Wire Resistance from Length, Area and Material

Resistance of a copper, aluminium or other wire at 20 °C from its length and cross-section, with the voltage drop and power loss at a current.

Method: R = ρ L / A; IEC 60028 (annealed copper, 1/58 Ω·mm²/m); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Conductor	Copper (annealed, IACS)	
Resistivity at 20 °C (for other metals) Used only when the conductor is 'Other'; ignored for copper and aluminium, which use their standard values.	0.10000	Ω·mm²/m
Length of wire	100.00	m
Cross-section	2.5000	mm²
Current	16.000	A

Calculated results

Parameter	Value	Unit
Resistivity used	0.017241	Ω·mm²/m
Resistance at 20 °C	0.68966	Ω
Voltage drop I R	11.034	V
Power loss I² R	176.55	W

Notes for this case

- One conductor at 20 °C. A circuit has a go and a return conductor; resistance rises about 0.4 % per kelvin for copper and aluminium.

Formula and method

$$R = \frac{\rho L}{A}, \quad \Delta V = IR, \quad P = I^2 R$$

Variables

metal	Conductor	-
ρ	Resistivity at 20 °C (for other metals)	Ω·m
L	Length of wire	m
A	Cross-section	m²
I	Current	A
ρ_{20}	Resistivity used	Ω·m
R	Resistance at 20 °C	Ω
ΔV	Voltage drop I R	V
P	Power loss I² R	W

Method and standards

Resistance of a uniform conductor.

Assumptions and limits

- The resistivity input is used only for 'Other'; for copper and aluminium the standard values (IEC 60028 and IEC 60889) are used and the entered value is ignored. The value used is shown as an output.
- DC resistance at 20 °C; no skin effect.

References

- R = ρ L / A
- IEC 60028 (annealed copper, 1/58 Ω·mm²/m)
- IEC 60889 (aluminium, 28.264 nΩ·m)

Report details

Report reference	FCC-C0Y0-2182 (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Wire Resistance from Length, Area and Material
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/cables/wire-resistance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.