DC Cable Voltage Drop and Size (Solar, Battery)

Voltage drop and power loss of a two-wire DC cable for solar strings, batteries and DC systems, and the conductor size needed for an allowed drop.

Method: ΔV = 2 ρ L I / A (go and return); IEC 60364-5-52 Annex G (conductor resistivity in service)

Input parameters

Unit system: SI

Parameter	Value	Unit
System voltage	48.000	V
Current	50.000	A
One-way cable length	15.000	m
Conductor cross-section	16.000	mm²
Resistivity of the conductor in service Default: copper in service (1.25 × the 20 °C value, IEC 60364-5-52 Annex G). Aluminium 0.036 Ω·mm²/m.	0.022500	Ω·mm²/m
Allowed voltage drop	2.0000	%

Calculated results

Parameter	Value	Unit
Voltage drop 2 ρ L I / A	2.1094	V
Voltage drop as a share of the system voltage	4.3945	%
Power lost in the cable	105.47	W
Smallest cross-section for the allowed drop	35.156	mm²

Notes for this case

- The drop with this cross-section exceeds the allowed value: use at least A_min.

Formula and method

$$\Delta V = \frac{2\rho L I}{A}, \quad A_{min} = \frac{2\rho L I}{u_{max} V}$$

Variables

V	System voltage	V
I	Current	A
L	One-way cable length	m
A	Conductor cross-section	m²
ρ	Resistivity of the conductor in service	Ω·m
u_{max}	Allowed voltage drop	-
ΔV	Voltage drop 2 ρ L I / A	V
u	Voltage drop as a share of the system voltage	-
P_{loss}	Power lost in the cable	W
A_{min}	Smallest cross-section for the allowed drop	m²

Method and standards

Resistance of the go and return conductors.

Assumptions and limits

- Resistive drop only.
- A drop above the allowed u_max is flagged.

References

- ΔV = 2 ρ L I / A (go and return)
- IEC 60364-5-52 Annex G (conductor resistivity in service)

Report details

Report reference	FCC-WT0N-BJGP (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	DC Cable Voltage Drop and Size (Solar, Battery)
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/dc-cable-voltage-drop

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.