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BATTERY CHARGER - POWER FACTORS

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BASIC DEFINITIONS

First some basic definitions. Volts can be thought of as the amount of pressure moving the electricity. Amps can be thought of as the amount of electrical current flow. Watts can be thought of as the power doing the work and is the result of Volts X Amps.

VOLT-AMPS

Battery chargers fall into a group of electrical loads called "inductive" loads. Inductive electrical loads are characterized by two different power designations – watts (W) and volt-amps (VA):

Watts – watts is the term most of us are familiar with and describes the actual power being generated by the battery charger that is doing the work (charging the battery). If a battery charger is charging at 10 amps and 14.0 volts DC it is producing 140 watts of power (10 X 14).

Volt-Amps – Volt-Amps describes what is called apparent power. Apparent power in inductive electrical loads results from the current lagging the voltage in the inductive load. It is the additional power required by the inductive load (battery charger) from its power source, and the resulting stress placed on the power source to produce the actual power (battery charging watts).

POWER FACTOR

The power factor in inductive electrical loads refers to the relationship between the volt-amps (apparent power) required by a battery charger and the watts (actual power) produced by that charger. The volt-amps required by a battery charger is more than the wattage being produced by the battery charger and the power factor is normally expressed as a decimal ratio of watts to volt-amps. Example: If the watts (actual power) is 60% of the volt-amps (apparent power), the power factor for the battery charger is expressed as .60. NOTE: Don't confuse the power factor in battery chargers with charging efficiency and/or resistance losses which are separate issues.

APPLICATION

So why is the power factor important? If the battery charger is drawing it's electricity from the electrical utility grid, power factor is normally not a concern. The electrical grid has an ample supply of electrical power to accommodate the battery charger's needs. If you are charging from a portable generator, though, that generator has a maximum wattage that it can produce. If all, or a portion, of the generator's load is used for recharging batteries and the power factor involved with the battery charger is not taken into account, you can unknowingly overload the generator.

Example: The scenario is thus - you have a 1500 watt gasoline generator, you are using a 12VDC (nominal) battery charger rated at 75 amps maximum that has a stated power factor of .60, and you have the charging voltage set to 15.0 VDC so you are able to bulk charge your battery at 70 amps. You are not using the generator for any other purpose while charging the battery, so the battery charger is the only electrical load on the generator.

The actual battery charging power used during bulk charging is 70 amps X 15.0 volts or 1050 watts. If you assume that the load on the generator is 1050 watts, you have a problem. The (apparent) load on the generator from the battery charging is 1050 watts divided by .60 power factor or 1750 volt-amps. If the 1500 watt capacity of your generator is based on a 100% power factor (1.00), it can only handle 1500 volt-amps. The generator is overloaded and serious damage can result.

Are battery chargers the only inductive loads I will encounter with my system?

No. Most power conversion devices – chargers, power supplies, inverters, and converters – are inductive loads with a power factor.

Do all these devices have the same power factor?

No. Different brands and different technologies (transformer or switching mode) will have different power factors.

Will the power factor for the charger be stated on the device or in the literature with the device?

Not always. Remember, most of these devices are intended to utilize power from the electrical grid so power factors are not as important. You may have to call the manufacturer to determine the power factor for that make and model.

How do I determine the volt-amp and/or watt specifications?

All electrical devices should have a power rating listed on the device and in the literature. This rating may be shown as volt-amps (VA), watts (W), or amps (A). When sizing and selecting a device, determine both the input volt-amp and output wattage specifications. Devices that are UL Listed will generally have better specification information available than those that don't.

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