

Autotransformer 120/240V - 32A and 120/240 - 100A

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**Autotransformer
120/240V 32A**



**Autotransformer
120/240V 100A**

The Autotransformer: for step up, step down and split phase balancing

An autotransformer can be used for step up, step down and split phase output balancing purposes. While the step up and step down functions are fairly straightforward, split phase output balancing may require some more attention.

Consider for example a 30A 120/240V split phase supply.

The supply could be the grid, a generator or two stacked inverters.

Some of the loads connected are 240V, others are 120V. On each 120V leg the load should not exceed 30A. The problem is that as soon as 120V loads are connected, the two legs will show a different current. This is because the 120V loads on the two legs will never be balanced. A 120V 1200W hairdryer, for example, will draw 10A from one leg. A 120V washing machine could even draw in excess of 20A from one leg. Between the two legs the difference in current, or current unbalance, will therefore often be 20A or more. This means that the 30A supply will not be used up to its full potential. By the time one leg draws 30A, the other leg may be drawing no more than 10A, and increasing the 240V load, for example, will result in an overload of one leg while the other leg still has spare capacity.

Theoretically, the total power that can be drawn from a 30A 120/240V supply is $30 \times 240 = 7,2 \text{ kVA}$.

In case of 20A unbalance, the practical maximum will be $30 \times 120 + 10 \times 120 = 4,8 \text{ kVA}$, or 67% of the theoretical maximum.

The solution is an Autotransformer.

By leaving the neutral of the split phase supply unused, and connecting an Autotransformer to create a new neutral, as shown in figure 1, any load unbalance is 'absorbed' by the Autotransformer.

In case of a 30A supply, the load can be increased to 7,2kVA, and a 20A load unbalance will result in one leg supplying 40A, and the other leg 20A. The 20A difference will flow through the neutral and the windings of the Autotransformer. The current through both 120V wires of the split phase supply will be 30A.

Ground relay for use with Multi or Quattro Inverter/Chargers included

When operating in inverter mode, the neutral output of the inverter/charger must be connected to ground to guarantee proper functioning of a GFCI. In case of a split phase supply the neutral must be grounded. For this purpose a grounding relay is built in the autotransformer's enclosure. The relay is controlled by the 230/240V Multi or Quattro. (The internal grounding relay in the 230/240V Multi or Quattro must be disabled)

Temperature protected

In case of overheating, the Autotransformer is disconnected from the supply. Reset is manual.

An alternative to stacked inverters

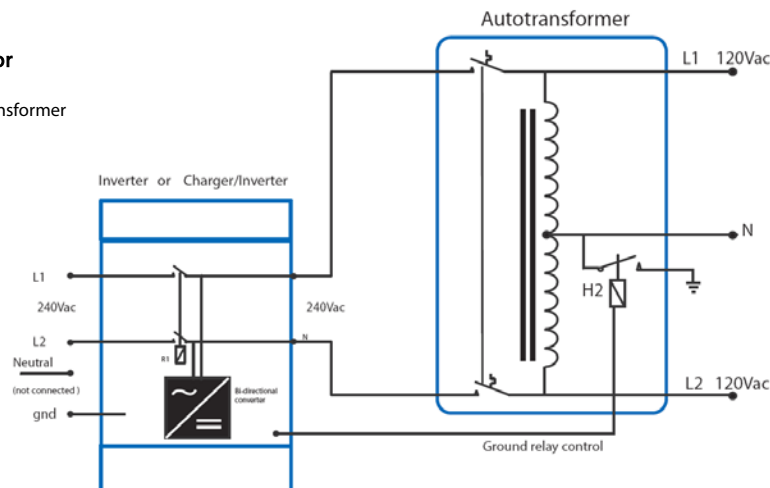
The alternative to stacking two 120V inverters to provide a 120/240V split phase supply is a 240V inverter with an additional Autotransformer.

Two stacked 120V 3kVA inverters will supply up to 25A to each 120V leg. If the load on one leg is less than 25A, the maximum load on the other leg is still limited to 25A.

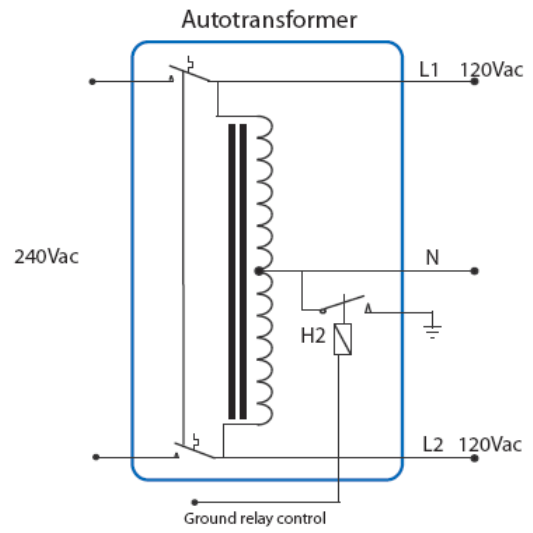
One 240V 5kVA inverter with a 32A Autotransformer will supply up to 21A of balanced load to each 120V leg. Fewer loads on one leg will however result in more power being available on the other leg, with a maximum unbalance of 32A.

Therefore the load can be up to 38,5A on one leg if the load is not more than 3,5A on the other leg (maximum unbalance: $38,5 - 3,5 = 35\text{A}$). If load unbalance is to be expected, a lower power 240V inverter with autotransformer will therefore be preferable to the stacked inverter solution.

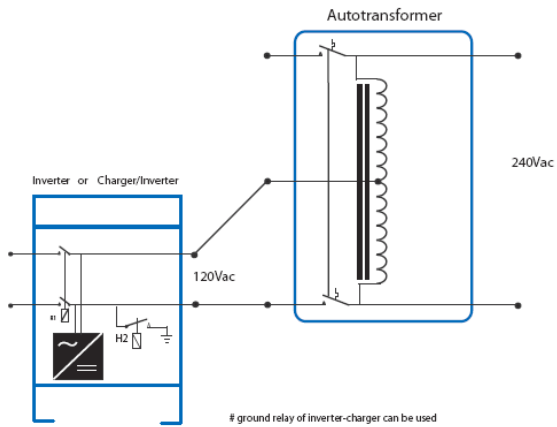
Figure 1:
Split phase supply for unbalanced load
(Ground relay of autotransformer should be used)



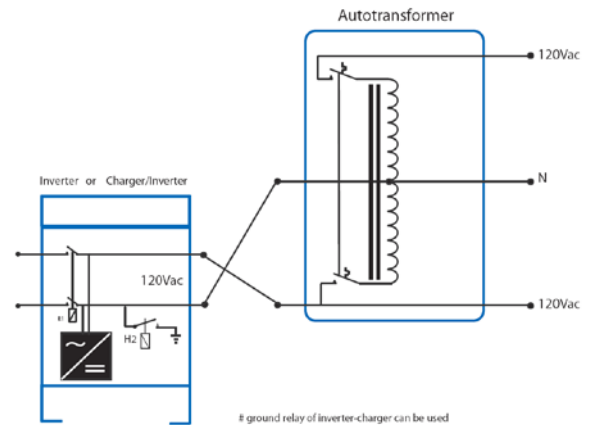
Autotransformer	32A	100A
Input/output voltage	120 / 240V	
Input circuit breaker	32A, two pole	100A, two pole
Frequency	50/60Hz	
Maximum 240 V feed through current	32A	100A
Neutral current, 30 min	32A (3800 VA)	
Neutral current, continuous	28A @ 40°C/100°F	
Transformer type	Toroidal	
Enclosure	Aluminium	
Input circuit breaker	yes	
Protection category	IP21	
Safety	EN 60076	
Weight	12,5 kg	13,5 kg
Dimensions (h x w x d)	375 x 214 x 110 mm	425 x 214 x 110 mm



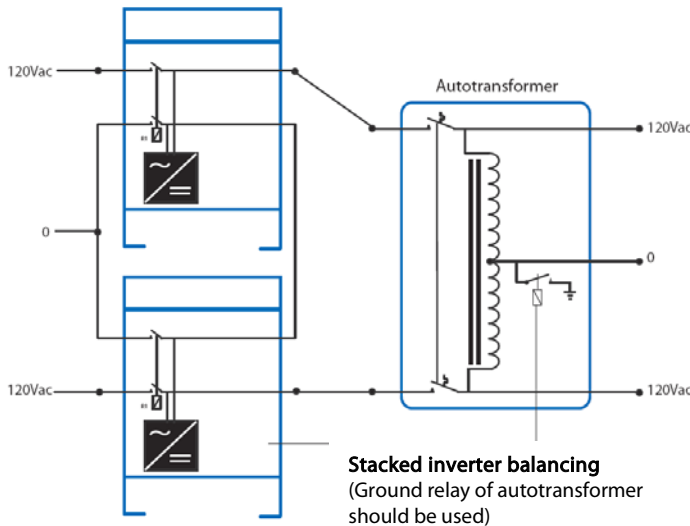
Autotransformer: schematic diagram



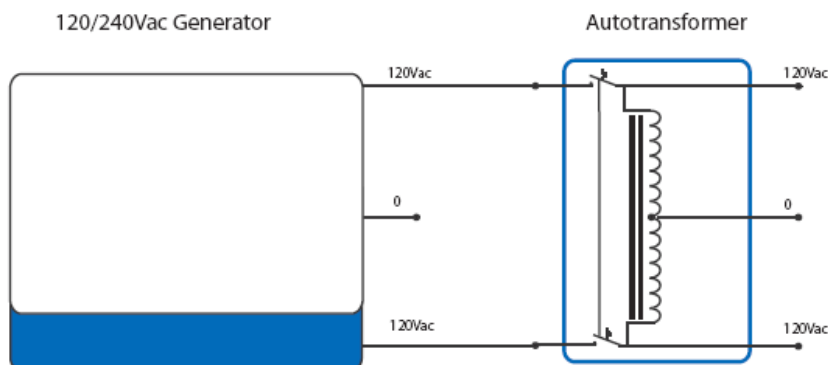
Step-Up: 120VAC to 240VAC
(Internal ground relay of inverter/charger may be used)



Split phase: 120VAC to 120/240VAC
(Internal ground relay of inverter/charger may be used)



Stacked inverter balancing
(Ground relay of autotransformer should be used)



Generator Balancing
(Neutral of generator should be connected to ground)

Oceanvolt teams up with Victron Energy

www.victronenergy.com

Press release Almere, 21 November 2013

The Finnish electric propulsion specialist Oceanvolt enters to a two-way relationship with Victron Energy.

The two companies will integrate their products to work as a unified system, which will form the base of Oceanvolts SEA® (Silent Electric Autonomy) concept. Oceanvolt SEA® system enables among other things running your A/C and other appliances without using your generator by converting the electricity from the propulsion system battery into 220VAC.

Oceanvolt will offer it's customers systems which use Victron Energy's charger/inverters, solar charger controllers and other electric components together with it's propulsion system. Oceanvolts electric propulsion systems have already been installed in over 50 customer boats.

Both parties of the agreement seem pleased. "Victron Energy's products perfectly compliments our propulsion system and together they offer our customers the comforts of home while at sea," says CEO of Oceanvolt, Timo Jaakkola.

"The Oceanvolt system impressed us. It is a mature and finished system. With this partnership our customers can offer an electric propulsion system which works as a part of a boats existing electrical network", says Victron Energy's Managing Director, Matthijs Vader.

[View picture here](#)