

# Mineral Insulated Thermocouple

Thermocouples,  
Fast-Responding,  
Durable and Capable;  
Ideal for Handling Higher  
Temperatures



Mineral insulated thermocouples from Watlow® are fast-responding, durable and capable of handling higher temperatures.

These thermocouples are manufactured with 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 thermocouple in most applications.

## Performance Capabilities

- Easily handles temperatures up to 2200°F (1200°C)
- 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 temperatures, high pressure environments

### Diameters as small as 0.020 in. (0.50 mm)

- Ideal when physical space or extremely fast response are critical

### Flexibility of the XACTPAK material

- Allows forming and bending of the thermocouple without the risk of cracking to meet design requirements

### Outer sheath

- Protects wires from oxidation and hostile environments

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

- Meets 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

## Typical 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

## Styles

### Cut and Stripped - Style AB

The main feature of Watlow's Style AB thermocouple is that it allows you to terminate the thermocouple yourself. Style AB is simply a section of XACTPAK material, junctioned and stripped. It is the most basic of all the mineral insulated thermocouple styles.

Because it is constructed with XACTPAK mineral insulation, the thermocouple is protected from moisture, thermal shock, high temperatures and high pressure.

#### Features

- **Cold end, stripped and sealed** with epoxy inhibits moisture penetration
- **Dual element style** allows two instruments to run off the same element, reducing costs

### Plug or Jack Termination - Style AC

Featuring plug or jack terminations, Style AC thermocouples can be quickly connected or disconnected. Besides saving time, this thermocouple style offers the advantage of ease of use even by inexperienced personnel. In addition, the thermocouples are color coded per ASTM E 230 specifications so you can easily determine the calibration.

On all Style AC thermocouples except ASTM E 230 Type R and S, the pins and contacts are of the same alloy as the thermocouple, resulting in higher accuracy. This technique eliminates errors due to temperature gradients across the connector. Type R and S connectors have compensating alloys.

#### Features

- **Plugs and jacks** are easy to connect and disconnect, saving you time
- **ASTM color coded connectors** allow quick identification of the thermocouple calibration
- **Miniature connectors**, available with thermocouple diameters up to 0.125 in. (3.0 mm), can be used in locations where space is minimal. The miniature plug permits quick connection to portable instrumentation
- **Matching thermocouple alloys** provide higher accuracy
- **An adapter** assures the connector is mounted rigidly to the sheath, preventing the connector from turning or twisting

### Metal Transitions - Style AF and AQ

Metal transitions are the distinguishing feature of Styles AF and AQ thermocouples. The transition provides a durable, potted connection between the XACTPAK sheathed thermocouple material and the flexible SERV-RITE® insulated wire.

On Style AF the transition is crimped to the sheath 0.040 in. (1 mm) and larger. Crimping is a quick, reliable method of attachment.

The Style AQ miniature transition thermocouple is designed for limited space applications where size and/or response time are critical. It is designed to give instant readings in various mediums. More accurate readings are possible because of its small size and fast response.

#### Features

- **The transition body** is filled with a potting compound, which insulates and strengthens the splice
- **Coiled spring strain relief** on Style AF protects the wire against sharp bends in the transition area
- **Custom lead wire terminations** include plug-in jacks, spade lugs, plugs with mating connectors and more
- **Many made-to-order options** are available in lead wire construction, length and sheath material
- **Stranded lead wire construction** is an ideal choice for applications where the lead wire is subjected to continuous flexing

### Connection Head - Style AR

Featuring connection heads, Style AR mineral insulated thermocouples are resistant to dust and moisture, ensuring continuous long term reliability. This is possible because the covers keep the connection to the extension wire clean.

The connection heads are designed for mating to a conduit, allowing permanent installation. A variety of head styles are available, including plastic, cast iron, aluminum and explosion proof.

#### Features

- **Connection head** provides superior dust and moisture resistance
- **Eight different head styles** are available to meet various application requirements
- **Lugs on covers** allow tightening with either a screwdriver or wrench
- **Plastic heads** are weather resistant and can be exposed to weak acids, organic solvents, alkalis, sunlight and dust. Bottom mounting is standard; side mounting is available on request
- **Cast iron heads** are available in standard and miniature sizes and are suitable for demanding high temperature environments, such as heavy industrial and process applications
- **Optional head-mounted transmitter**, 4-20mA, reduces electrical noise. The transmitter is available on connection head Styles A, B, C, D, E and H

## Styles (con't)

### Wafer Head - Style AS

The Style AS thermocouple features a “wafer” head, which allows quick access to terminal screws for wiring. This thermocouple is an economical choice because the termination is brazed directly to the XACTPAK sheath.

#### Features

- **Termination** directly to sheath allows quick hookup and disassembly
- **The terminal head** is available in a wide range of materials in both single and dual configurations
- **Ceramic termination rating** to 540°C (1000°F)

### For Use with Thermowells - Style AT

Style AT thermocouple is an energy and process temperature sensor that features XACTPAK metal-sheathed mineral insulation, enhancing the sensor’s ability to “read” temperature by transferring heat quickly to the measuring junction.

This thermocouple style is ideal for process petrochemical and power applications where a sensor-thermowell assembly is typically used. Thermowells protect the thermocouple and allow replacement of the sensor without shutting down the process, saving valuable downtime.

#### Features

- **Designed for use with thermowells**, Style AT is ideal for process industry applications
- **Compliance with specifications such as ASTM** assures high quality sensor products
- **Manufacturing capabilities** include special tube cleaning processes, insulation baking to 1095°C (2000°F) and much more
- **Connection heads** come in four different styles
- **Spring-loading option** allows the thermocouple to maintain contact against the bottom of the thermowell, assuring rapid heat transfer to the sensor

#### Applications

- Petrochemical
- Refineries
- Power stations
- Blast furnaces
- Incinerators

## Ordering Information

Ordering information varies. Please contact your Watlow representative for details.