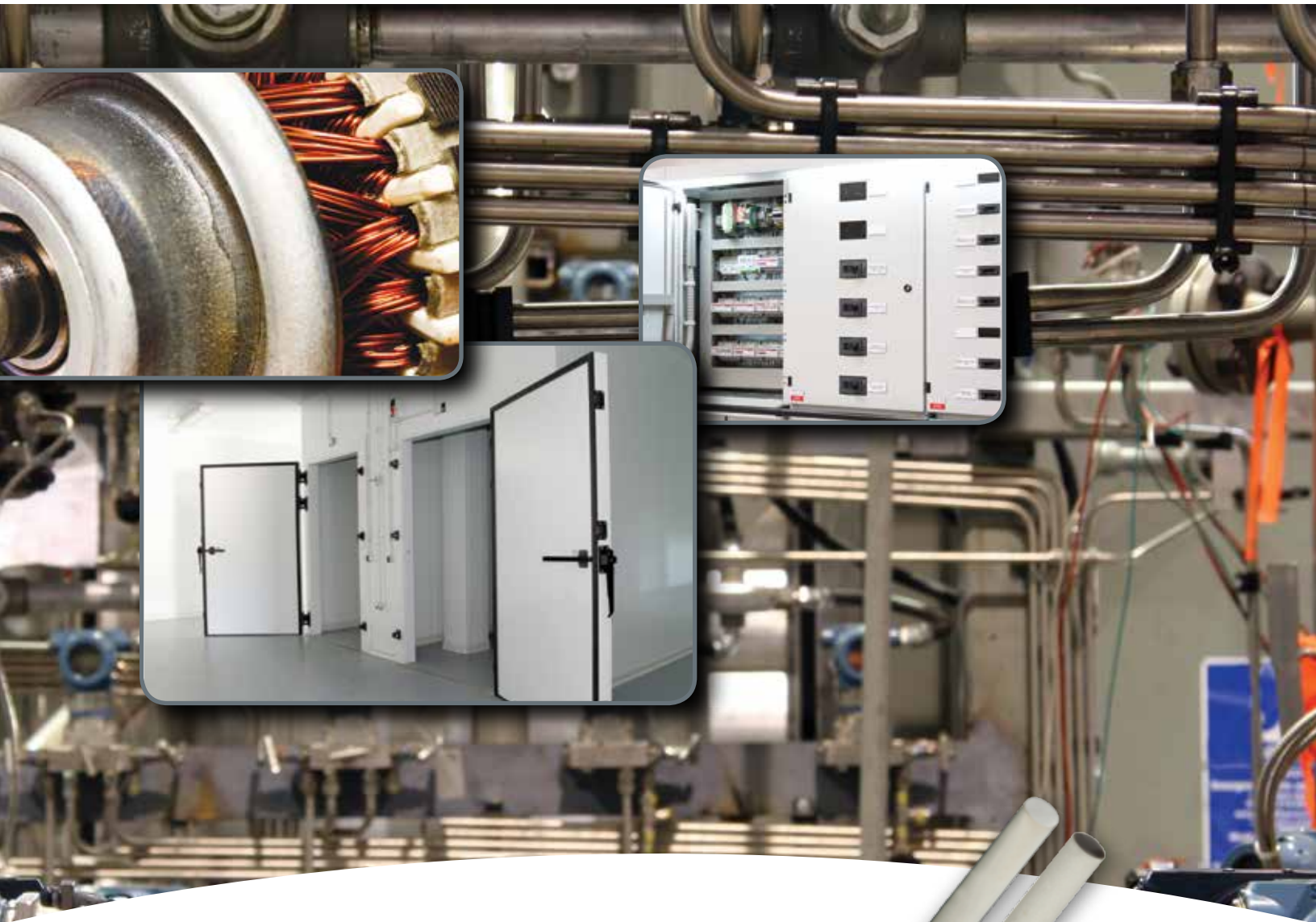
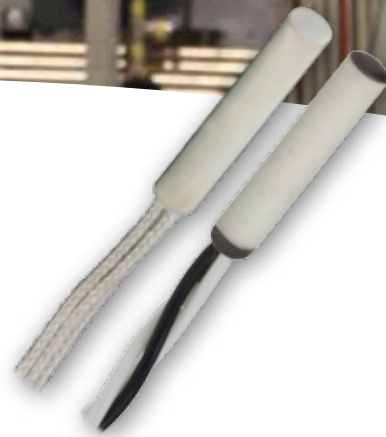




## Thin Film Platinum RTDs

### **HEL-700 Series**



# Thin Film Platinum RTDs

The HEL-700 Series Thin Film Platinum RTDs (Resistance Temperature Detectors) are designed to monitor or control critical temperatures in industrial applications. They provide a linear change in resistance versus temperature, combining high linearity, stability, accuracy, and wide temperature range in a small, fast-response package.

The HEL-700 Series is designed to measure temperatures from -75 °C to 540 °C [-100 °F to 1000 °F] with high accuracy. These fully-assembled elements are ready-to-use in probe assemblies, without the need for fragile splices to extension leads.

These products are manufactured using a thin layer of platinum deposited on an alumina substrate and are laser trimmed to a resistance interchangeability of a standard  $\pm 0.2\%$  ( $\pm 0.5$  °C accuracy) or optional  $\pm 0.1\%$  ( $\pm 0.3$  °C accuracy). The sensor chip is then glassed, wired and potted or ceramic fired to result in a cylindrical alumina package with either TFE Teflon®- or fiberglass-insulated lead wires.

## Key Features

- Wide temperature range
- Interchangeable
- Accurate
- Linear resistance vs temperature
- Fast response
- Laser trimmed
- Ceramic case material
- TFE Teflon® or fiberglass leadwires
- Multiple small sizes
- Ready-to-use, fully assembled elements

## Potential Applications

Temperature sensing for monitoring, compensation and regulation in:

### INDUSTRIAL

- HVAC equipment
- Instrument and probe assemblies
- Process control
- Motor windings and bearings
- Battery packs
- Environmental chambers
- Ovens and kilns
- Drill holes in large objects

### MEDICAL

- Autoclaves

### AEROSPACE/DEFENSE

- Aircraft
- Space vehicles

WIDE TEMPERATURE RANGE • INTERCHANGEABLE • ACCURATE

# Thin Film Platinum RTDs, HEL-700 Series

**Table 1. Specifications**

| Characteristic                                                                                                                                            | Condition                      | Parameter                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Alpha:<br>R <sub>0</sub> = 1000 Ω<br>R <sub>0</sub> = 100 Ω                                                                                               | 0 °C                           | 0.00375 Ω/Ω/°C<br>0.00385 Ω/Ω/°C                                                                                      |
| Temperature range:<br>TFE Teflon<br>fiberglass                                                                                                            | —                              | -70 °C to 260 °C [-94 °F to 500 °F]<br>-75 °C to 540 °C [-100 °F to 1000 °F]                                          |
| Temperature accuracy:<br>R <sub>0</sub> ±0.2% trim (standard)<br>R <sub>0</sub> ±0.1% trim (optional)                                                     | —                              | ±0.5°C or 0.8% of temperature, whichever is greater<br>±0.3°C or 0.6% of temperature, whichever is greater            |
| Base resistance and interchangeability, R <sub>0</sub> ±ΔR <sub>0</sub> :<br>R <sub>0</sub> ±0.2% trim (standard)<br>R <sub>0</sub> ±0.1% trim (optional) | 0 °C                           | 1000 Ω ±2 Ω<br>1000 Ω ±1 Ω                                                                                            |
| Linearity:<br>-40 °C to 125 °C<br>-75 °C to 540 °C                                                                                                        | —                              | ±0.1% of full scale<br>±2.0% of full scale                                                                            |
| Time constant                                                                                                                                             | water at 3 ft/s<br>still water | <0.5 s for 0.086 in O.D.<br><1.0 s for 0.086 in O.D.                                                                  |
| Operating current                                                                                                                                         | —                              | 2 mA max. minimal self heating errors of 1 °C;<br>1 mA recommended                                                    |
| Stability                                                                                                                                                 | occupied environments          | <0.25 °C /year; 0.05 °C /5 years                                                                                      |
| Self heating                                                                                                                                              | —                              | <15 mW/°C typ. for 0.086 in O.D.                                                                                      |
| Insulation resistance                                                                                                                                     | 50 Vdc at 25 °C                | >50 MΩ                                                                                                                |
| Construction/material:<br>case<br>Teflon®-insulated leads<br>fiberglass-insulated leads                                                                   | —                              | high purity alumina<br>nickel-coated stranded copper, epoxy potting<br>nickel-coated stranded copper, ceramic potting |

**Table 2. Constant Values (β = 0 and C = 0 for T > 0 °C)**

| Constant                    | 1000 Ω                   | 100 Ω                      | Functional Behavior                                                                                                                                                                                                                                                                                   |
|-----------------------------|--------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alpha α (°C <sup>-1</sup> ) | 0.00375 ±0.000029        | 0.003850 ±0.000010         | $R_T = R_0(1 + AT + BT^2 - 100CT^3 + CT^4)$<br>Where:<br>R <sub>T</sub> = Resistance (Ω) at temperature T (°C)<br>R <sub>0</sub> = Resistance (Ω) at 0 °C<br>T = Temperature (°C)<br>$A = \alpha + \frac{\alpha\delta}{100}$ $B = \frac{-\alpha\delta}{100^2}$ $C_{T<0} = \frac{-\alpha\beta}{100^4}$ |
| Delta δ (°C)                | 1.605 ±0.009             | 1.4999 ±0.007              |                                                                                                                                                                                                                                                                                                       |
| Beta β (°C)                 | 0.16                     | 0.10863                    |                                                                                                                                                                                                                                                                                                       |
| A (°C <sup>-1</sup> )       | 3.81 x 10 <sup>-3</sup>  | 3.908 x 10 <sup>-3</sup>   |                                                                                                                                                                                                                                                                                                       |
| B (°C <sup>-2</sup> )       | -6.02 x 10 <sup>-7</sup> | -5.775 x 10 <sup>-7</sup>  |                                                                                                                                                                                                                                                                                                       |
| C (°C <sup>-4</sup> )       | -6.0 x 10 <sup>-12</sup> | -4.183 x 10 <sup>-12</sup> |                                                                                                                                                                                                                                                                                                       |
|                             |                          |                            |                                                                                                                                                                                                                                                                                                       |

## CAUTION PRODUCT DAMAGE

- Ensure proper ESD (Electrostatic Discharge) precautions are followed when handling this product.

**Failure to comply with these instructions may result in product damage.**

# Thin Film Platinum RTDs, HEL-700 Series

Table 3. Accuracy vs Temperature

| Temperature<br>(°C) | Tolerance                |             |                          |             |
|---------------------|--------------------------|-------------|--------------------------|-------------|
|                     | Standard Trim<br>(±0.2%) |             | Optional Trim<br>(±0.1%) |             |
|                     | ±ΔR <sup>1</sup><br>(Ω)  | ±ΔT<br>(°C) | ±ΔR <sup>1</sup><br>(Ω)  | ±ΔT<br>(°C) |
| -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         |

<sup>1</sup>1000 Ω RTD. Divide Δ by 10 for 100 Ω RTD.

Table 4. NIST Calibration

| Temperature<br>(°C) | Standard Temperature Point<br>(±ΔT (°C)) |      |      |
|---------------------|------------------------------------------|------|------|
|                     | 1                                        | 2    | 3    |
| -100                | 0.5                                      | 0.27 | 0.15 |
| 0                   | 0.03                                     | 0.03 | 0.03 |
| 100                 | 0.4                                      | 0.11 | 0.07 |
| 200                 | 0.8                                      | 0.02 | 0.08 |
| 300                 | 1.2                                      | 0.33 | 6.2  |
| 400                 | 1.6                                      | 0.5  | 8.3  |
| 500                 | 2.0                                      | 0.8  | 9.6  |
| 600                 | 2.6                                      | 1.2  | 10.4 |

<sup>1</sup>NIST-traceable calibration provides resistance readings at 1, 2 or 3 standard temperature points to yield a resistance versus temperature curve with 10x better accuracy.

Figure 1. Resistance vs Temperature

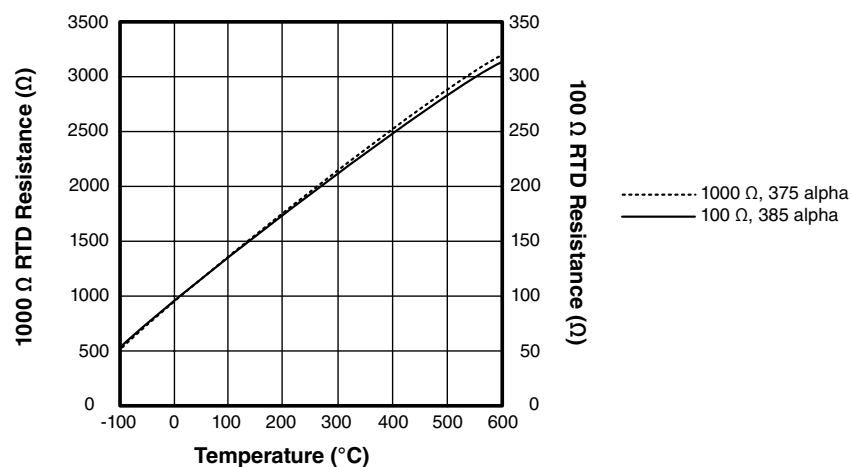


Figure 2. Nomenclature and Ordering Guide

For example, a **HEL-705-U-0-12-C1** part number defines an HEL-700 Series Thin Film RTD with two, 28 gauge TFE Teflon® insulated leadwires, an alpha of 1000 Ω: 0.00375 Ω/Ω/°C, a standard ±0.2% trim resistance, 12 inch leadwires, and a NIST calibration report at 0 °C.

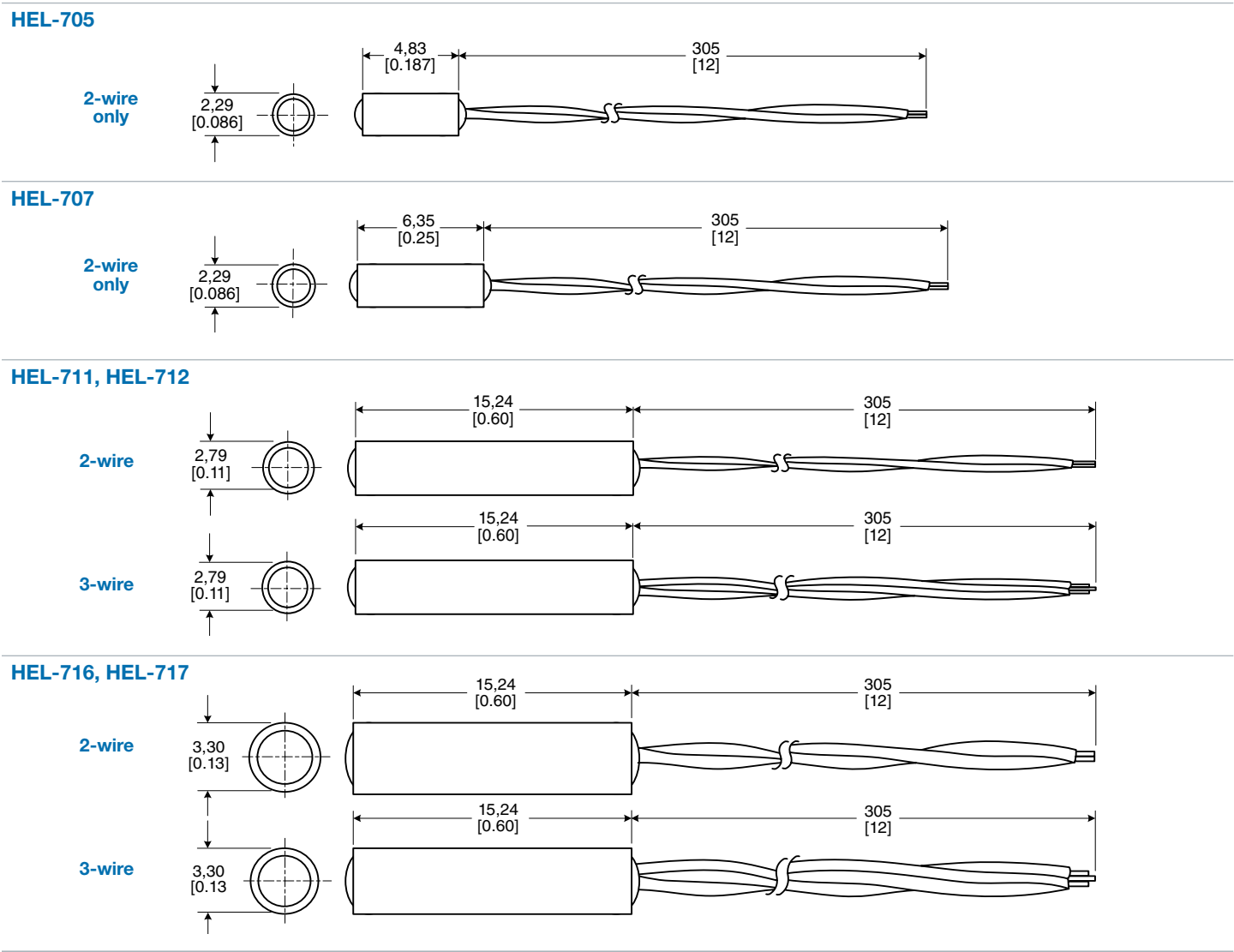
| HEL-                                                | 705-                                                               | U-                                               | 0-                       | 12-                 | C1                                   |
|-----------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------|--------------------------|---------------------|--------------------------------------|
| Product Series                                      | Leadwire Insulation Material, Gauge and Number                     | Resistance and Alpha                             | Resistance Trim          | Leadwire Length     | NIST Calibration Report              |
| <b>HEL-700 Series</b><br>Thin Film<br>Platinum RTDs | <b>705</b> TFE Teflon®, 28 gauge;<br>1000 Ω: 2-wire, 100 Ω: 2-wire | <b>U</b> 1000 Ω: 0.00375 Ω/Ω/°C                  | <b>0</b> Standard: ±0.2% | <b>12</b> 12 inches | <b>00</b> none                       |
|                                                     | <b>707</b> fiberglass, 28 gauge;<br>1000 Ω: 2-wire, 100 Ω: 2-wire  | <b>T</b> 100 Ω: 0.00385 Ω/Ω/°C<br>(DIN Standard) | <b>1</b> Optional: ±0.1% |                     | <b>C1</b> at 0 °C                    |
|                                                     | <b>711</b> TFE Teflon®, 28 gauge;<br>1000 Ω: 2-wire, 100 Ω: 3-wire |                                                  |                          |                     | <b>C2</b> at 0 °C and 100 °C         |
|                                                     | <b>712</b> fiberglass, 28 gauge;<br>1000 Ω: 2-wire, 100 Ω: 3-wire  |                                                  |                          |                     | <b>C3</b> at 0 °C, 100 °C and 260 °C |
|                                                     | <b>716</b> TFE Teflon®, 24 gauge;<br>1000 Ω: 2-wire, 100 Ω: 3-wire |                                                  |                          |                     |                                      |
|                                                     | <b>717</b> fiberglass, 24 gauge;<br>1000 Ω: 2-wire, 100 Ω: 3-wire  |                                                  |                          |                     |                                      |

# Thin Film Platinum RTDs, HEL-700 Series

Figure 3. All Available Standard Configurations

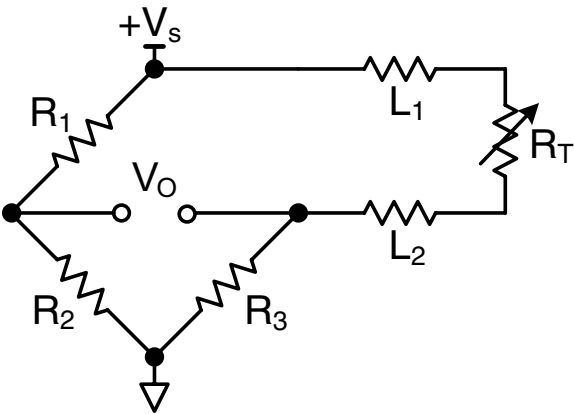
| Teflon®-Insulated Leadwires |                                     | Fiberglass-Insulated Leadwires |                                     |
|-----------------------------|-------------------------------------|--------------------------------|-------------------------------------|
| HEL-705                     | <div>2-wire only</div>              | HEL-707                        | <div>2-wire only</div>              |
| HEL-711                     | <div>2-wire</div> <div>3-wire</div> | HEL-712                        | <div>2-wire</div> <div>3-wire</div> |
| HEL-716                     | <div>2-wire</div> <div>3-wire</div> | HEL-717                        | <div>2-wire</div> <div>3-wire</div> |

Figure 4. Dimensional Drawings (For reference only: mm [in].)

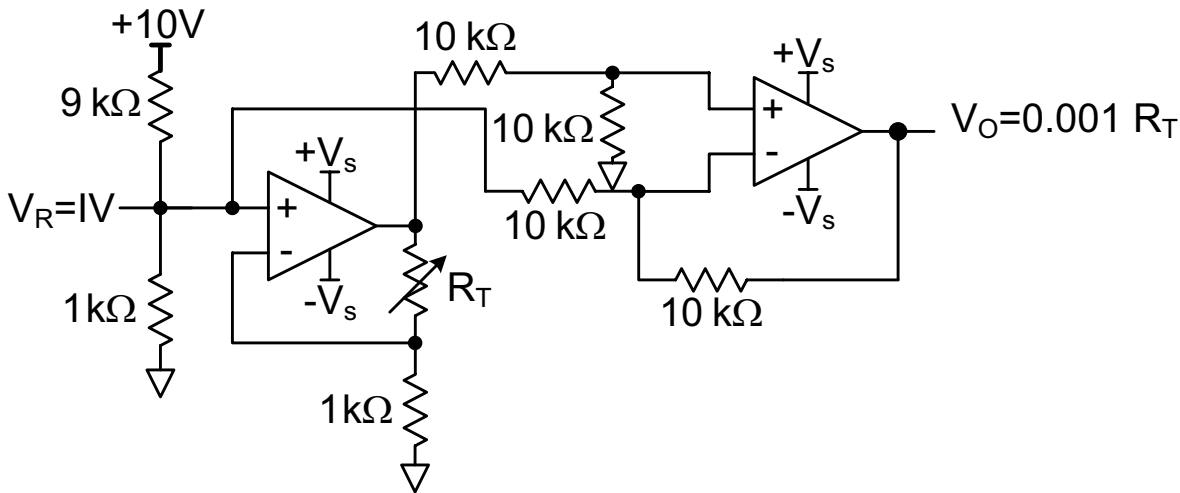


# Thin Film Platinum RTDs, HEL-700 Series

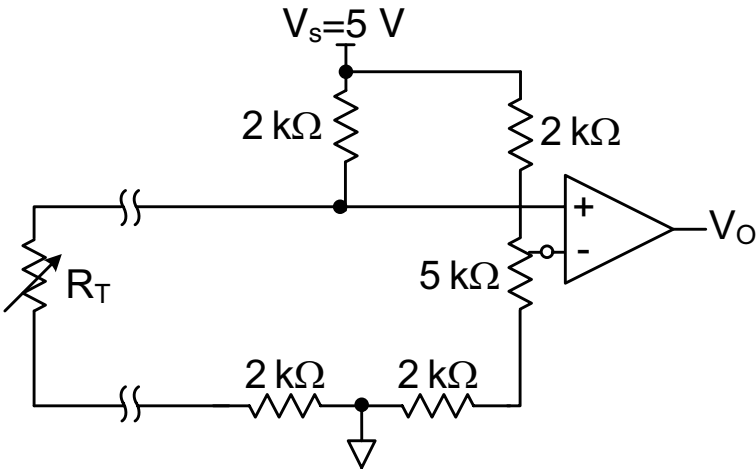
Figure 5. Circuits  
Wheatstone Bridge 2-Wire Interface



Linear Output Voltage



Adjustable Point (Comparator) Interface



## ADDITIONAL INFORMATION

The following associated literature is available at [sensing.honeywell.com](http://sensing.honeywell.com):

- Temperature Sensors Line Guide
- Thermal Sensors Range Guide

### WARNING

#### PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

### WARNING

#### MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

## Sales and Service

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or email us at [info.sc@honeywell.com](mailto:info.sc@honeywell.com). Visit us on the Web at [sensing.honeywell.com](http://sensing.honeywell.com)

### Phone and Fax:

|               |                                                           |
|---------------|-----------------------------------------------------------|
| Asia Pacific  | +65 6355-2828<br>+65 6445-3033 Fax                        |
| Europe        | +44 (0) 1698 481481<br>+44 (0) 1698 481676 Fax            |
| Latin America | +1-305-805-8188<br>+1-305-883-8257 Fax                    |
| USA/Canada    | +1-800-537-6945<br>+1-815-235-6847<br>+1-815-235-6545 Fax |

Sensing and Control  
Honeywell  
1985 Douglas Drive North  
Golden Valley, MN 55422  
[honeywell.com](http://honeywell.com)

## WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, 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. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

# Honeywell



**Стандарт  
Электрон  
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

**Наши контакты:**

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331