Rhodium-Iron RTDs

Rhodium-iron features

- Good long term stability: ±10 mK from 1.4 K to 325 K
- RF-800 offers a wide temperature range from 0.65 K to 500 K
- Linear response above 100 K
- Excellent resistance to ionizing radiation

Rhodium-iron temperature sensors offer a positive temperature coefficient, monotonic response over a wide temperature range, and high resistance to ionizing radiation.

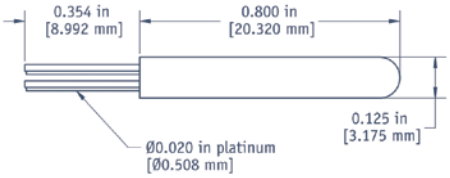
The RF-800 rhodium-iron resistance sensor features monotonically decreasing resistivity from 500 K to 0.65 K, although sensitivity (dR/dT) falls off in the region of 30 K. From 100 K to 273 K the resistance changes linearly with temperature to within 1 K. RF-800-4 sensors also exhibit monotonic response at higher temperatures, hence their adaptability for use over the broad range from 1.4 K to 500 K.

Packaging options

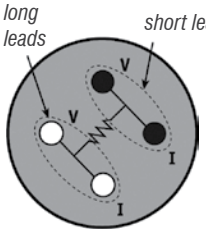
RF-800-4

RF-800

RF-800

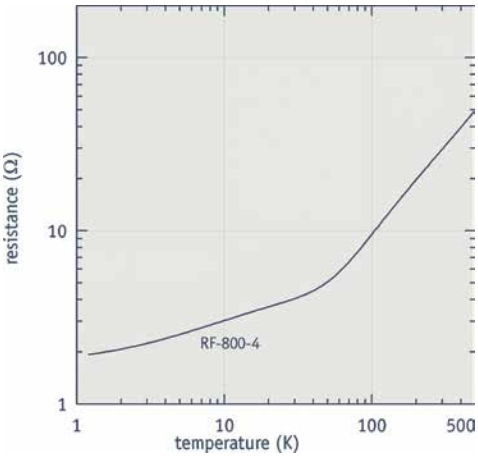


General tolerance of ±0.005 in [±0.127 mm] unless otherwise noted

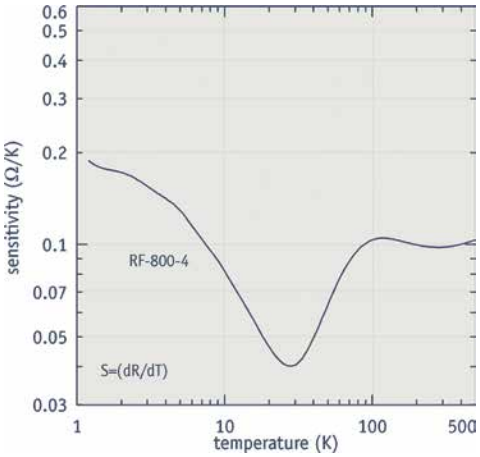


Looking at end with leads toward user. Polarity is arbitrary.

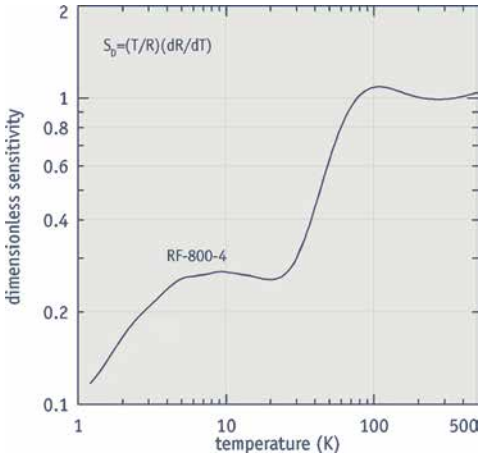
Typical rhodium-iron resistance



Typical rhodium-iron sensitivity



Typical rhodium-iron dimensionless sensitivity



Specifications

Standard curve Not applicable

Recommended excitation 1 mA

Dissipation at recommended excitation 10 µW at 4.2 K, 250 µW at 273 K

Thermal response time 10 s at 273 K

Use in radiation Recommended for use in ionizing radiation environments—see Appendix B

Use in magnetic field Not recommended for use in magnetic fields below 77 K—see Appendix B

Reproducibility[1] ±5 mK at 4.2 K

Soldering standard J-STD-001 Class 2

[1] *Short-term reproducibility data is obtained by subjecting sensor to repeated thermal shocks from 305 K to 4.2 K*

Range of use

	Minimum limit	Maximum limit
RF-800-4	0.65 K	500 K[2]

[2] *Usable to 800 K, but large and erratic temperature shifts can occur at lower temperatures without proper thermal conditioning*

Calibrated accuracy

	Typical sensor accuracy[3]	Long-term stability[4]
1.4 K	±7 mK	±10 mK
4.2 K	±7 mK	±10 mK
10 K	±8 mK	±10 mK
77 K	±13 mK	±10 mK
305 K	±23 mK	±10 mK
400 K	±41 mK	—
500 K	±42 mK	—

[3] *$[(\text{Calibration uncertainty})^2 + (\text{reproducibility})^2]^{0.5}$ for more information see Appendices B, D, and E*

[4] *Long-term stability data is obtained by subjecting sensor to 200 thermal shocks from 305 K to 77 K*

Physical specifications

	Size	Mass	Lead type	Internal atmosphere	Materials used
RF-800-4	0.51 mm × 9 mm long	735 mg	4 platinum wire	solid	Alumina and glass cylindrical case—rhodium-iron alloy wire encapsulated in ceramic

Typical magnetic field-dependent temperature errors[5] ΔT/T (%) at B (magnetic induction)

	Package parallel to field B			
	2.5 T	8 T	14 T	19 T
4.2 K	11	40	—	—
20 K	4	—	—	—
40 K	1.5	12	30	47
66 K	0.3	2.5	6	9
87 K	0.2	1.5	4	6
110 K	0.1	0.9	2.4	—
190 K	0.03	0.3	0.9	—
300 K	-0.01	0.1	0.4	—

[5] *Not recommended for use in magnetic fields below 77 K*

Temperature response data table (typical)

See Appendix G for expanded response table

	RF-800-4		
	R (Ω)	dR/dT (Ω/K)	(T/R)·(dR/dT)
1.4 K	1.5204	0.178	0.16
4.2 K	1.9577	0.135	0.29
20 K	3.1632	0.0461	0.29
77 K	6.8341	0.0959	1.1
150 K	14.463	0.105	1.1
300 K	29.697	0.101	1.0
400 K	39.824	0.103	1.0

Packaging options

For information on mounting adapters available for use with the SD package, see page 21.

See the appendices for a detailed description of:
Installation
Uncalibrated sensors
SoftCal™
Calibrated sensors
CalCurve™
Sensor packages

To add length to sensor leads, see page 25.

Ordering information

Uncalibrated sensor—Specify the part number in the left column only, for example RF-800-4.

Calibrated sensor—Add the calibration range suffix code to the end of the model number, for example RF-800-4-1.4L.

Rhodium-iron RTD	Calibration range suffix codes Numeric figure is the low end of the calibration Letters represent the high end: B=40 K, D=100 K, L=325 K, H=500 K									
Part number	Uncal	1.4B	1.4D	1.4L	1.4H	4B	4D	4L	4H	70L
RF-800-4	■			■	■			■	■	

Other packaging available through special order—consult Lake Shore

Accessories suggested for installation—see Accessories section for full descriptions

Stycast® epoxy	VGE-7031 varnish
CryoCable™	Indium solder
Apiezon® grease	90% Pb, 10% Sn solder
Manganin wire	Phosphor bronze wire