Generator (DG Set) kVA Sizing from Load

Generator kVA rating needed for a running load from its kW and power factor, a growth margin and the planned loading, with the kW rating and full-load current.

Method: S = P / cos φ; rating by kVA and by engine kW

Input parameters

Unit system: SI

Parameter	Value	Unit
Running load	400.00	kW
Power factor of the load	0.85000	
Margin for growth	10.000	%
Planned loading of the set	80.000	%
Rated power factor of the generator	0.80000	
Voltage (three phase, line to line)	415.00	V

Calculated results

Parameter	Value	Unit
Load in kVA	470.59	kVA
Generator rating needed	687.50	kVA
kW rating at the generator's power factor	550.00	kW
Full-load current of that rating	956.45	A

Notes for this case

- The set must cover both the kVA and the kW (engine) demand; the larger governs. Motor starting can need more: check the starting kVA against the maker's data.

Formula and method

$$S_L = \frac{P}{\cos\varphi}, \quad S_g = \max\left(\frac{S_L(1+m)}{k_L}, \frac{P(1+m)}{k_L \cos\varphi_g}\right)$$

Variables

P	Running load	W
$\cos\varphi$	Power factor of the load	-
m	Margin for growth	-
k_L	Planned loading of the set	-
$\cos\varphi_g$	Rated power factor of the generator	-
V	Voltage (three phase, line to line)	V
S_L	Load in kVA	VA
S_g	Generator rating needed	VA
P_g	kW rating at the generator's power factor	W
I_g	Full-load current of that rating	A

Method and standards

Alternator kVA and engine kW limits.

Assumptions and limits

- Steady load; no step-load or harmonic derating.

- No site derating for altitude or ambient temperature (apply the maker's factors) and no motor-starting kVA check.

References

- S = P / cos φ; rating by kVA and by engine kW

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/power/generator-kva-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.