt bar graph indicates the power drawn from the power inverter. It will indicate watt by loads. For long term operation , the watt should in the green & orange area of the bar graph. Short-term operation is possible with watt in the red area. If the watt rises to the flash all bar, the inverter will protect itself.

I-4. Over voltage indicator :

The over voltage indicator indicates that the power inverter has shut itself Down because its input voltage has been over detect voltage 12 / 24V / 48VDC version.

I-5. Under voltage indicator :

The under voltage indicator indicates that the power inverter has shut itself Down because its input voltage has been low than detect voltage 12 / 24V / 48VDC.

I-6. Over temp indicator :

The over temp indicator indicates that the power inverter has shut itself down because it has become overheated. The power inverter may overheat because it has been operated at power levels above its rating, or because it has been installed in a location which does not allow it to dissipate heat properly. The power inverter will restart automatically once it has cooled off.

I-7. Overload indicator :

The overload indicator indicates that the power inverter has shut itself down because its output circuit has been short circuited or drastically overloaded.

Switch the ON/OFF switch to OFF, correct the fault condition, and then switch the ON/OFF switch back to ON.

J. Operating limits:

J-1. Power output:

The inverter will operate most AC loads within its power rating. When determining whether a microwave oven can be operated by the inverter, remember that the power commonly advertised for microwave ovens is the cooking power (the power delivered to the food) not the power actually consumed by the microwave oven. The microwave oven will consume 40% to 100% more than its advertised cooking power. Check the rating sticker on the back of the oven to determine its actual power draw.

The Power inverter may not be able to start some of this motor even though their rated current draw is within the power inverter. If motor refuse to start, observe the battery voltage indicator while trying to start the motor. If the battery voltage indicator drops below 11 volts while inverter is attempting to start the motor, this may be why the motor won't start. Make sure that the battery connections are good and that the battery is fully charged. If the connections are good and the battery is charged, but the voltage still drops below 11 volts, you may need to use a larger battery.

K. Trouble shooting:

K-1. Common problems Television interference :

Operation of the power inverter can interfere with television reception on Some channels. If this situation occurs, the following steps may help to alleviate the problem.

- ◆ Make sure that the chassis ground lug on the back of the power inverter is solidly connected to the ground system of your vehicle, boat or home.
- ◆ Do not operate high power loads with the power inverter while watching television.
- ◆ Make sure that the antenna feeding your television provides an adequate (“Snow free”) signal and that you are using good quality cable between the antenna and the television.
- ◆ Move the television as far away from the power inverter as possible.
- ◆ Keep the cables between the battery and the power inverter as short as possible and twist them together with about 2 to 3 twists per foot.

This minimizes radiated interference from the cables.

K-2. Troubleshooting guide:



WARNING!

Do not open or disassemble Inverter, attempting to service the unit yourself may result in a risk of electrical shock or fire.

Problem and Symptoms	Possible Cause	Solution
Low output voltage 110V : 95-105VAC, 220V 220V : 190-210VAC	Using average reading Voltmeter	Use true RMS and cable. See page 7 Point 6-7. of manual
Load LED bar flash.	Overload	Reduce load.
No output voltage.	Low input voltage.	Recharge battery,

And voltage indicator. In lower red zone		check connections and cable.
No output voltage. Over Temp indicator On, load less than: 1500W	Thermal shutdown	Improve ventilation make sure ventilation openings in inverter is not obstructed, reduce ambient temperature.
No output voltage, Over Load indicator On.	Short circuit or Wiring Error.	Check AC wiring For short circuit or Improper polarity (hot and neutral reversed)
	Very high power load	Remove load

L. Maintenance :

Very little maintenance is required to keep your inverter operating properly.

You should clean the exterior of the unit periodically with a damp cloth to prevent accumulation of dust and dirt. At the same time, tighten the screws on the DC input terminals.

Appendix A

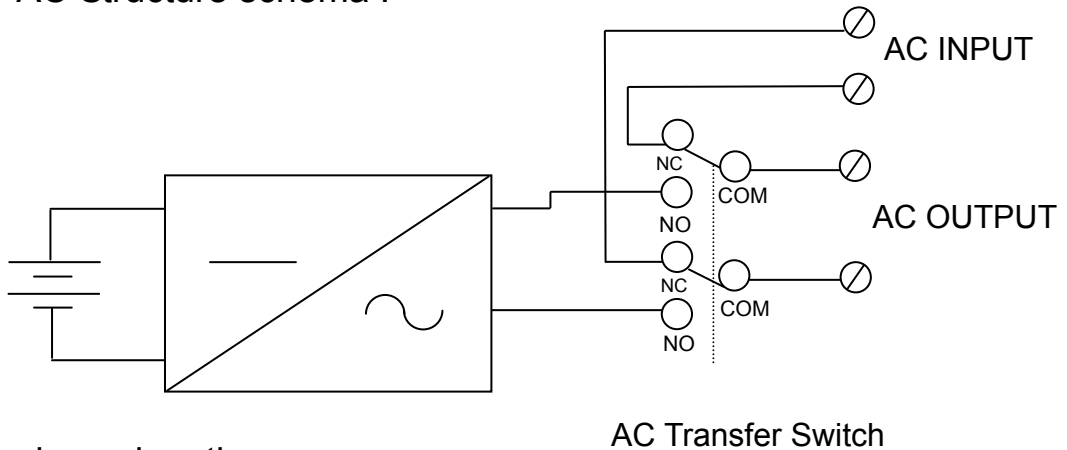
A-1. Dip Switch (110V)

S1	S2	Function	S3	S4	Output voltage	S5	Out Frequency
OFF	OFF	DC/AC OUT MODE.	OFF	OFF	120V	OFF	60Hz
OFF	ON	DC/AC +GREEN POWER MODE.	ON	OFF	115V	ON	50Hz
ON	OFF	UPS MODE.	OFF	ON	110V		
ON	ON	UPS MODE +DELAY MODE +GREEN POWER.	ON	ON	100V		

Dip Switch (220V)

S1	S2	Function	S3	S4	Output voltage	S5	Out Frequency
OFF	OFF	DC/AC OUT MODE.	OFF	OFF	240V	OFF	60Hz
OFF	ON	DC/AC +GREEN POWER MODE.	ON	OFF	230V	ON	50Hz
ON	OFF	UPS MODE.	OFF	ON	220V		
ON	ON	UPS MODE +DELAY MODE +GREEN POWER.	ON	ON	200V		

NDC-AC Structure schema :



1. Mode explanation:

(a) DC/AC OUT MODE :

AC output power is supplied directly by DC, no matter shore power is available or not, so the AC Transfer Switch is “ON”.
(No Green Power Function)

(b) DC/AC OUT MODE + GREEN POWER MODE :

AC output power is supplied directly by DC (AC Transfer Switch is “ON”). When AC output is without load, the DC/AC will turn to Green Power Mode to reduce the consumption of the battery.

(c) UPS MODE :

When shore power is normal, AC output power is supplied by AC input, so the AC Transfer Switch is “OFF” and DC/AC is in “Standby”.

When AC input power fails, the AC Transfer Switch will switch from “OFF” to “ON” automatically in 10msec and AC output power is supplied by DC simultaneously.

When shore power is back to the normal situation, the AC Transfer Switch will switch from “ON” to “OFF” and AC output power is again supplied by the AC input power.

- ※ The standard voltage $\pm 15\%$ is the normal AC input power range. Under or over this range will be treated as power failure, so it will transfer automatically to DC/AC output. The 15% Range can be set from the remote control.

(d) UPS MODE + DELAY MODE + GREEN POWER :

The procedure is the same as UPS mode. The only difference is switching time.

In this mode, the AC Transfer Switch will switch from "ON" to "OFF" in 5 seconds for delay purpose, not in 10 msec.

When input power comes from AC, there will be no Green Power Function; however, when it is from DC, and AC output is without load, the DC/AC will turn to Green Power Mode to reduce the consumption of the battery.

Model No.	PM-600H-12xx PM-600H-24xx	PM-1000H-12xx PM-1000H-24xx	PM-1500H-12xx PM-1500H-24xx	PM-2000H-12xx PM-2000H-24xx	PM-3000H-12xx PM-3000H-24xx
Continuous Output power	600W	1000W	1500W	2000W	3000W
Output power surge	1800W	3000W	4500W	6000W	9000W
AC Output voltage	100/110/120V ± 2% 220/230/240V ± 2% DIP switch select				
Output voltage Regulation	-8% / ± 3% All models				
Output frequency	50 / 60 Hz selectable ±0.05% Accuracy				
Output Wave form	Pure Sine Wave < 3% THD				
Efficiency (Full Load)	83%~85%				
No Load power consumption	<1.5W (In power saving mode.)				
Input voltage range	10V – 16VDC,20V-32VDC				
Power saving recovery time	1 second				
AC Transfer time (UPS-mode)	< 10msec max				
LED status indicators	High/Low battery shutdown, over temperature shutdown, overload shutdown / input DC voltage scale meter & output watts percent scale metter.				
Protection Feature * Remote controller option.	Over load, short circuit, over/under input voltage, over temperature, reverse input polarity (by fuse).				
RS485 Remote controller	Power output ON/OFF, green power mode, reset, error message, ...etc.				
Operation temperature range	0~50°C (32°~122°F)				
Storage temperature range	-30°C~70°C (-22°~158°F)				
Dimensions (L xW xH) mm	370x270x120	420x270x120	470x270x120	470x270x190	530x270x190
N.W. – 12V (kg)	4.5 (Kgs)	5.5 (Kgs)	8.0 (Kgs)	10 (Kgs)	13.5 (Kgs)
G.W. – 12V (kg)	8.9 (Kgs)	11.0 (Kgs)	13.0 (Kgs)	(Kgs)	20.2 (Kgs)
N.W. – 24V (kg)	4.5 (Kgs)	5.5 (Kgs)	8.0 (Kgs)	(Kgs)	13.5 (Kgs)
G.W. – 24V (kg)	8.9 (Kgs)	11.0 (Kgs)	12.2 (Kgs)	(Kgs)	19.1 (Kgs)

※Remote controller is optional