Voltage Divider Calculator (with Load)

Output voltage of a two-resistor voltage divider with and without a load, the current drawn, the power in the resistors and the Thévenin resistance.

Method: Kirchhoff's laws; Thévenin's theorem

Input parameters

Unit system: SI

Parameter	Value	Unit
Input voltage	24.000	V
Upper resistor	10,000	Ω
Lower resistor (output across it)	5,000.0	Ω
Load resistance across the output Enter a very large value for no load.	100,000	Ω

Calculated results

Parameter	Value	Unit
Output voltage, no load	8.0000	V
Output voltage with the load	7.7419	V
Current from the source (with the load)	1.6258	mA
Power taken from the source	0.039019	W
Thévenin (output) resistance $R_1 \parallel R_2$	3,333.3	Ω

Formula and method

$$V_o = V_{in}\,\frac{R_2}{R_1 + R_2}, \quad V_L = V_{in}\,\frac{R_2 \parallel R_L}{R_1 + R_2 \parallel R_L}$$

Variables

V_{in}	Input voltage	V
R_1	Upper resistor	Ω
R_2	Lower resistor (output across it)	Ω
R_L	Load resistance across the output	Ω
V_o	Output voltage, no load	V
V_L	Output voltage with the load	V
I	Current from the source (with the load)	A
P	Power taken from the source	W
R_{th}	Thévenin (output) resistance $R_1 \parallel R_2$	Ω

Method and standards

Series circuit with the load in parallel with R_2.

Assumptions and limits

- Ideal source.

References

- Kirchhoff's laws; Thévenin's theorem

Report details

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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/voltage-divider

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Reopens the calculator with the inputs of this report.