PV DC Cable Voltage Drop, Loss and Minimum Size

Voltage drop, power loss and minimum copper or aluminium cross-section of a PV string or array DC cable for a loss limit at the conductor temperature.

Method: Ohm's law with temperature-corrected conductor resistivity

Input parameters

Unit system: SI

Parameter	Value	Unit
Operating current (I_mp of the string or array)	9.6000	A
Operating voltage (V_mp)	750.00	V
One-way cable length	60.000	m
Conductor cross-section	4.0000	mm²
Conductor	Copper	
Conductor temperature	70.000	°C
Allowed voltage drop	1.0000	%

Calculated results

Parameter	Value	Unit
Loop resistance (out and back)	0.61883	Ω
Voltage drop	5.9408	V
Voltage drop	0.79210	%
Power loss in the cable	0.057031	kW
Minimum cross-section for the allowed drop	3.1684	mm²

Notes for this case

• Two-wire DC loop R = ρ(T)·2L/A with ρ_{20} = 1.724 × 10^{-8} Ω·m (copper, IEC annealed) or 2.82 × 10^{-8} Ω·m (aluminium) and the temperature coefficient. Voltage drop as a fraction equals the power loss fraction. Check current rating and installation derating separately.

Formula and method

$$R = \rho_{20}\left[1+\alpha(T-20)\right]\frac{2L}{A}, \quad \frac{\Delta V}{V} = \frac{IR}{V}, \quad A_{min} = \frac{\rho\, 2LI}{(\Delta V/V)_{max}\, V}$$

Variables

I	Operating current (I_mp of the string or array)	A
V	Operating voltage (V_mp)	V
L	One-way cable length	m
A	Conductor cross-section	m²
$\mathrm{material}$	Conductor	-
T	Conductor temperature	K
ΔV_{max}	Allowed voltage drop	-
R	Loop resistance (out and back)	Ω
ΔV	Voltage drop	V
$\Delta V/V$	Voltage drop	-
P_{loss}	Power loss in the cable	W
A_{min}	Minimum cross-section for the allowed drop	m²

Method and standards

DC loop resistance.

Assumptions and limits

- Direct current; uniform temperature.

References

Ohm's law with temperature-corrected conductor resistivity

Report details

Report reference	FCC-4TN4-MMKG (the same inputs always give the same reference)
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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/solar-pv/pv-dc-cable-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.