Infrared Thermometer Emissivity Correction

True surface temperature from an infrared thermometer reading taken at one emissivity setting, for the real emissivity and the reflected background temperature.

Method: Stefan–Boltzmann law with reflected radiation; $\varepsilon T^4 + (1 - \varepsilon)T_r^4$

Input parameters

Unit system: SI

Parameter	Value	Unit
Temperature shown by the instrument	150.00	°C
Emissivity set in the instrument	0.95000	
Real emissivity of the surface	0.30000	
Reflected (background) temperature	30.000	°C

Calculated results

Parameter	Value	Unit
True surface temperature	263.96	°C
Correction (true − shown)	113.96	K

Notes for this case

- Total-radiation (Stefan–Boltzmann) model; real instruments work in a band (8–14 µm), so this is an estimate. Better: set the right emissivity, or use tape of known emissivity.

Formula and method

$$\varepsilon_{set} T_{ind}^4 + (1 - \varepsilon_{set}) T_r^4 = \varepsilon T^4 + (1 - \varepsilon) T_r^4$$

Variables

T_{ind}	Temperature shown by the instrument	K
ε_{set}	Emissivity set in the instrument	-
ε	Real emissivity of the surface	-
T_{refl}	Reflected (background) temperature	K
T	True surface temperature	K
ΔT	Correction (true − shown)	K

Method and standards

Radiance balance, broadband.

Assumptions and limits

- Grey, opaque surface; broadband model.

References

- Stefan–Boltzmann law with reflected radiation
- $\varepsilon T^4 + (1 - \varepsilon)T_r^4$

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/infrared-emissivity-correction

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.