

Temperature Sensors HEL-700 Series

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 $^{\circ}\text{C}$

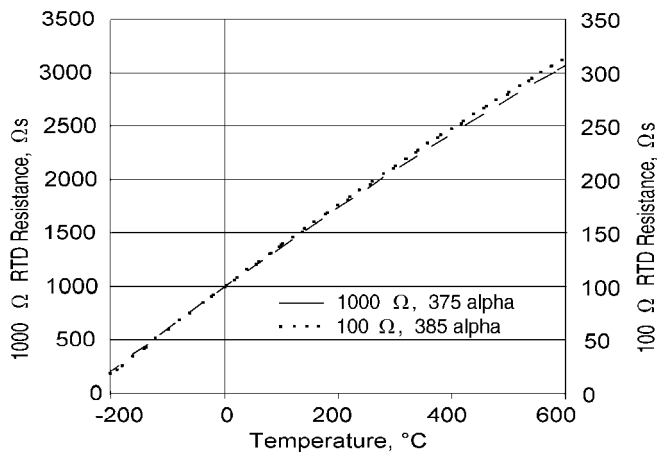
$$A = a + \frac{a d}{100} \quad B = \frac{-a d}{100^2} \quad C_{T < 0} = \frac{-a b}{100^4}$$

CONSTANTS

Alpha, α ($^{\circ}\text{C}^{-1}$)	0.003750 ± 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 $T > 0^{\circ}\text{C}$

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.

ACCURACY VS TEMPERATURE

EL-700 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:

Trim Tolerance	Standard $\pm 0.2\%$		Optional $\pm 0.1\%$	
	$\pm \Delta R$ (Ω)	$\pm \Delta T$ ($^{\circ}\text{C}$)	$\pm \Delta R$ (Ω)	$\pm \Delta T$ ($^{\circ}\text{C}$)
Temperature ($^{\circ}\text{C}$)				
-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

NIST CALIBRATION

NIST traceable calibration provides resistance readings at 1, 2 or 3 standard temperature points to yield a resistance versus temperature curve with up to 10 times better accuracy. A calibration report is as follows:

Calibration	1 Point	2 Point	3 Point
T ($^{\circ}\text{C}$)	$\pm \Delta T$ ($^{\circ}\text{C}$)	$\pm \Delta T$ ($^{\circ}\text{C}$)	$\pm \Delta T$ ($^{\circ}\text{C}$)
-200	0.9	--	--
-100	0.5	0.27	0.15
0	0.03	0.03	0.03
100	0.4	0.11	0.08
200	0.8	0.2	0.1
300	1.2	0.33	0.13
400	1.6	0.5	0.17
500	2.0	0.8	0.25
600	2.6	1.2	0.33

PLATINUM RTDs

ELECTRICAL INTERFACING

Fig. 1 illustrates the most common method of measuring an RTD. As R_T increases or decreases with temperature, V_o increases or decreases. An op-amp is used to observe V_o . Lead wire resistance, L_1 and L_2 , add to the RTD leg of the bridge and may affect the temperature reading.

Fig. 2 is a simple circuit that provides a voltage output linear to within 0.1% or a $\pm 0.3^\circ\text{C}$ (0.5°F) error over a range of -40°C to $+150^\circ\text{C}$ (-40°F to $+302^\circ\text{F}$).

Fig. 3 illustrates one way to detect one particular temperature, if required in an application. The potentiometer may be adjusted to correspond to the desired temperature.

Fig. 1: Wheatstone Bridge 2-Wire Interface

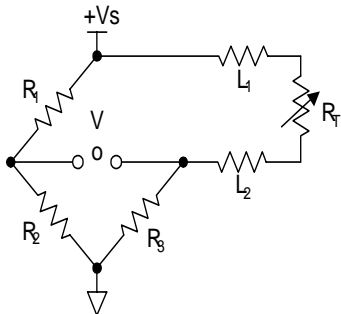


Fig. 2: Linear Output Voltage

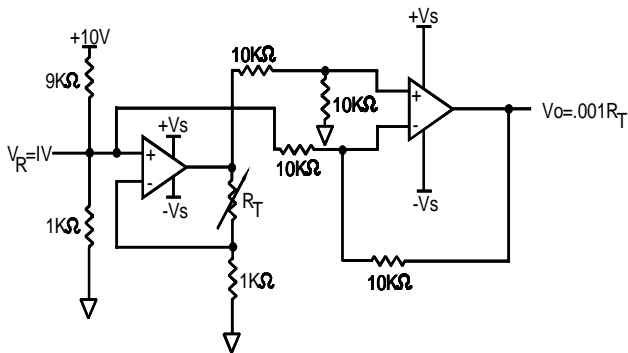
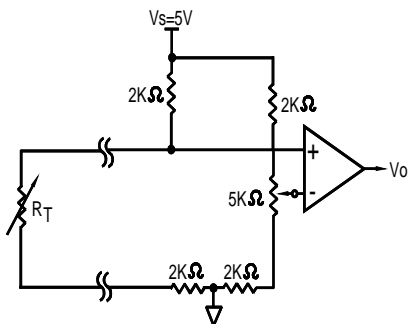


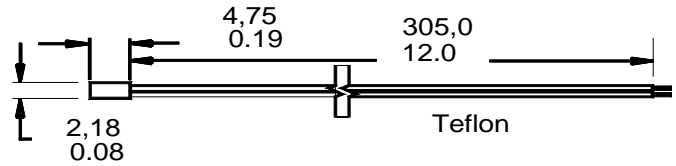
Fig. 3: Adjustable Point (Comparator) Interface



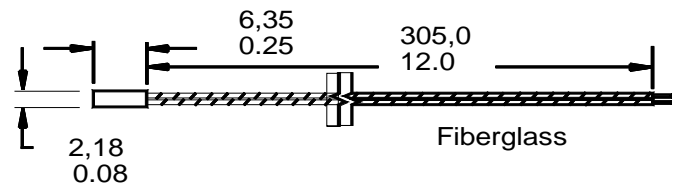
Temperature Sensors HEL-700 Series

MOUNTING DIMENSIONS (for reference only) mm/in

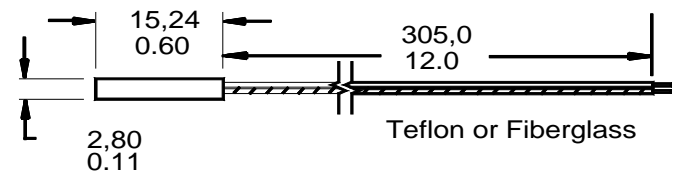
HEL-705



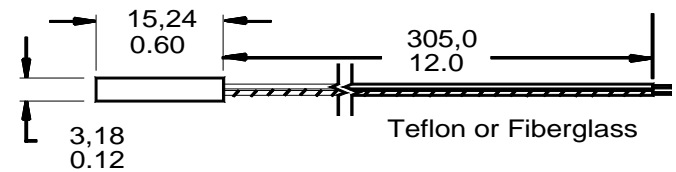
HEL-707



HEL-711, HEL-712



HEL-716, HEL-717



Temperature Sensors HEL-700 Series

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For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

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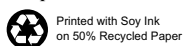
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