

## Temperature Sensors HEL-700 Series

PLATINUM RTDs

### FUNCTIONAL BEHAVIOR

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

$R_T$  = Resistance (W) at temperature T (°C)

$R_0$  = Resistance (W) at 0°C

T = Temperature in °C

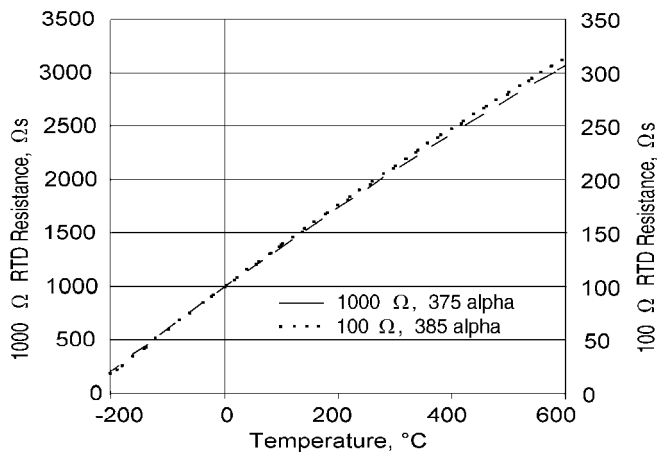
$$A = a + \frac{a d}{100} \quad B = \frac{-a d}{100^2} \quad C_{T<0} = \frac{-a b}{100^4}$$

### CONSTANTS

|                                                     |                        |                          |
|-----------------------------------------------------|------------------------|--------------------------|
| <b>Alpha, <math>\alpha</math> (°C<sup>-1</sup>)</b> | 0.003750<br>±0.000029  | 0.003850<br>±0.000010    |
| <b>Delta, <math>\delta</math> (°C)</b>              | 1.605 ± 0.009          | 1.4999 ± 0.007           |
| <b>Beta, <math>\beta</math> (°C)*</b>               | 0.16                   | 0.10863                  |
| <b>A (°C<sup>-1</sup>)</b>                          | 3.81x10 <sup>-3</sup>  | 3.908x10 <sup>-3</sup>   |
| <b>B (°C<sup>-2</sup>)</b>                          | -6.02x10 <sup>-7</sup> | -5.775x10 <sup>-7</sup>  |
| <b>C (°C<sup>-4</sup>)*</b>                         | -6.0x10 <sup>-12</sup> | -4.183x10 <sup>-12</sup> |

\*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: ±0.2% or ±0.1%. The corresponding resistance interchangeability and temperature accuracy for these tolerances are:

| Trim Tolerance   | Standard ±0.2% |          | Optional ±0.1% |          |
|------------------|----------------|----------|----------------|----------|
| Temperature (°C) | ±ΔR (Ω)        | ±ΔT (°C) | ±ΔR (Ω)        | ±ΔT (°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 (°C)      | ±ΔT (°C) | ±ΔT (°C) | ±ΔT (°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  $\pm 0.3^\circ\text{C}$  ( $0.5^\circ\text{F}$ ) error over a range of  $-40^\circ\text{C}$  to  $+150^\circ\text{C}$  ( $-40^\circ\text{F}$  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

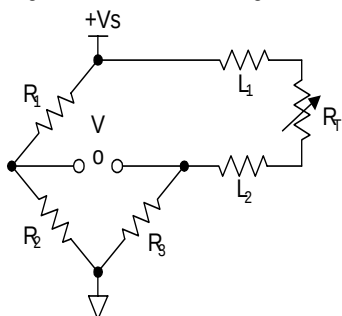


Fig. 2: Linear Output Voltage

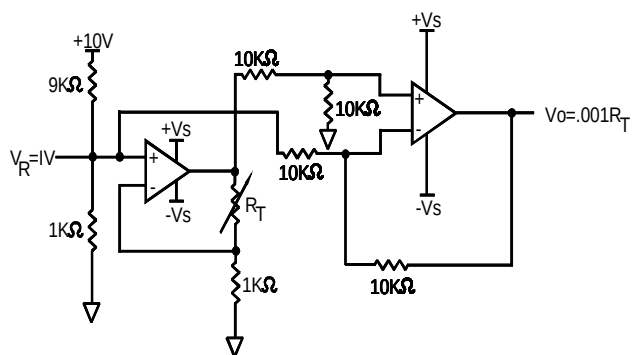
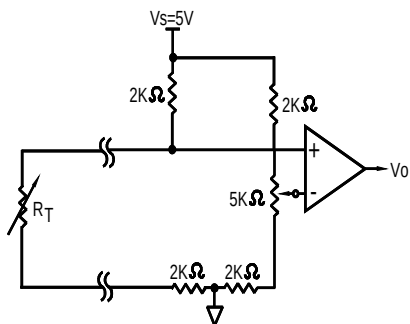


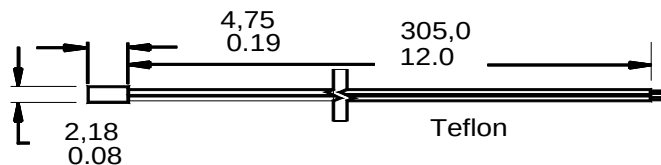
Fig. 3: Adjustable Point (Comparator) Interface



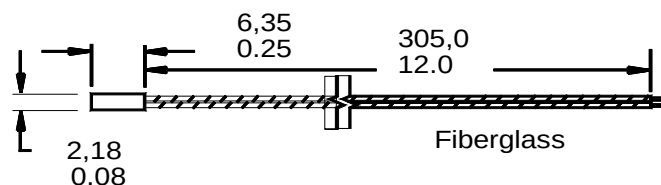
## Temperature Sensors HEL-700 Series

### MOUNTING DIMENSIONS (for reference only) mm/in

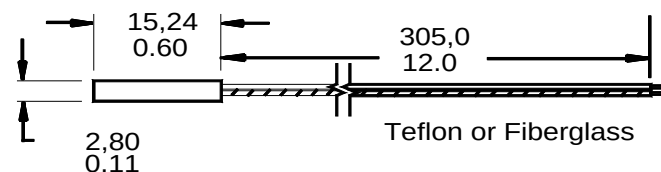
#### HEL-705



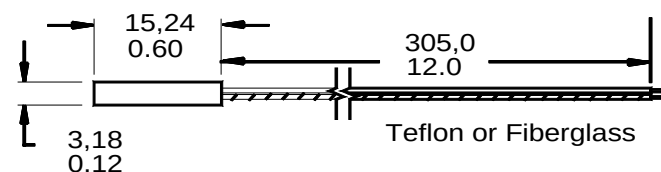
#### HEL-707



#### HEL-711, HEL-712



#### HEL-716, HEL-717



### Temperature Sensors HEL-700 Series

#### WARRANTY and REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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While we provide application assistance, personally, through our literature and the Honeywell website, it is up to the customer to determine the suitability of the product in the application.

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

1-800-537-6945 USA

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1-815-235-6847 International

#### FAX

1-815-235-6545

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