

## TC23- Melt Bolt Style Thermocouple with Lead Wire and Connector

## TEMPERATURE SENSOR

**TC23-** A bolt-style thermocouple is a specialized temperature sensor that incorporates a thermocouple junction within a bolt or screw, enabling precise surface temperature measurement. This design allows for secure installation onto equipment, ensuring direct contact with the monitored surface. This construction is most widely used in industrial and automotive applications to provides reliable temperature monitoring for critical components.

### Key Feature:

- Thermocouple sensor integrated with bolt for easy, direct and secure mounting.
- Ensures accurate temperature measurement of metal surfaces with direct contact.
- Available in Type J, K to match specific temperature requirements.
- Available in different thread sizes and lengths to suit multiple applications.
- Quickly detects temperature changes for effective monitoring and ensure fast response time.
- Available with different wire lengths and insulation types for various environments.
- Suitable for temperature measurement of high vibration applications
- Available in IEC 60584 & ANSI MC 96.1 standard tolerances

### Thermocouple Junction options for TC23



**Ungrounded Junction:** Junction is similar to grounded junction except wire are fuse welded, which is then insulated with Mgo powder and formed cap by welding without incorporating thermocouple wires. Thus, the junction is called the ungrounded junction.

#### Key Benefits :

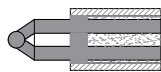
- Wires are protected from any mechanical damage
- Offers rugged construction, the same as the grounded junction.
- Strain due to differential expansion between wire and sheath is minimized with insulated wires.



**Grounded Junction:** In grounded junction thermocouple wires and sheath of the mineral insulated cable is welded together to form a junction. Thermocouple wires and sheath becomes an integral part of the junction. Thus, the wire is grounded to the sheath.

#### Key Benefits:

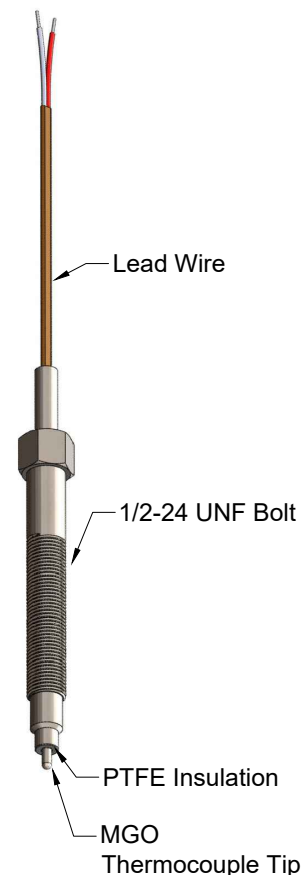
- Slower response than Exposed junction, but offers rugged construction.
- Can hold higher pressure than exposed junction and Ungrounded junction.



**Exposed Junction:** In expose junction, the sheath is removed, and thermocouple wires fuse-welded to form a junction. Tip of the MI cable is sealed with high temperature cement to protect MGO from contamination.

#### Key Benefits:

- Fast response time due to the less mass.



### Suggested Maximum Temperature Limit As per ASTM E608/608M

| Thermocouple Type | °C (F)    | °C (F)     | °C (F)      | °C (F)      | °C (F)      | °C (F)      |
|-------------------|-----------|------------|-------------|-------------|-------------|-------------|
| OD                | 1/25"     | 1/16"      | 1/8"        | 3/16"       | 1/4"        | 3/8"        |
| T                 | 260(500)  | 260(500)   | 315(600)    | 370 (700)   | 370 (700)   | 370 (700)   |
| J                 | 260 (500) | 440(825)   | 520 (970)   | 620(1150)   | 720 (1330)  | 720 (1330)  |
| K                 | 700(1290) | 920 (1690) | 1070 (1960) | 1150 (2100) | 1150 (2100) | 1150 (2100) |
| E                 | 300(570)  | 510(950)   | 650 (1200)  | 730 (1350)  | 820(1510)   | 820(1510)   |

The suggested maximum temperature limit is based on information available in the ASTM standard and test performed in our facility. The maximum temperature limit may change based on the type of process and material/ liquid it is going to be used in. These limits apply to protected thermocouples.

### Response Time

| Thermocouple OD | Junction |          |            |
|-----------------|----------|----------|------------|
|                 | Exposed  | Grounded | Ungrounded |
| 1/25"           | 0.005    | 0.1      | 0.3        |
| 1/16"           | 0.02     | 0.2      | 0.5        |
| 1/8"            | 0.03     | 0.7      | 1.3        |
| 3/16"           | 0.07     | 1.1      | 2.2        |
| 1/4"            | 0.1      | 2.2      | 4.5        |
| 3/8"            | 0.9      | 2.7      | 7.5        |

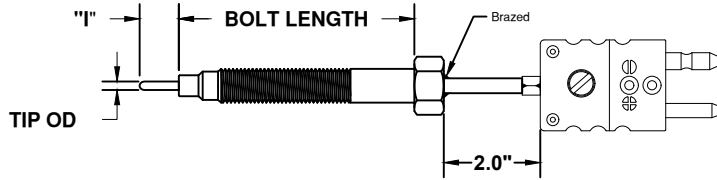
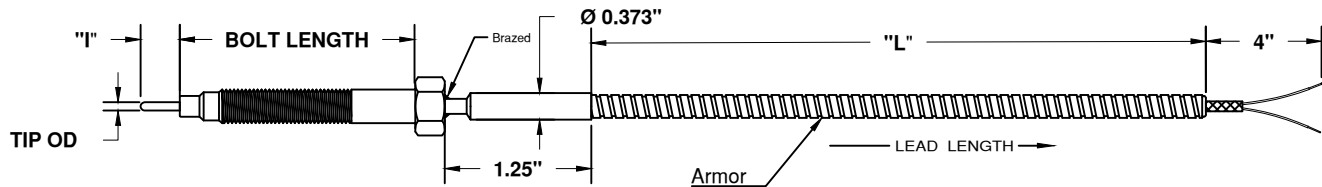
Response time is measured in liquid by inserting thermocouple into the temperature-controlled circulating bath. Time taken to reach 63.2% of a step temperature change is noted as the response time of thermocouple. For a fast response, the exposed tip is recommended, but the exposed junction is not as rugged as ungrounded and grounded junctions for industrial use.

### Temperature Accuracy As per ASTM E608/608M/ IEC 60584 & ANSI MC 96.1 standard tolerances

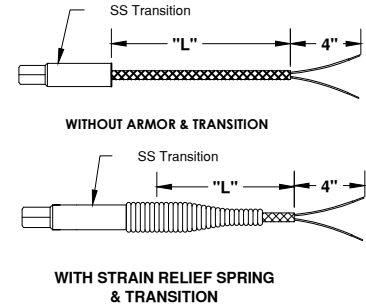
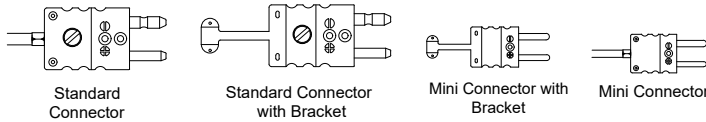
| Type | Temperature     | Standard Limit                         | Special Limit                         |
|------|-----------------|----------------------------------------|---------------------------------------|
| T    | -200 °C to 0 °C | ± 1 °C or 1.5% Whichever is greater    | N/A                                   |
|      | 0 °C to 350 °C  | ± 1 °C or .75% Whichever is greater    | ± 0.5 °C or 0.4% Whichever is greater |
| J    | 0 °C to 750 °C  | ± 2.2 °C or .75% Whichever is greater  | ± 1.1 °C or 0.4% Whichever is greater |
|      | -200 °C to 0 °C | ± 1.7 °C or 1.0% Whichever is greater  | N/A                                   |
| E    | 0 °C to 900 °C  | ± 1.7 °C or .5% Whichever is greater   | ± 1 °C or 0.4% Whichever is greater   |
|      | -200 °C to 0 °C | ± 2.2 °C or 2.0 % Whichever is greater | N/A                                   |
| KORN | 0 °C to 1250 °C | ± 2.2 °C or .75% Whichever is greater  | ± 1.0 °C or 0.4% Whichever is greater |
|      | -200 °C to 0 °C | ± 2.2 °C or 2.0 % Whichever is greater | N/A                                   |

#### Notes:

- All the thermocouples are manufactured as ASTM E608/608M
- Calibration is available as per ASTM E220 on request



## Termination Options-



|      | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|------|---|---|---|---|---|---|---|---|---|----|----|----|
| TC23 |   |   |   |   |   |   |   |   |   |    |    |    |

For Example- TC23-J-G-2-8-2i-6-24i-3Z-STP-0-0-WC

| 1. THERMOCOUPLE TYPE               |                          |
|------------------------------------|--------------------------|
| CODE                               |                          |
| J                                  | Iron(+) vs Constantan(-) |
| K                                  | Chromel(+) vs Alumel(-)  |
| Use "S" for Special limit of Error |                          |

| 2. MEASURING JUNCTION |                                 |
|-----------------------|---------------------------------|
| CODE                  |                                 |
| G                     | Simplex / Grounded Junction     |
| UG                    | Simplex / Un- Grounded Junction |
| E                     | Simplex / Exposed               |

| 3. TIP OD |               |             |
|-----------|---------------|-------------|
| CODE      | IMPERIAL SIZE | METRIC SIZE |
| 2         | 1/8"          | 3.2 mm      |
| 3         | 3/16"         | 4.76 mm     |
| 2M        | 0.079"        | 3.0 mm      |
| 3M        | 0.197"        | 5.0 mm      |

| 4. SHEATH MAT. |        |
|----------------|--------|
| CODE           |        |
| 8              | SS 316 |

| 5. IMMERSION LENGTH (I)                                      |  |
|--------------------------------------------------------------|--|
| Immersion length - use "I" for inches and "M" for millimetre |  |

| 6. BOLT LENGTH              |     |
|-----------------------------|-----|
| CODE                        |     |
| 3                           | 3"  |
| 6                           | 6"  |
| 9                           | 9"  |
| 12                          | 12" |
| Specify if any other length |     |

| 7. LEAD LENGTH (L)                                      |                       |
|---------------------------------------------------------|-----------------------|
| CODE                                                    |                       |
| 0                                                       | No lead wire required |
| Lead length - use "I" for inches and "M" for millimetre |                       |

| 8. WIRE TYPE                                                             |                              |
|--------------------------------------------------------------------------|------------------------------|
| CODE                                                                     |                              |
| 0                                                                        | When ordering with Connector |
| 2                                                                        | TEFLON (205° C)              |
| 6                                                                        | TEFLON (260° C)              |
| 3                                                                        | FIBRE GLASS (510° C)         |
| NOTE:- Add "O" for no jacketing. Add "X" for SS braiding & "Z" for Armor |                              |

| 9. CODES FOR TERMINATION |                        |
|--------------------------|------------------------|
| CODE                     |                        |
| Z                        | Bare ends              |
| STP                      | Standard Plug          |
| MP                       | Miniature Plug         |
| HTP                      | High Temperature Plug  |
| UTP                      | Ultra Temperature Plug |

| 10. CODES FOR TERMINATION (JACK) |                        |
|----------------------------------|------------------------|
| CODE                             |                        |
| 0                                | Not required           |
| STJ                              | Standard Jack          |
| MJ                               | Miniature Jack         |
| HTJ                              | High Temperature Jack  |
| UTJ                              | Ultra Temperature Jack |

| 11. OPTIONAL ACCESSORY |                                                          |
|------------------------|----------------------------------------------------------|
| CODE                   |                                                          |
| 0                      | Not required                                             |
| 02                     | Strain relief spring (Only for lead wire without Armour) |

| 12. OPTIONAL ACCESSORY                   |              |
|------------------------------------------|--------------|
| CODE                                     |              |
| 0                                        | Not required |
| WC                                       | Wire clamp   |
| Only choose when ordering with connector |              |