Inductor Turns from the Core A_L Value and Peak Flux Density

Number of turns for a required inductance from a core's inductance factor A_L, the actual inductance with whole turns, and the peak flux density at the peak current.

Method: Inductance factor A_L and peak flux density

Input parameters

Unit system: SI

Parameter	Value	Unit
Required inductance	47.000	µH
Inductance factor of the core (per turn²)	250.00	nH
Effective core area	40.000	mm²
Peak current	2.5000	A
Saturation flux density of the core material	0.35000	T

Calculated results

Parameter	Value	Unit
Turns (rounded up)	14.000	
Exact turns √(L/A_L)	13.711	
Inductance with the rounded turns	49.000	µH
Peak flux density L I/(N A_e)	218.75	mT
Fraction of saturation	62.500	%

Notes for this case

• L = A_L N²; peak flux B = L I/(N A_e). Keep B below about 70–80 % of saturation at the hottest temperature (ferrite B_sat falls with temperature).

Formula and method

$$N = \left\lceil \sqrt{\frac{L}{A_L}} \right\rceil, \quad L = A_L N^2, \quad B_{pk} = \frac{L\, I_{pk}}{N\, A_e}$$

Variables

L	Required inductance	H
A_L	Inductance factor of the core (per turn²)	H
A_e	Effective core area	m²
I_{pk}	Peak current	A
B_{sat}	Saturation flux density of the core material	T
N	Turns (rounded up)	-
N_{exact}	Exact turns √(L/A_L)	-
L_{actual}	Inductance with the rounded turns	H
B_{pk}	Peak flux density L I/(N A_e)	T
B_{pk}/B_{sat}	Fraction of saturation	-

Method and standards

Inductor winding from catalogue core data.

Assumptions and limits

- A_L constant (no saturation), uniform flux in the core.

References

Inductance factor A_L and peak flux density

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/electronics/inductor-turns-al-value

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.