

Appendix F: DC Currents on Single-Phase Stand-alone Inverters

When the sinusoidal ac output current of a stand-alone inverter goes to zero 120 times per second, the input dc current also goes nearly to zero. With a resistive ac load connected to the inverter, the dc current waveform resembles a sinusoidal wave with a frequency of 120 Hz. The peak of the dc current is significantly above the average value of the current, and the lowest value of dc current is near zero.

An example of this is shown in the Figure F1. This is an example of a single-phase stand-alone inverter operating with a 4000-watt resistive load. The input battery voltage is 22 volts. The figure shows the dc current waveform. The measured average dc current is 254 amps. The RMS value of this current is 311 amps.

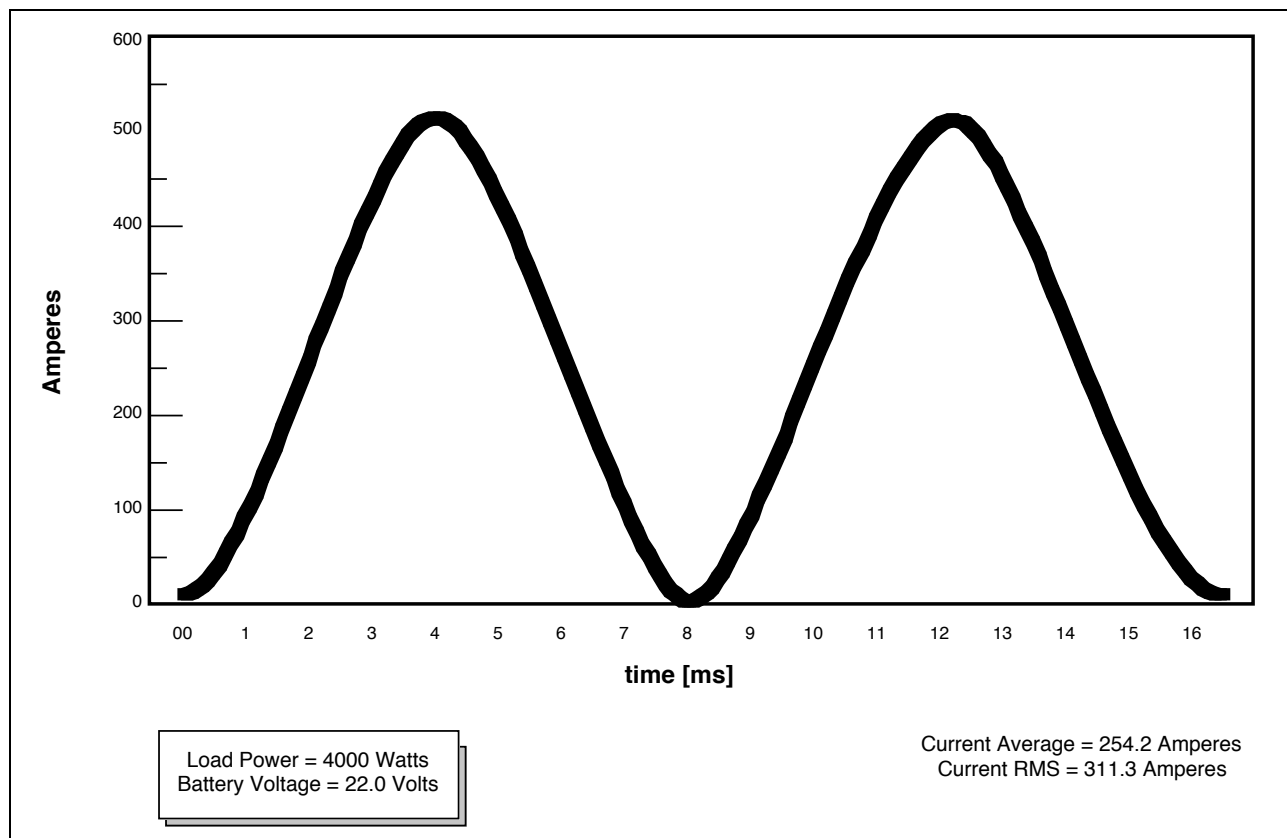


Figure F-1. Inverter Current Waveform (dc side)

The calculated dc current for this inverter (as was done in Example 6 in Appendix E) is 214 amps ($4000/22/0.85$) when using the manufacturer's specified efficiency of 85%.

The RMS value of current is the value that causes heating in conductors and is the value of current that causes overcurrent devices to trip. In this case, if the inverter were operated at 100% of rated power and at a low battery voltage, the conductors and overcurrent devices would have

to be rated to carry 311 amps, not the calculated 214 amps. Code requirements would increase the cable ampacity requirements and overcurrent device ratings to 388 amps (1.25 x 311).

Loads that have inductive components may result in even higher RMS values of dc currents.

The systems designer should contact the inverter manufacturer in cases where it is expected that the inverter may operate at loads approaching the full power rating of the inverter. The inverter manufacturer should provide an appropriate value for the dc input current under the expected load conditions.

Some inverters may employ topologies that filter the dc input current resulting in less ripple