

Temperature Sensors

Platinum RTDs

HRTS Series



FEATURES

- Resistance interchangeable
- Accurate
- Linear
- Fast
- Laser trimmed
- Bolt, cement-on or strap-on models

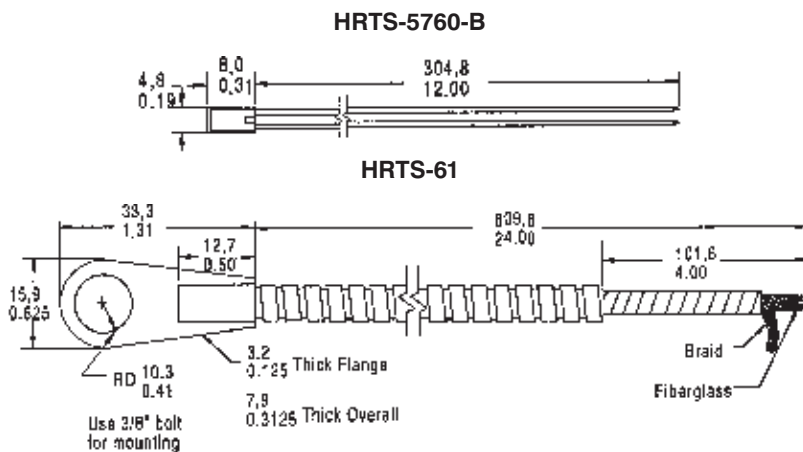
TYPICAL APPLICATIONS

- HVAC – room, duct and refrigerant equipment
- OEM assemblies
- Electronic assemblies – semiconductor protection, temperature compensation
- Process control – temperature regulation

ORDER GUIDE

HRTS-5760-B	Miniature, ceramic body, 28 ga TFE Teflon insulated leads (2-wire only)
HRTS-61	Bolt-on, nickel plated copper alloy body, 24 ga fiberglass insulated leads, SST braid, TFE overwrap, spiral armor
-T	100Ω, 0.00385 Ω/Ω/°C, 3-wire leads, DIN specification
-U	1000Ω, 0.00375 Ω/Ω/°C, 2-wire leads
-0	±0.2% Resistance Trim (Standard)
-1	±0.1% Resistance Trim (Optional)
-12	Standard length, HRTS-5760-B
-24	Standard length, HRTS-61

MOUNTING DIMENSIONS (for reference only)



The HRTS is designed to measure surface temperatures from -200° to $+480^{\circ}$ C (-320° to $+900^{\circ}$ F) in printed circuit, temperature probe, or other applications.

HRTS surface temperature sensors are fully assembled elements, ready to use, without the need for fragile splices to extension leads.

A thin layer of platinum is deposited on an alumina substrate and laser trimmed to a resistance interchangeability of $\pm 0.2\%$ with $\pm 0.5^{\circ}$ C accuracy or $\pm 0.1\%$ with $\pm 0.3^{\circ}$ C accuracy. The sensor chip is then glassed, wired and potted or ceramic fired to result in a cylindrical alumina package with either Teflon or fiber glass insulated lead wires.

Fig. 1: Wheatstone Bridge 2-Wire Interface

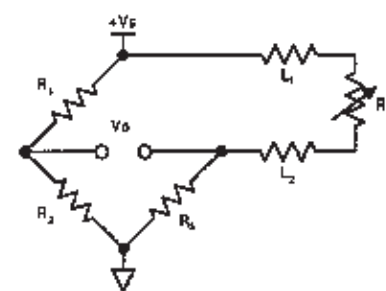


Fig. 2: Linear Output Voltage

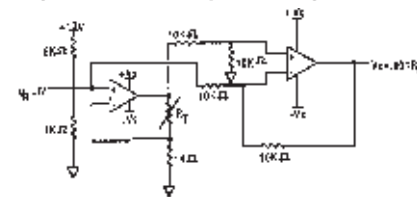
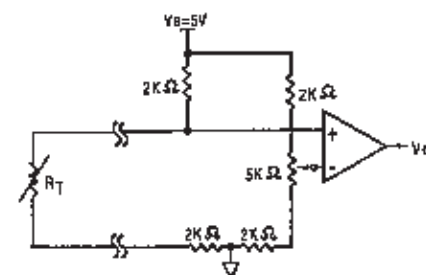


Fig. 3: Adjustable Point (Comparator) Interface



Temperature

Platinum RTDs

FUNCTIONAL BEHAVIOR

$$R_T = R_0(1 + AT + BT^2 - 100CT^3 + CT^4)$$

R_T = Resistance (Ω) at temperature T ($^{\circ}\text{C}$)

R_0 = Resistance (Ω) at 0°C

T = Temperature in $^{\circ}\text{C}$

$$A = \alpha + \frac{\alpha \delta}{100} \quad B = \frac{-\alpha \delta}{100^2} \quad C_{T < 0} = \frac{-\alpha \beta}{100^4}$$

CONSTANTS

Alpha, α ($^{\circ}\text{C}^{-1}$)	0.00375 ± 0.000029	0.003850 ± 0.000010
Delta, δ ($^{\circ}\text{C}$)	1.605 ± 0.009	1.4999 ± 0.007
Beta, β ($^{\circ}\text{C}$)	0.16	0.10863
A ($^{\circ}\text{C}^{-1}$)	3.81×10^{-3}	3.908×10^{-3}
B ($^{\circ}\text{C}^{-2}$)	-6.02×10^{-7}	-5.775×10^{-7}
C ($^{\circ}\text{C}^{-4}$)	-6.0×10^{-12}	-4.183×10^{-12}

Both $\beta = 0$ and $C = 0$ for $T > 0^{\circ}\text{C}$

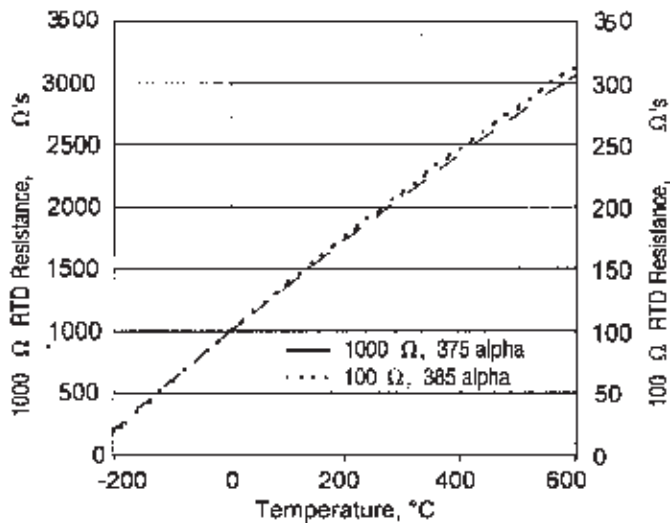
ACCURACY VS TEMPERATURE

HRTS platinum RTDs are available in two base resistance trim tolerances: $\pm 0.2\%$ or $\pm 0.1\%$. The corresponding resistance interchangeability and temperature accuracy for these tolerances are:

Tolerance	Standard $\pm 0.2\%$		Optional $\pm 0.1\%$		
	Temperature ($^{\circ}\text{C}$)	$\pm \Delta R^*$ (Ω)	$\pm \Delta T$ ($^{\circ}\text{C}$)	$\pm \Delta R^*$ (Ω)	$\pm \Delta T$ ($^{\circ}\text{C}$)
	-200	6.8	1.6	5.1	1.2
	-100	2.9	0.8	2.4	0.6
	0	2.0	0.5	1.0	0.3
	100	2.9	0.8	2.2	0.6
	200	5.6	1.6	4.3	1.2
	300	8.2	2.4	6.2	1.8
	400	11.0	3.2	8.3	2.5
	500	12.5	4.0	9.6	3.0
	600	15.1	4.8	10.4	3.3

*1000 Ω RTD. Divide ΔR by 10 for 100 Ω RTD.

RESISTANCE VS TEMPERATURE CURVE



CAUTION

PRODUCT DAMAGE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

SPECIFICATIONS

Sensor Type	Thin film platinum RTD: $R_0 = 1000 \Omega @ 0^{\circ}\text{C}$; $\alpha = 0.00375 \Omega/\Omega/^{\circ}\text{C}$ $R_0 = 100 \Omega @ 0^{\circ}\text{C}$; $\alpha = 0.00385 \Omega/\Omega/^{\circ}\text{C}$
Temperature Range	HRTS-5760-B: -200° to $+260^{\circ}\text{C}$ (-320° to $+500^{\circ}\text{F}$) HRTS-61: -75° to $+425^{\circ}\text{C}$ (-100° to $+800^{\circ}\text{F}$)
Temperature Accuracy	$\pm 0.5^{\circ}\text{C}$ or 0.8% of temperature @ 0.2% R_0 Trim $\pm 0.3^{\circ}\text{C}$ or 0.6% of temperature @ 0.1% R_0 Trim Optional
Time Constant, $1/e$	HRTS-5760-B: Typically 0.6 sec. on metal surfaces HRTS-61: Typically 20 sec. On metal surfaces
Operating Current	2 mA max. for self-heating errors of 1°C 1 mA recommended
Self-Heating	0.3 mW/ $^{\circ}\text{C}$
Lead Material	Nickel coated stranded copper, Teflon or Fiberglass insulated