Energy Stored in a Capacitor and an Inductor

Energy stored in a capacitor from capacitance and voltage with its charge, and in an inductor from inductance and current with its flux linkage.

Method: E = ½ C V²; E = ½ L I² (circuit theory)

Input parameters

Unit system: SI

Parameter	Value	Unit
Capacitance	470.00	µF
Voltage on the capacitor (DC or instantaneous; peak for an AC capacitor)	400.00	V
Inductance	50.000	mH
Current in the inductor	10.000	A

Calculated results

Parameter	Value	Unit
Energy in the capacitor ½ C V²	37.600	J
Charge C V	0.18800	C
Energy in the inductor ½ L I²	2.5000	J
Flux linkage L I	0.50000	Wb

Formula and method

$$E_C = \frac{1}{2}CV^2, \quad Q = CV, \quad E_L = \frac{1}{2}LI^2, \quad \Psi = LI$$

Variables

C	Capacitance	F
V	Voltage on the capacitor (DC or instantaneous; peak for an AC capacitor)	V
L	Inductance	H
I	Current in the inductor	A
E_C	Energy in the capacitor ½ C V²	J
Q	Charge C V	C
E_L	Energy in the inductor ½ L I²	J
Ψ	Flux linkage L I	Wb

Method and standards

Stored field energy.

Assumptions and limits

- Linear components.
- V and I are instantaneous (or DC) values. For an AC capacitor the peak stored energy uses the peak voltage √2 × V_rms; entering the RMS value gives half the peak energy (the same holds for the inductor current).

References

- E = ½ C V²
- E = ½ L I² (circuit theory)

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/circuits/capacitor-inductor-energy

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.