Capacitor Size at Motor Terminals from No-Load Current

Largest capacitor that can be connected directly at an induction motor's terminals without self-excitation, from its no-load current, and the share of motor rating.

Method: Capacitor limit at 90 % of no-load magnetising kvar

Input parameters

Unit system: SI

Parameter	Value	Unit
Line voltage	415.00	V
No-load current	18.000	A
Share of no-load magnetising kvar	90.000	%
Motor rating	37.000	kW

Calculated results

Parameter	Value	Unit
No-load reactive power	12.938	kvar
Capacitor rating	11.645	kvar
Capacitor as share of motor kW	31.472	%

Notes for this case

• A capacitor switched with the motor corrects its power factor where the reactive current is drawn. If it supplies more than the motor's magnetising kvar, the motor can self-excite after switch-off, generating overvoltage while it runs down and endangering the motor and capacitor; restarting (reversing, star-delta transition) can also be damaging. So the rating is kept to about 90 % of the no-load reactive power, $\sqrt{3}\cdot V\cdot I_0$. Larger correction goes on the bus with its own switching.

Formula and method

$$Q_0 = \sqrt{3}\, V I_0, \quad Q_c = k Q_0$$

Variables

V	Line voltage	V
I_0	No-load current	A
k	Share of no-load magnetising kvar	-
P	Motor rating	W
Q_0	No-load reactive power	var
Q_c	Capacitor rating	var
Q_c/P	Capacitor as share of motor kW	-

Method and standards

Motor capacitor.

Assumptions and limits

- No-load current mostly magnetising.

References

Capacitor limit at 90 % of no-load magnetising kvar

Report details

Report reference	FCC-FKTR-6ZJ1 (the same inputs always give the same reference)
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Calculator	Capacitor Size at Motor Terminals from No-Load Current
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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/motors/motor-capacitor-no-load-current

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.