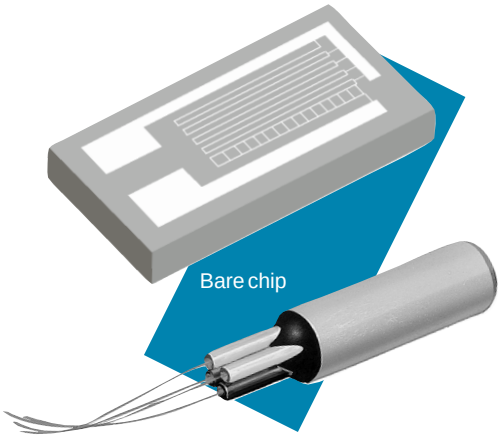
RF-100 Rhodium-Iron RTDs

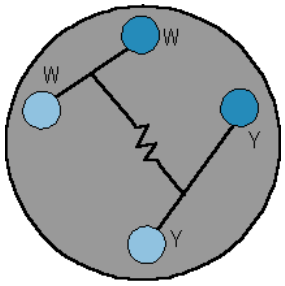
- Good long term stability
- Wide range: 1.4 K to 325 K
- Linear response above 100 K
- High resistance to ionizing radiation
- Repeatability is ±10 mK from 1.4 K to 325 K
- Small chip size available with extremely fast thermal response time

Rhodium-iron temperature sensors offer a positive temperature coefficient, monotonic response over a wide temperature range and high resistance to ionizing radiation. Wire-wound capsule versions have excellent stability and are widely used as secondary temperature standards by many national standards laboratories.

The Lake Shore thin film rhodium-iron temperature sensor offers significant advantages over comparable wire-wound resistance sensors. The thin film sensors offer a smaller package size which makes them useful in a broader range of experimental mounting schemes, and they are available at a much lower cost. Additionally, they have proven to be very stable over repeated thermal cycling and under extended exposure to ionizing radiation. Furthermore, the thermal time constant of thin film rhodium-iron temperature sensors (bare chip) is on the order of milliseconds; while the thermal time constant of wire-wound resistors is on the order of seconds.



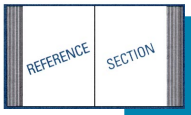
Strain-free mounting in an epoxy-sealed, gold-plated copper canister



RF-100-AA

W	White
W	White
Y	Yellow
Y	Yellow

Sensor is not a kelvin bridge, so lead identification is positive or negative, current or voltage is not important. Wires that are the same color are connected to the same side of the sensor. Looking at epoxy seal with leads toward user.



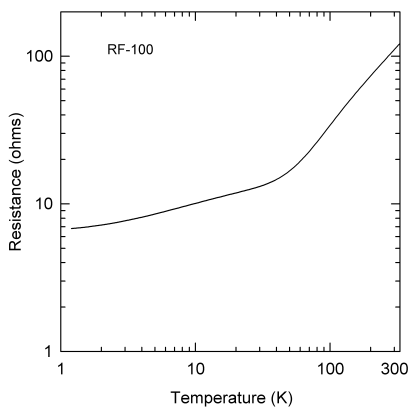
See the Reference Section for a detailed description of

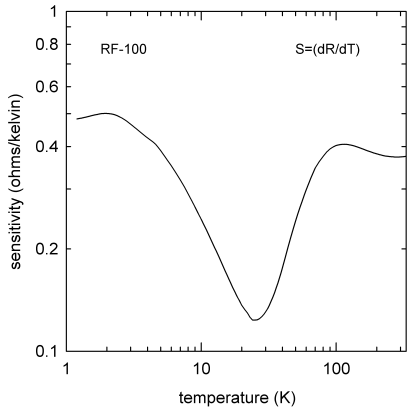
Self-heating
Installation
Uncalibrated sensors
Calibrated sensors
CalCurve™
Sensor packages

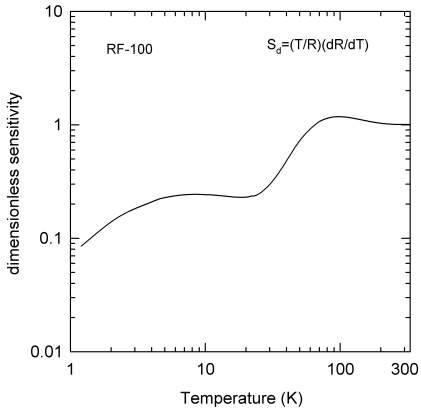
For information on Packages for Sensor Installation, see pages 1-40 to 1-42.

Adding lead length to sensors - see page 1-43.

Typical Resistance and Sensitivity values for RF-100s. See page A-57 for tabular data.







Specifications

	Unpackaged chip (BR, BG, BC)	RF-100-AA
Temperature		
Useful range		
Minimum	1.4 K	1.4 K
Maximum	325 K	325 K
Maximum storage temperature	305 K	305 K
Standard curve	Not applicable	Not applicable
Resistance (typical	See plots on previous page	See plots on previous page
Sensitivity (typical)	See plots on previous page	See plots on previous page
Dimensionless sensitivity (typical)	See plots on previous page	See plots on previous page
Repeatability	±10 mK (1.4 K to 325 K)	±10 mK (1.4 K to 325 K)
Accuracy (interchangeability)	Not applicable	Not applicable
Accuracy (SoftCal™)	Not applicable	Not applicable
Accuracy (calibrated)	±10 mK at 4.2 K; ±25 mK at 100 K; ±35 mK at 300 K (both models)	
Stability		
Short-term	±10 mK (1.4 K to 325 K)	±10 mK at 1.4 K to 325 K
Long-term (per year)	±20 mK (1.4 K to 325 K)	±20 mK at 1.4 K to 325 K
Thermal response time	2 ms at 4.2 K; 12 ms at 77 K; 35 ms at 273 K	0.8 S at 4.2 K; 3.6 S at 77 K; 15 S at 273 K
Recommended recalibration schedule	Annual	Annual
Excitation		
Recommended	0.5 mA	0.5 mA
Maximum power before damage	5 mW, 5 mA or 1 V, whichever is less.	5 mW, 5 mA or 1 V, whichever is less.
Dissipation at rated excitation	10 µW at 4.2 K, 100 µW at 273 K	10 µW at 4.2 K, 100 µW at 273 K
Units range (volts or ohms)	0 to 130 Ω	0 to 130 Ω
Lead wire configuration	No polarity	Four (4) leads, color coded
Physical Specifications		
Materials in the sensor/construction	Rhodium-iron film chip with back side metallized with Mo/Au. If soldered attachment is desired, only indium solder should be used.	Rhodium-iron chip is mounted strain free in a cylindrical gold plated copper can.
Size in millimeters	1.3 mm wide; 3.8 mm long 0.38 mm high	3 mm diameter; 8.5 mm long
Mass	7 milligrams	360 milligrams
Leads		
Size	BR: NA; BG: 0.051 mm dia, 1" long; BC: 0.064 mm dia.,1" long	32 AWG (0.24 mm diameter); 15 cm long
Number	BR: none; BG: 4; BC: 2	Four (4)
Material	BR: NA; BG: Gold; BC: Copper	Phosphor-bronze wire
Insulation	BR: NA; BG: None; BC: None	Heavy build Polyimide
Internal atmosphere	Not applicable	Helium 4 (^{4}He) is standard
Environmental		
Radiation effects (temperature shift [mK])	Recommended for use in radiation environments (see Reference Section)	
Magnetic fields	Not recommended for use in magnetic fields below 77 K (all models)	
ESD sensitivity	Not applicable	Not applicable
Noise sensitivity	Not applicable	Not applicable

Ordering Information

Uncalibrated sensor

Specify the Model number in the left column only, for example RF-100T-AA.

Calibrated sensor

Add Calibration Range Suffix Code to the end of the Model number.

Accessories suggested for installation (see Section 3)

Stycast® Epoxy	CryoCable™
Apiezon® Grease	Manganin Wire
IMI-7031 Varnish	Indium Solder
90% Pb, 10% Sn Solder	Phosphor-Bronze Wire

Accessories available for sensors

ECRIT	Expanded interpolation table
SCR	Special calibration report
8000	Calibration report on floppy disk
COC-SEN	Certificate of conformance

USD | American Express | VISA | MasterCard

Rhodium Iron RTD RF-100	Calibration Range Suffix Codes Numeric figure is the low end of the calibration. Letter represents the high end: B = 40 K, D = 100 K, L = 325 K.							
Model number	Uncalibrated	1.4B	1.4D	1.4L	4B	4D	4L	70L
RF-100T-AA, CD	✓	✓	✓	✓	✓	✓	✓	✓
RF-100T-BC	✓	✓	✓	✓	✓	✓	✓	✓
RF-100T-BG	✓							
RF-100T-BR	✓							
RF-100U-AA, CD	✓	✓	✓	✓	✓	✓	✓	✓
RF-100U-BC	✓	✓	✓	✓	✓	✓	✓	✓
RF-100U-BG	✓							
RF-100U-BR	✓							

For customers having ordered one of the following model numbers: RF-100T-BM, RF-100T-MC, RF-100T-MG, RF-100U-BM, RF-100U-MC and RF-100U-MG, please be aware that back side metallization is now standard on all Rhodium-Iron chips.

Other packaging available through special order. Consult Lake Shore.

T	Trimmed chip within 100 Ω ±1% at ice point (273.15 K)		
U	Untrimmed chip within 100 Ω ±30% at ice point		
AA	Copper canister	BR	Bare chip, no leads
BC	Bare chip with 42 AWG copper leads	BG	Bare chip with 0.0508 mm x 25.4 mm gold leads