

## Thermocouples

### Mineral Insulated

Watlow's mineral insulated thermocouples are fast-responding, durable, and capable of handling high temperatures.

These thermocouples are manufactured with best-in-class XACTPAK®, Watlow's trademark for metal sheathed, mineral insulated (MI) thermocouple material. XACTPAK responds fast because the protective metal outer sheath allows the use of smaller diameter thermocouple conductors. The rock hard compacted MgO insulation further enhances the sensor's ability to "read" temperature by transferring heat quickly to the measuring junction.

The XACTPAK protecting sheath and compacted insulation outperforms bare wire thermocouples in most applications.

#### Performance Capabilities

- Easily handles temperatures up to 1200°C (2200°F)
- Meets or exceeds initial calibration tolerances per ASTM E 230

#### Features and Benefits

##### Special mineral insulation

- Protects thermocouple from moisture and thermal shock
- Permits operation in high temperature, high pressure environments

##### Diameters as small as 0.010 in. (0.25 mm)

- Ideal when physical space or extremely fast response are critical

##### Flexibility of the XACTPAK material

- Allows you to form and bend the thermocouple, without risk of cracking, to meet your design requirements



##### Outer sheath

- Protects the wires from oxidation and hostile environments

##### Wide range of sheath materials, diameters, and calibrations

- Meet specific requirements

##### In-house manufacturing of XACTPAK material

- Rigid quality control procedures
- Assures high standards are met
- Single source reliability

##### Custom capabilities

- Include options such as special lead lengths, lead wires and terminations

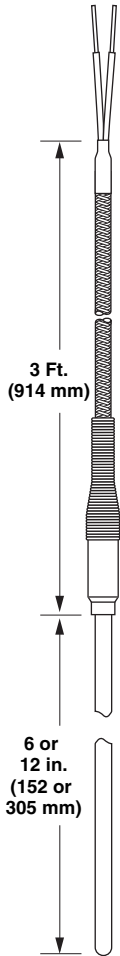
##### Applications

- Heat treating
- Furnaces/kilns
- Turbines
- Bearing temperature
- Power stations
- Steam generators
- Diesel engines
- Nuclear reactors
- Atomic research
- Jet engines and test cells
- Rocket engines
- Semiconductor manufacturing
- Refineries/oil processing
- Catalytic reformers
- Food processing

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## Mineral Insulated

### Metal Transitions with Spring Strain Relief Styles AF



### Rapid Ship Sensors

Rapid Ship sensors come with three feet of stranded conductor FEP insulated flexible lead, split lead termination, ungrounded junction, 149°C (300°F) potting. See page 166 to order additional connector hardware.

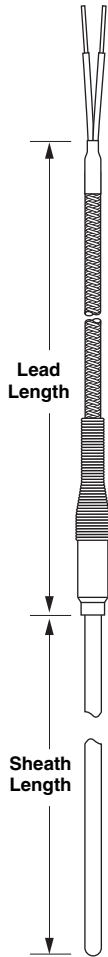
| Calibration | Sheath Material | Sheath Diameter |       | Sheath Length   |                 |
|-------------|-----------------|-----------------|-------|-----------------|-----------------|
|             |                 |                 |       | in. (mm)        |                 |
|             |                 | in.             | (mm)  | 6 (152)         | 12 (305)        |
| J           | 316 SS          | 0.063           | (1.6) | AFED0TF060UJ030 | AFED0TF120UJ030 |
|             |                 | 0.125           | (3.2) | AFGD0TF060UJ030 | AFGD0TF120UJ030 |
|             |                 | 0.188           | (4.8) | AFHD0TF060UJ030 | AFHD0TF120UJ030 |
|             |                 | 0.250           | (6.4) | AFJD0TF060UJ030 | AFJD0TF120UJ030 |
| K           | Alloy 600       | 0.063           | (1.6) | AFED0TQ060UK030 | AFED0TQ120UK030 |
|             |                 | 0.125           | (3.2) | AFGD0TQ060UK030 | AFGD0TQ120UK030 |
|             |                 | 0.188           | (4.8) | AFHD0TQ060UK030 | AFHD0TQ120UK030 |
|             |                 | 0.250           | (6.4) | AFJD0TQ060UK030 | AFJD0TQ120UK030 |

See next page for custom ordering information.

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## Mineral Insulated

### Metal Transitions with Spring Strain Relief Styles AF (Con't)



<sup>①</sup>Stranded lead wire available only for sheath O.D. 0.063 to 0.500 inch.  
<sup>②</sup>1000°F potting not recommended with FEP insulated wire.

**Note:** 149°C (300°F) potting standard

**Custom Ordering Information**—Items in **Bolded Green Type** are preferred with shorter lead times.

|  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
|--|--|----------------|---------------|---------|----------|---------|---------|---|---|----|----|----|----|----|----|
|  | 1  | 2              | 3             | 4       | 5        | 6       | 7       | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|  | <b>A</b>   | <b>F</b>       |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>2. Style</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
|  | <b>F = Metal transition with strain relief and 149°C (300°F) potting</b> |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>3. Sheath O.D. (inch)</b>   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| A = 0.010  | <b>E = 0.063</b>   |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| B = 0.020  | <b>G = 0.125</b>   |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| C = 0.032  | <b>H = 0.188</b>   |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| D = 0.040  | <b>J = 0.250</b>   |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>4. Lead Wire Construction</b>   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
|  | Stan-<br>dard  | Over-<br>braid | Flex<br>Armor |         |          |         |         |   |   |    |    |    |    |    |    |
| Fiberglass Solid   | A  | J              | R             |         |          |         |         |   |   |    |    |    |    |    |    |
| FEP Solid  | C  | L              | T             |         |          |         |         |   |   |    |    |    |    |    |    |
| Fiberglass Stranded <sup>①</sup>   | <b>B</b>   | <b>K</b>       | S             |         |          |         |         |   |   |    |    |    |    |    |    |
| FEP Stranded <sup>①</sup>  | <b>D</b>   | M              | U             |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>5. Fittings, Weld Pads</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| If required, enter order code from pages 39-40. If none, enter "0".                                  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>6. Lead Wire Termination</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>A = Standard male plug</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| B = Standard female jack   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| C = Standard plug with mating connector  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| F = Miniature male plug  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| G = Miniature female jack  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| H = Miniature plug with mating connector   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>T = Standard, 1 ½ inch split leads</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| U = 1 ½ inch split leads with spade lugs   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| W = 1 ½ inch split leads with BX connector and spade lugs  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>7. Sheath Material</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| A = 304 SS   | <b>Q = Alloy 600 (Type K)</b>  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>F = 316 SS</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| C = PFA coated over SS (available on G, H and J diameter)  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>8-9. Sheath Length "L" (whole inches)</b>   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>03, 06, 12, 18, 24</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| Available lengths: 01 to 99, over 99 consult factory<br>Maximum length for PFA coating is 48 inches. |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>10. Sheath Length "L" (fractional inch)</b>   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>0 = 0</b>   | 1 = 1/8  | 2 = 1/4        | 3 = 3/8       | 4 = 1/2 | 5 = 5/8  | 6 = 3/4 | 7 = 7/8 |   |   |    |    |    |    |    |    |
| <b>11. Junction</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
|  | Grounded   | Ungrounded     | Exposed       |         |          |         |         |   |   |    |    |    |    |    |    |
| Single   | <b>G</b>   | <b>U</b>       | E             |         |          |         |         |   |   |    |    |    |    |    |    |
| Dual   | H  | W (isolated)   | D (isolated)  |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>12. Calibration</b>   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
|  | E  | J              | K             | N       | T        |         |         |   |   |    |    |    |    |    |    |
| Standard limits  | E  | <b>J</b>       | <b>K</b>      | N       | <b>T</b> |         |         |   |   |    |    |    |    |    |    |
| Special limits   | 2  | 3              | 4             | —       | 8        |         |         |   |   |    |    |    |    |    |    |
| <b>13-14. Lead Wire Length "E" (whole feet)</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>03, 04, 06, 08, 10</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| Available lengths: 01 to 30, over 30 consult factory   |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>15. Special Requirements</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| <b>0 = None</b>  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| H = High temperature 538°C (1000°F) potting  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| M = 260°C (500°F) potting  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |
| X = Special requirements, consult factory  |  |                |               |         |          |         |         |   |   |    |    |    |    |    |    |

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