

**General specification**

**Input Wave form:**  
**Nominal voltage:**  
**Low voltage trip:**  
**Low voltage re engage:**  
**High voltage trip:**  
**High voltage re engage:**  
**Max input AC voltage:**  
**Nominal input frequency:**  
**Low freq trip:**  
**High freq trip:**  
**Output wave form:**  
**Overload protection:**  
**Short circuit protection:**  
**Transfer switch rating:**  
**Efficiency on line transfer mode:**  
**Line transfer time:**  
**Bypass without battery connected:**  
**Max bypass current:**  
**Bypass over load current:**  
**Inverter specification / output**  
**Output wave form:**  
**Output continuous power watts:**  
**Output continuous power VA:**  
**Power factor:**  
**Nominal output voltage rms:**  
**Output voltage regulation:**  
**Output frequency:**  
**Nominal efficiency:**  
**Surge ratings:**  
**Short circuit protection:**  
**Inverter specification / input**  
**Nominal input voltage:**  
**Minimum start voltage:**  
**Low battery alarm:**  
**Low battery trip:**  
**High voltage alarm:**  
**Power saver:**  
**Power saver:**

**Power**

Sine wave (Utility or Generator)  
 120VAC 230VAC  
 90v ± 4% 184v/154v ± 4%  
 100v ± 4% 194v/164v ± 4%  
 140v ± 4% 253v ± 4%  
 135v ± 4% 243v ± 4%  
 150VAC 270VAC  
 50Hz or 60Hz (Auto detect)  
 47Hz for 50 Hz, 57Hz for 60 Hz  
 55Hz for 50 Hz, 65 Hz for 60 Hz  
 ( Bypass mode) same as input  
 Circuit breaker  
 Circuit breaker  
 30 amp or 40 amp  
 95%+  
 10 ms Typical  
 Yes  
 30 amp or 40 amp  
 35 amp or 45 amp: Alarm  
 95%+  
 10 ms Typical  
 Yes  
 30 amp or 40 amp  
 35 amp or 45 amp: Alarm  
 Pure sine wave  
 1000 1500 2000 3000 4000 5000 6000 7000  
 1000 1500 2000 3000 4000 5000 6000 7000  
 0.9-1.0  
 120/230VAC  
 +/- 10% rms  
 50Hz ± 0.3Hz or 60Hz ± 0.3Hz  
 >88%  
 3000 6000 9000 12000 15000 18000 21000  
 Yes, fault after 1 secs  
 12v 24v 48v  
 10v 20v 40v  
 10.5v 21v 42v  
 10v 20v 40v  
 16v 32v 64v  
 Below 25 watts when enabled  
 Same switched on/off on remote

**Charger mode specification**

**Input voltage range:**  
**Output voltage:**  
**Charge current:**  
**Battery initial voltage for start up:**  
**Over charge protection shutdown:**  
**Charger curves (4 stage constant current) battery types**  
**4 step digital controlled progressive charge**  
**Battery type:**  

	Fast V	Float V (*2 for 24v; *4 for 48v)
Gel U.S.A	14.0	13.7
A.G.M. 1	14.1	13.4
A.G.M. 2	14.6	13.7
Sealed lead acid	14.4	13.6
Gel euro	14.4	13.8
Open lead acid	14.8	13.3
Calcium	15.1	13.6
De-sulphation	15.5 for 4 hrs	

**Remote control / RS232 / USB**  
 Yes, Optional  
 1000/2000/3000 Model: 442\*218\*179mm  
 4000/5000/6000 Model: 598\*218\*179mm  
 1000 2000 3000 4000 5000 6000 7000  
 18kg 20kg 22kg 35kg 38kg 40kg 45kg

**Ordering Information**

**Typical part number** ▶ AP Combi -10 -12 -E  
 1. Basic Series  
 AP Combi = Combined Inverter & Charger  
 2. Power Rating  
 10 = 1000W 20 = 2000W 30 = 3000W  
 40 = 4000W 50 = 5000W 60 = 6000W 70 = 7000W  
 3. Battery Voltage  
 12 = 12VDC 24 = 24VDC 48 = 48VDC  
 4. AC Voltage  
 E = 230VAC NC = 120VAC

**Remote control installation**

remove 4 screws holding this panel and disconnect the cable behind it



**Mechanical Drawing**



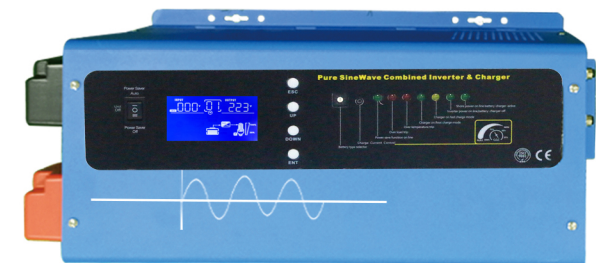
**Product Information Guide**



1000W	4000W
2000W	5000W
3000W	6000W 7000W

Continuous power with P.F.C charger

**SineWave Combined Inverter & Charger**



Models: 1012、2012、3012、1024、2024、3024、4024、2048、3048、4048  
 1012E、1512E、2012E、3012E、1024E、1524E、2024E、3024E、4024E、  
 5024E、6024E、2048E、3048E、4048E、5048E、6048E、7048E

**Indication & fault finding chart**

Status	Function	L.E.D.s on main unit	L.E.D.s on remote
Charge Function	Constant current charge	on	on
	Constant voltage charge	flash	on
	Float	on	on
Inverter mode	Standby	on	on
	Inverter on	on	on
Alarms	Power saver on	on	on
	Battery low voltage	on	on
	Battery high voltage	on	on
	Over load ( inverter mode )	on	on
	Over temp ( inverter mode )	on	on
	Over temp ( line mode )	on	on
Fault Mode	Over charge	on	on
	Fan lock	on	on
	Battery high voltage	on	on
	Inverter mode overload	on	on
	Over temperature	on	on
	Back voltage	flash	flash

**Charge current control**



Power Solution Series

The specifications are subject to change without notice.



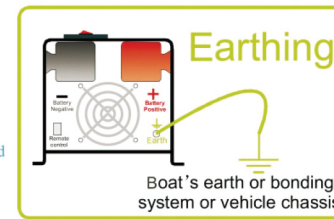
# Combined inverter & charger

## Basic wiring for the Power Combi Series

**Warning: High voltage, do not open unless qualified to do so; Please read instructions before working on this product.**



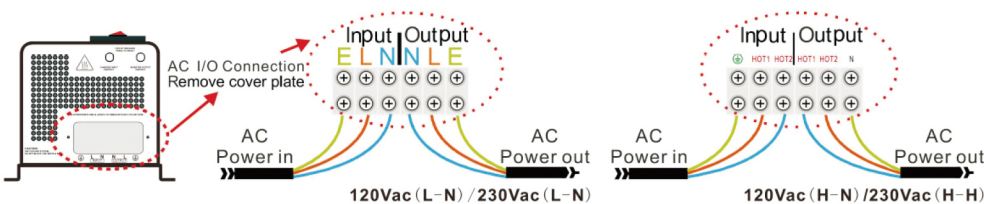
When the AP Combi is in inverter mode the "through the box" earth line is automatically disconnected from the input earth and joined to the output neutral, complying with the natural earth inverter requirements if you wish to maintain a through earth simply connect the input earth to the output earth



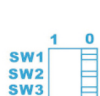
### WHAT CABLE TO USE in mm<sup>2</sup>:

A charger or inverter	cable run distance 0 - 1.5m	cable run distance 1.5 - 4.0m
125-180 A	50 mm <sup>2</sup>	70 mm <sup>2</sup>
180-330 A	70 mm <sup>2</sup>	90 mm <sup>2</sup>

Please note that if there is a problem obtaining for example 90 mm<sup>2</sup> cable, use 2\* 50 mm<sup>2</sup>, or 3\*35 mm<sup>2</sup>. One cable is always best but, cable is simply copper and all you require is the copper, so it does not matter if it is one cable or 10 cables as long as the square area adds up. Performance of any product can be improved by thicker cable and shorter runs, so if in doubt round up and keep the length as short as possible.



### AP Combi Dip SW function



Switch NO	Switch Function	Position: 0	Position: 1
SW1	Battery/AC Priority	Utility Priority	Battery Priority
SW2	AC Input Range	184-253VAC	154-253VAC
SW3	Load Sensing Cycle	30 seconds	5 seconds

### Check list

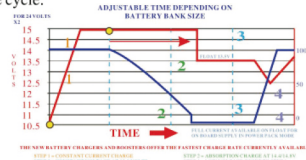
- 1) Ensure that the inverter has the correct DC voltage for your boat or vehicle system, i.e. 12v or 24v/48v.
- 2) Fit as close to the batteries as possible, the shorter the DC cables the better. Voltage drop on long cables will effect the unit's performance.
- 3) Do not reverse the cables! Connect the red cable to the positive terminal and the black cable to the negative terminal of the battery. In the event of reverse polarity the unit could be totally destroyed.
- 4) Always use the inverter in an environment which is well ventilated, not exposed to direct sunlight or a heat source, away from water, moisture, oil or grease, away from any highly inflammable substance, out of reach from children.
- 5) The output voltage of this unit must never be on your AC system at the same time as any other AC source such as the 230V external mains line or a generator. All external power must go through the AP Combi.
- 6) Always switch on the AP Combi first, before plugging in any appliance.
- 7) Under new electrical legislation only professional electricians should install this product.

### Installation

- 1) Position the unit as close to the main battery bank as possible
- 2) Position in a cool, dry & well ventilated space
- 3) Orientation of the unit is not critical.
- 4) Either purchase the standard cable set from Dealer which is about 1.5 metres, or if using your own cable, use the cable size chart provided on the installation drawing to ensure you have thick enough cable for the DC leads. In the event of not being able to get the size requested (it can be hard to get thick cable) then simply add multiple length of thinner cable, i.e. if you cannot get 90mm<sup>2</sup> cable then use 3\* 35mm<sup>2</sup> cable, at the end of the day it's just copper we need.
- 5) Fit a fuse suitable for the job, again look at the installation drawing. We have a full range of high current fuses in the GANLR range of gold fuse products, ranging from 100-500 AmPs. on the DC side
- 6) Connect the cables from the batteries to the fuse then to the unit, this way if there is a fault at the unit the fuse is already in place and this will be safe. In the event of an isolation switch being used, please ensure the rating of the switch can handle the power of the unit.
- 7) Ensure the unit is switched off during installation.
- 8) On the AC side ensure the shore power (all external AC sources) are totally disconnected, connect the output from the inverter to suitable Residual Current Breaker (R.C.D. for earth protection) and current over load trips. Fuse the AC input side depending on through power requirements, the max through power is 30AmPs, so fuse at 40A (allowing also for charger consumption) if you intend to use the full through power for standard 13-16 amps throughout then a 20A fuse would be appropriate.
- 9) We recommend Multi core tri rated AC cable, if used on a boat or vehicle, as this is much safer where vibration is likely. Only use single solid household AC cable if the product is being used as a power source for a house or platform free of vibration.
- 10) Before attempting to switch on the unit, please ensure you have selected the correct battery type on the small battery type selector switch on the front of the main box, rotate the switch to your battery type. The Progressive charge control software will automatically adjust for battery bank size and state

### Charge Stage Transition Definitions

- Boost CC Stage: If AC input is applied, the charger will run at full current in CC mode until the charger reaches the boost voltage.
- Software timer will measure the time from AC start until the battery charger reaches 0.3V below the boost voltage, then take this time as T<sub>b</sub>, and T<sub>b</sub> × 10 = T<sub>1</sub>.
- Boost CV Stage: Start a T<sub>1</sub> timer; the charger will keep the boost voltage in Boost CV mode until the T<sub>1</sub> timer has run out. Then drop the voltage down to the float voltage. The timer has a minimum time of 1 hour and a maximum time of 12 hours.
- Float Stage: In float mode, the voltage will stay at the float voltage.
- If the AC is reconnected or the battery voltage drops below 12Vdc/24Vdc, the charger will reset the cycle above.
- If the charge maintains the float state for 10 days, the charger will reset the cycle.



The battery type and charge voltage recommendations are set out above For 24V unit x the above by 2. Some battery types may look confusing such as gel usa and gel euro, AGM usa and AGM euro. If you find this confusing then join the club, we have had the different voltage curves supplied to us by different companies from the U.S.A. and Europe for what we seem the same product, however it's not our call, we simply supply the options, if in doubt call your battery supplier and ask which charge voltage they want you to use for their battery type, and select the closest to it. If totally confused then use the lower voltage setting until you have had a higher voltage setting confirmed to you by whoever supplied the batteries to you.

The de-sulphation cycle on switch position 8 is marked in red because this is a very dangerous setting if you do not know what you are doing. Before even attempting to use this cycle you must clearly understand what it does and when and how you would use it.

What causes sulphation? This can occur with infrequent use of the batteries, or if the batteries have been left discharged so low that they will not accept a charge. This cycle is a very high voltage charge cycle designed to try to break down the sulphate 'crust' that is preventing the plates taking a charge and thus allow the plates to clean up and so accept charge once again.

How to use this function. (only suitable for open lead acid batteries) 1) Ensure the battery bank is totally isolated from anything else on the boat or vehicle; the high voltage applied by this setting could destroy all your electronics and other electrical equipment still connected (hence all these instructions are in red, this is a very expensive mistake).

2) Make sure the battery compartment is very well ventilated and battery caps are removed.

3) Switch the battery type selector switch to the correct position, then switch the AC power on.

4) Because this is such a dangerous setting there is a 4 hr time out period build into the software, however on a very large battery bank this may not be enough and the unit may need to be switched off and on again to do another cycle.

What to expect on this cycle. I would recommend you monitor the voltage of the sulphated battery bank. When you switch on the cycle the voltage should shoot up to the full 15.5 volts very fast (within minutes) this is because the batteries cannot accept the charge (assuming they are sulphated). However, over a period of 1-2 hrs the voltage should start to drop (as the plates start to clean and the batteries start to take a charge) the voltage could drop way down to about 12.5 volts then start to rise. This shows the batteries are now taking a charge and starting to fill up. In this case it would be safe to switch the unit off and select your normal charging curve and hopefully this will bring your batteries back from the dead. You may need to repeat the process a few times. Please note this is a professional guess tool, which most times helps, but its not magic, so expect the worst and hope for the best. Never leave a system unattended when on this mode. If the battery temperature reaches above 50 deg c (ie. if the batteries are almost too hot to touch) then stop the process).

### Install remote control.

Isolate the unit before attempting this so there are no high voltages. The local control panel on the front of the unit can also be used as a remote control, reveal the screws holding the panel onto the main box, carefully remove the panel and disconnect it from the connection socket behind the unit.

Fill the hole on the main unit using the blank replica of the remote control unit.

Using the remote cable supplied then re-connect the panel to the unit

### Operation and what to expect

1) After the unit is installed, using the panel on the front of the unit, and with the shore power (120/230V AC) still disconnected, switch the unit on. The leds will cycle through there test routine, then the unit should go into inverter mode and 120/230V should be produced on the output AC terminals (provided the batteries are over 11 volts).

2) If the above is ok, then connect the shore power to feed 120/230V into the AP Combi, after a short while, the inverter should go off line, and feed the shore power through the inverter. Changeover is about 20 milli secs (so fast that you should not be able to notice it) and the battery charger should come on-line and go through it's charge sequence ending, after 1-10 hrs, with float voltage.

### Common Faults:

There are numerous faults which the unit can detect and transmit the fault to you by the use of l.e.d.s and alarm on the unit itself. The remote control gives a little help but the real fault finding can only take place at the unit. Please see the fault finding chart over the page for full information.