

Let's talk about Generators

Generators are widely used in the Camping and Caravan community to provide a number of uses and benefits. However before purchasing such a generator it is wise to consider what use it will be put to and assess what capacity generator will provide the purchaser with his/her requirements.

Typical uses for a genset will include the following:

Run lights for evening illumination. Typically	150 watts
Run battery charger	100 to 200 watts
Run a TV	150 to 300 watts
Run sound and radio equipment	50 watts
Electrical hot water heater	500 watts
Airconditioner	1000 to 1600 watts (depending on cap)
Fan	50 watts
Fridge (150 l)	80watts
Electrical resistance air heater	1000 to 1500 watts
Electric blanket	150watts
Microwave	900 watts

Looking at the above list we can break it down roughly into 2 types of load that the generator has to service.

The first category is *Resistive* loads. This includes incandescent lights, electrical hot water heater, Electrical resistance air heater and an electric blanket.

These electrical loads are very straightforward to assess against a generators quoted *continuous output capacity*. For instance if you have a gen set rated for continuous output of say 1600 watts, a 1500 watt air heater will be run OK.

If we add all the *Resistive* load items in the above list it would look like this:

Lights	150 watts
Hot water heater	500 watts
Air heater	1500 watts
Electric Blanket	150 watts

This makes a grand total of 2300 watts and you would need a genset that could supply a minimum of 2300 watts continuously.

The complication comes when considering the other items. They have a type of load that is referred to as an Inductive load or a combination of *Inductive and Resistive load*.

It is more difficult to estimate the gensets requirements to adequately drive these loads. because they generally have a momentarily high inrush current when first activated. This can be 3 to 4 times the appliance's normal running current.

For the small ticket items such as the sound equipment, the TV or the Fridge, the extra genset capacity is usually not significant if you are using say a 1500W continuously rated gen set, but when you add say a 1300 watts airconditioner to the mix, then we need some understanding about what is going to occur.

Before we go further, let's look at how gensets are rated.

Up to a few years ago, most generators were *field excited* units but now days the *Inverter* units are becoming most popular. They have the great advantage of being lighter and they are better at starting motors (inductive loads).

Gensets are usually advertised with the **Maximum output** to the fore, but the **Continuous** rating is usually amid the fine print. Gensets will put out the maximum power for a short period of time to be able to start motors etc...

An airconditioner rated at 1300 watts input will for a small fraction of a second require perhaps 4000 watts to start and accelerate the compressor up to speed. This starting procedure is of very short duration but in the case of for example a genset rated at MAX. 2000Watts then inertia of the petrol motor/genset is of great importance to get the compressor successfully started.

Gensets are driven with an internal combustion engine (either petrol or diesel) and therefore have some short comings regarding performance. The hotter the ambient air is (the air that is sucked into the engine for combustion) so the power output of the engine and generator will decrease. A good rule is to allow a 1.5% decrease in output for every 5 degree C above 25C. So on a 45 C day, a genset will be de-rated by $4 \times 1.5 = 6\%$. So with a 1500 W continuously rated genset, at 45C will only produce $\underline{1500-90} = 1410\text{Watts}$. Height above sea level will also cause then genset to be de-rated further.

Having some understanding of the above, it can be seen that it is very easy to underestimate your genset requirements. Let's now consider airconditioners that one may wish to run on a genset.

The rated power input of an airconditioner is that steady state power input at the rating point of the aircon. This is usually measured at an outside temperature of 35C and an inside temp. of 27C & 50 % humidity. As the outside temperature increases, so does the power requirement of the airconditioner. Typically an aircon rated at say 1300W may well require 1400Watts when the outside temp reaches 40C.

So you can see that as the genset is losing power as the outside temp increases, so the aircon is requiring more!

So we have the following:

We would all choose to have the lightest genset to manhandle around. More powerful gensets have to have larger engines and therefore the weight increases.

If you have a significant inductive load (an airconditioner or a microwave) then you need significantly more power to start them than what is printed on the data sheet for that appliance. Normal engineering requirements for starting capacitor motors (that is most single phase airconditioners) off a genset is, in fact, 4 x rated power input. So by normal engineering criteria, a 1300W aircon should be driven with a 4 x 1300W or a 5200W (max rated) genset.

These days with the advent of inverter type gensets, it is quite apparent that smaller gensets can be used. However, it must be borne in mind that the margin between what the genset can put out (particularly in hot conditions) and the power requirement of the aircon can be borderline, and occasionally insufficient. Purchase these remarkably well engineered small gensets by all means, but bear in mind they will often be working "on the edge" and the occasional failure will have to be looked at in light of the above explanation.