Capacitor kvar Output at a Different Voltage and Frequency

Actual kvar and current of a power capacitor used at a voltage and frequency other than its rating, since output varies with voltage squared and frequency.

Method: Q = ω C V²: output ∝ V² f

Input parameters

Unit system: SI

Parameter	Value	Unit
Rated kvar	25.000	kvar
Rated voltage	440.00	V
Rated frequency	50.000	Hz
Actual system voltage	415.00	V
Actual frequency	50.000	Hz

Calculated results

Parameter	Value	Unit
Actual kvar output	22.240	kvar
Output as a share of the rating	88.959	%
Line current (three phase)	30.940	A
Rated line current (three phase)	32.804	A

Formula and method

$$Q = Q_r \left(\frac{V}{V_r}\right)^2 \frac{f}{f_r}$$

Variables

Q_r	Rated kvar	var
V_r	Rated voltage	V
f_r	Rated frequency	1/s
V	Actual system voltage	V
f	Actual frequency	1/s
Q	Actual kvar output	var
Q/Q_r	Output as a share of the rating	-
I	Line current (three phase)	A
I_r	Rated line current (three phase)	A

Method and standards

Fixed capacitance at another voltage and frequency.

Assumptions and limits

- No series reactor.
- A system voltage above 1.1 times the rating is flagged (IEC 60831-1 admits 1.10 U_N only for limited periods).

References

- Q = ω C V²: output ∝ V² f

Report details

Report reference	FCC-SPWZ-QEA3 (the same inputs always give the same reference)
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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/capacitor-kvar-at-voltage

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.