RTD Self-Heating Error

Temperature error of a resistance thermometer heated by its own measuring current, from the current, resistance and self-heating coefficient.

Method: ΔT = I² R / k (IEC 60751 self-heating definition)

Input parameters

Unit system: SI

Parameter	Value	Unit
Measuring current	1.0000	mA
Sensor resistance at the temperature	138.50	Ω
Self-heating coefficient (mW per K) In mW per K, from the sensor data sheet, for the medium and flow it sits in (still air is far lower than flowing water). If the data sheet gives K/mW (°C/mW), enter its reciprocal.	2.0000	

Calculated results

Parameter	Value	Unit
Power in the sensor I² R	0.13850	mW
Self-heating error (reads high)	0.069250	K

Formula and method

$$P = I^2 R, \quad \Delta T = \frac{P}{k_{sh}}$$

Variables

I	Measuring current	A
R	Sensor resistance at the temperature	Ω
k_{sh}	Self-heating coefficient (mW per K)	-
P	Power in the sensor I² R	W
ΔT	Self-heating error (reads high)	K

Method and standards

Power balance at the sensor.

Assumptions and limits

- Steady state.
- k_sh is in mW per K. Some data sheets give the inverse, a self-heating error in K/mW (°C/mW): enter 1 divided by that value.

References

• ΔT = I² R / k (IEC 60751 self-heating definition)

Report details

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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/instrumentation/temperature/rtd-self-heating-error

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.