kVA and KW Explained
Advantages of MGE Constant KW Technology

Technical Bulleting
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WHAT IS KW AND KVA?

Looking at different electrical equipment you will notice that the power ratings are either expressed in kVA (kilo Volt Ampres) or sometimes in kW (kilo Watts). The next question is what’s the difference? Both are measurements of power however they are truly different.

To understand the differences consider how each are derived. kW is called actual or real power, or simply the amount of power that is available to do real work. kVA. On the other hand kVA is known as “apparent” power. This is because only a portion of the available kVA may be available to do real work. The remainder is simply excess current.

The difference between kVA and kW really depends on the power factor (PF). When the voltage and current are in phase with each other in an AC circuit, the power factor is 1.0 or “unity”. The more the voltage falls out of phase with the current the lower the power factor becomes and the less “real power” or kW the device uses; however it may still be using the same amount of current as a device with a higher power factor. Power factor will be “leading” or “lagging” depending on which way the load shifts the current’s phase with respect to the voltage’s phase. Inductive loads cause current to lag behind voltage, while capacitive loads cause current to lead voltage hence leading or lagging power factor.

$kVA = Volts \times A$
$kW = Volts \times Amps \times Power Factor$ or $[kVA \times Power Factor]$

The next question is why express the kVA value of a device and what use is kVA if only part of it can do work? The reason kVA is used as a rating is because the rating of an electrical device is dependent on the amount of current they can sustain. A kW rating does not indicate how much current a device can carry (as the power factor may not be known) where kVA does indicate the maximum current at a specific voltage level.

HOW DOES IT RELATE TO UPS SYSTEMS:

UPS modules are traditionally rated in kVA. In most cases the UPS module will have more KVA than kW which can be an advantage. Even though the power factor of many UPS loads are around 0.9 or higher, even close to unity (1.0) in some cases extra kVA can be put to good use to clear faults or assist in providing extra current during surge conditions.
Just because a UPS is rated with a 0.8 or 0.9 output power factor doesn’t mean that it can not supply unity or near unity power factor loads perfectly. For example a 30 kVA MGE UPS may be rated at 0.8 PF (24 kW), yet it will provide a unity power factor all the way up to it’s rated kW level.

In fact, all of MGEs three phase UPS have output power factors that will match these load power factors identically. The reason is because MGEs three phase UPSs are what’s known as constant kW devices. This means that they will be capable of a unity power factor output all the way up to their rated kW level. Since most UPSs are very rarely loaded higher than 80%, this means that MGE will match the power factor rating of all loads.

**Constant kW Technology:** All MGE three phase UPSs are constant kW and will provide unity power factor outputs up to their rated kW level.