Heater Element: Resistance, Current and Power at Another Voltage

Resistance and current of a resistive heater from its rated power and voltage, and the power and current when run at a different voltage.

Method: Ohm's law and P = V²/R

Input parameters

Unit system: SI

Parameter	Value	Unit
Rated power	3.0000	kW
Rated voltage	230.00	V
Actual voltage	210.00	V

Calculated results

Parameter	Value	Unit
Resistance V²/P	17.633	Ω
Rated current	13.043	A
Power at the actual voltage	2.5009	kW
Current at the actual voltage	11.909	A

Notes for this case

- Assumes constant resistance; real elements change resistance a little with temperature.

Formula and method

$$R = \frac{V_r^2}{P_r}, \quad P = \frac{V^2}{R}$$

Variables

P_r	Rated power	W
V_r	Rated voltage	V
V	Actual voltage	V
R	Resistance V²/P	Ω
I_r	Rated current	A
P	Power at the actual voltage	W
I	Current at the actual voltage	A

Method and standards

Ohm's law.

Assumptions and limits

- Constant resistance.

References

- Ohm's law and P = V²/R

Report details

Report reference	FCC-WMXF-TSBC (the same inputs always give the same reference)
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Calculator	Heater Element: Resistance, Current and Power at Another Voltage
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Release checks	2 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/circuits/heater-resistance-voltage

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.