

## AGN 004 – Operating Charts

### DESCRIPTION:

The operating charts are used to determine the amount of load an alternator can tolerate at a specific power factor. If the load is at a low lagging power factor, extra excitation is required and therefore the rotor is subject to thermal damage. If the load has a leading power factor, instability will occur and if the power factor is nearing zero leading, self-excitation will occur and the voltage will rise, leading to possible pole slip. The alternator must always operate within the operating envelope.

### READING THE CHARTS:

When using the chart the operating power factor needs to be known and the corresponding radial line needs to be followed into the origin of the curve until the line intersects with the operating envelope. At this point the per unit kW can be read directly from the vertical axis and the per unit kVAr from the horizontal axis. For the per unit kVA the point of intersection needs following downwards circumferentially, using the semi-circle guidelines, to the horizontal axis.

### EXAMPLE:

See following chart.

Rated **670kVA**, 400V, 50Hz, 3ph.

When operating at power factor 0.5 lagging,

Maximum kW (orange line) = 0.44p.u.

$$670 \times 0.44 = 295\text{kW}$$

Maximum kVAr (blue line) = 0.76p.u.

$$670 \times 0.76 = 509\text{kVAr}$$

Maximum kVA (violet line) = 0.88p.u.

$$670 \times 0.88 = 590\text{kVA}$$

When operating at power factor 0.5 leading,

Maximum kW (green line) = 0.19p.u.

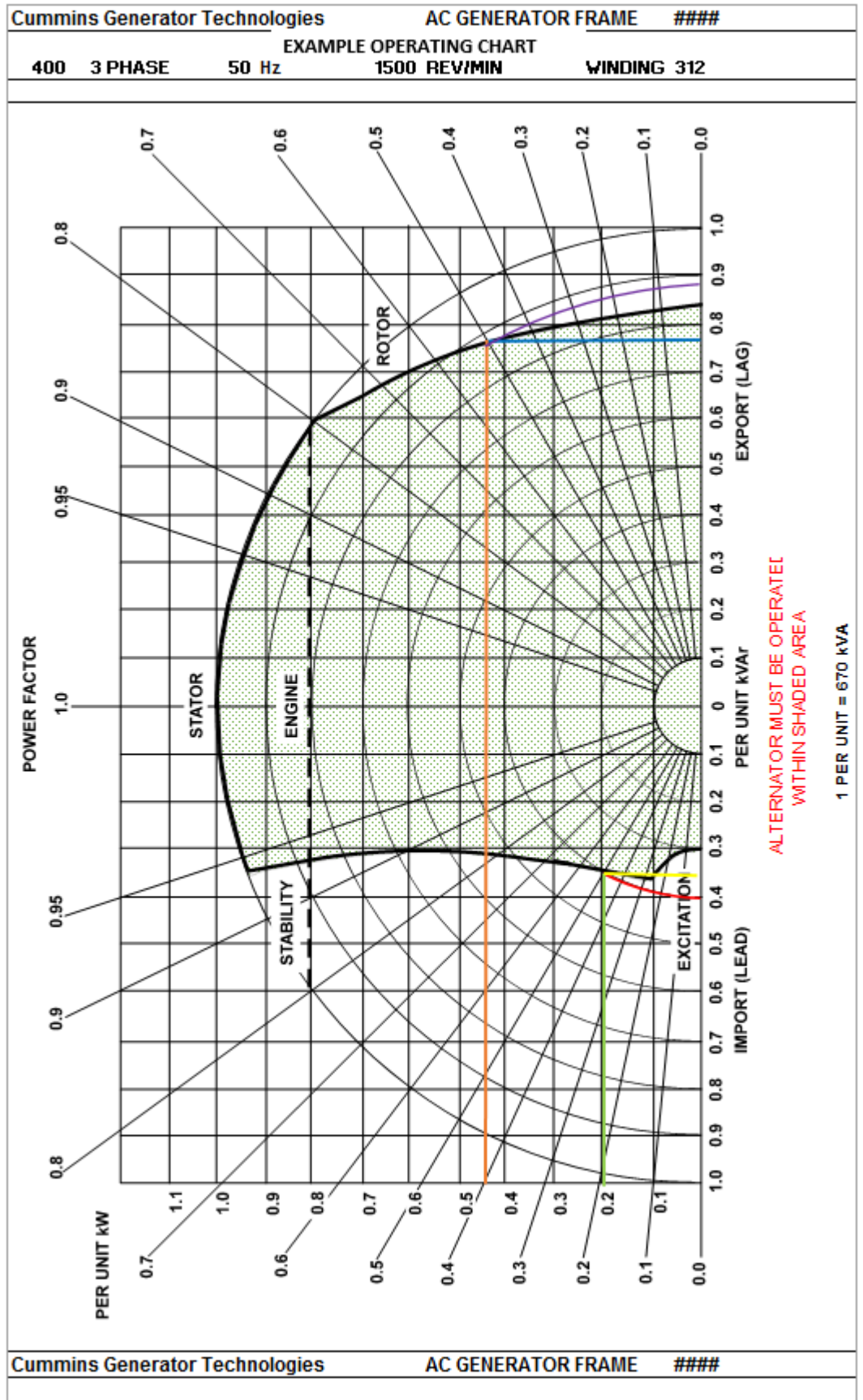
$$670 \times 0.19 = 127\text{kW}$$

Maximum kVAr (yellow line) = 0.34p.u.

$$670 \times 0.34 = 228\text{kVAr}$$

Maximum kVA (red line) = 0.4p.u.

$$670 \times 0.4 = 268\text{kVA}$$



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