# TC-70 MGO-PAC Industrial Thermocouple with Head

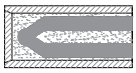
**TEMPERATURE SENSOR**

**TC70-**An Industrial thermocouple consists of a thermocouple probe housed in a protective sheath, along with a connection head for wiring and terminal connections. This type of thermocouple is commonly used in industrial applications where ruggedness, durability, and secure electrical connections are required.

**Key Feature:**

- Uses connection head to protect the electrical connections from environmental factors such as moisture, dust, and mechanical damage.
- Connection head usually made of aluminum, stainless steel or plastic and available in weatherproof, explosion-proof, or corrosion-resistant designs.
- Connection head contains terminals or 4-20mA output temperature transmitter for signal conditioning.
- Available in different thermocouple types K, J, T, E, N.
- A wide selection of sheath material to suit application requirement 304ss, 316ss, 321ss, Inconel® 600, Incolloy 800, Monel, Pyrosil D etc
- Available in IEC 60584 & ANSI MC 96.1 standard tolerances

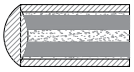
## Thermocouple Junction options for TC 70



**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 :**

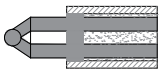
· Wires are protected from any mechanical damage
· Offers rugged construction, the same as the grounded junction.
· Strain due to differential expansion between wire and sheath is minimized with insulated wires.



**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:**

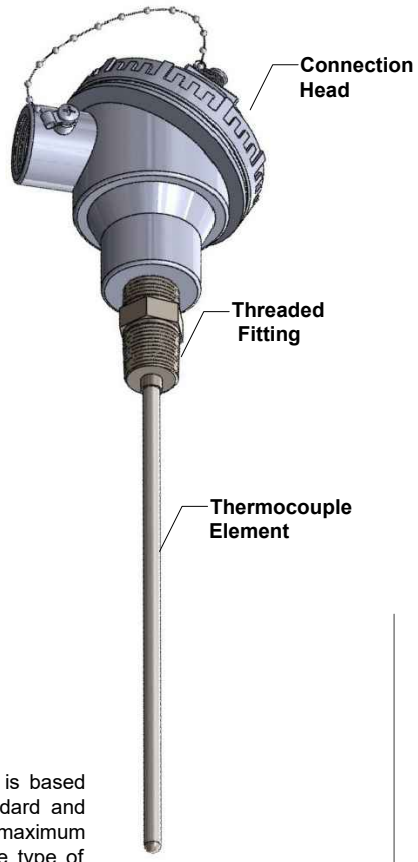
**-** Slower response than Exposed junction, but offers rugged construction.
**-** Can hold higher pressure than exposed junction and Ungrounded junction.



**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 |
| E | -200 °C to 0 °C | ± 1.7 °C or 1.0% Whichever is greater | N/A |
| | 0 °C to 900 °C | ± 1.7 °C or .5% Whichever is greater | ± 1 °C or 0.4% Whichever is greater |
| KORN | -200 °C to 0 °C | ± 2.2 °C or 2.0 % Whichever is greater | N/A |
| | 0 °C to 1250 °C | ± 2.2 °C or .75% Whichever is greater | ± 1.0 °C or 0.4% Whichever is greater |

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

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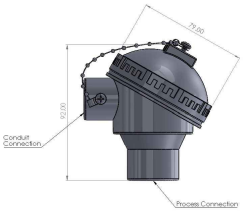
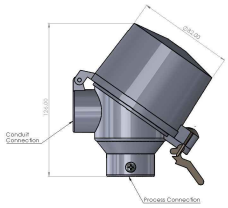
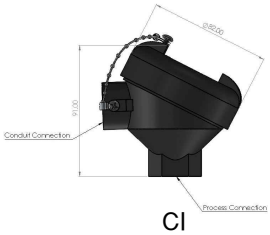
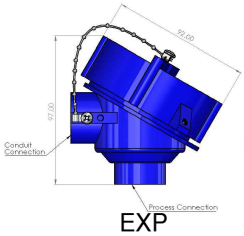
**TEMPERATURE SENSOR**

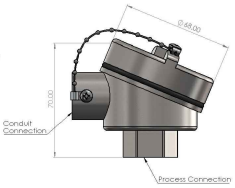
### Connection Heads


KNE

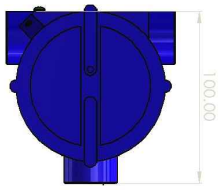

DANAW


CI


EXP


SS


FL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### Transmitters and Displays

| Model | TT-167 | TT-267 | TT-367 | TT-467 | TT-567 |
|---|---|---|---|---|---|
| **Transmitter** |  |  |  |  |  |
| **Output** | | | | | |
| 4-20 mA | X | X | X | X | X |
| HART®Protocol | | X | X | X | X |
| **Input** | | | | | |
| Thermocouple | K,J,R,S,T N,E,B, Pt100, Pt1000 | K,J,R,S,T N,E,B, Pt100, Pt1000 | K,J,R,S,T N,E,B, Pt100, Pt1000 | K,J,R,S,T N,E,B, Pt100, Pt1000 | K,J,R,S,T N,E,B, Pt100, Pt1000 |
| **Approval** | | | | | |
| Electrical | | CE, CSA | CE, CSA | CE, CSA | CE, CSA |
| HazLoc | | OPTIONAL | OPTIONAL | OPTIONAL | OPTIONAL |
| | | | | | |
| Integaral Display | | | X | X | X |
| Field Programable | | X | X | X | X |

### Thermowell Options (refer to thermowell order code when order thermowell with thermocouple assembly

| **Thermowell** |  |  |  |  |  |
|---|---|---|---|---|---|
| | Flanged Helical Thermowell | Flanged Thermowell | Socket Weld Thermowell | Threaded Thermowell | Metal Protection Tubes |
| **MODELS** | TF, TF-H | TF | SWT01, SWT02, SWT03 | TWS01, TWS02, TWS03 | PT |
| | | | | | |
| |  |  |  | | |
| | Vanstone Thermowell | Weld in Themowell | Tri-Clamp Thermowell | | |
| **MODELS** | TWV-02,TWV-03 | TWT-W | TCT-01, TCT-02, TCT-03, TCT-04 | | |

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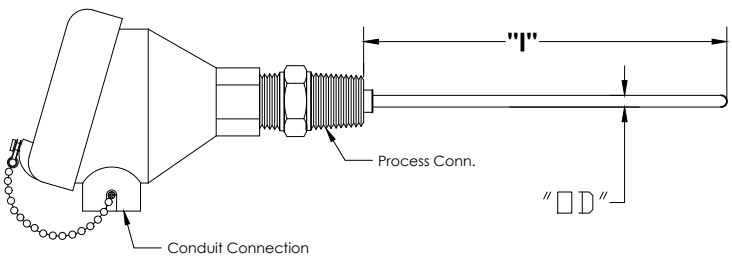


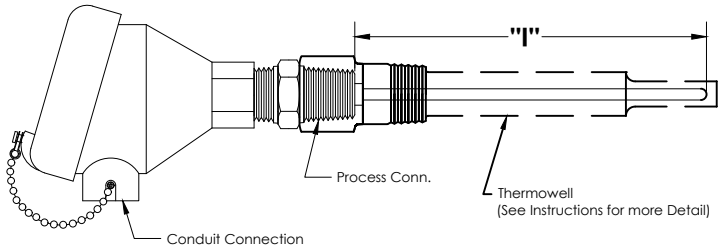


| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| TC70 | | | | | | | | | | |

For Example- TC70-J-UG-4-8-12i-A-57-01-SS-TB

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

| 2. MEASURING JUNCTION | |
|---|---|
| CODE | |
| G | Simplex/Grounded |
| UG | Simplex/Ungrounded |
| E | Simplex/Exposed |
| DG | Duplex/Grounded |
| DUG | Duplex/Ungrounded |
| DE | Duplex/Exposed |

| 3. SHEATH OD | | |
|---|---|---|
| CODE | IMPERIAL SIZE | METRIC SIZE |
| 2 | 1/8" | 3.2 mm |
| 3 | 3/16" | 4.76 mm |
| 4 | 1/4" | 6.35 mm |
| 5 | 5/16" | 7.9mm |
| 6 | 3/8" | 9.5 mm |
| 7 | 0.215" | 5.46 mm |
| 2M | 0.079 | 3.0mm |
| 3M | 0.197" | 5.0mm |
| 4M | 0.236" | 6.0 mm |
| 5M | 0.315" | 8.0mm |
| 6M | 0.354" | 9.0 mm |
| 7M | 0.394" | 10.0 mm |

| 4. SHEATH MAT. | |
|---|---|
| CODE | |
| 8 | SS 316 |
| 4 | SS 310 |
| 9 | SS 304 |
| 6 | SS 321 |
| 3 | INCONEL 600 |
| 5 | SS 446 |
| 10 | INCONEL 800 |

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

| 6. CONNECTION HEAD | |
|---|---|
| CODE | |
| A | Gen purpose Aluminum head IP68 |
| EA | Economical Aluminum gen purpose head(non-rated) |
| S | SS general purpose |
| CG | Cast iron |
| PG | Polypropylene |
| SX | SS Explosion proof |
| AX | Aluminum explosion proof (CSA,FM,ATEX,IECE'x approved) |
| 06 | "Fieldmount Temp Transmitter w/ Display Aluminum" |
| 07 | "Fieldmount Temp Transmitter w/ Display SS" |
| 06X | "Exd Fieldmount Temp Transmitter w/ Display Aluminum" |
| 07X | "Exd Fieldmount Temp Transmitter w/ Display SS" |
| 09 | General Purpose Transmitter w/ Indicator |
| 10 | Aluminum connection head (CCOE approved) |
| DA | Dual entry gen purpose Aluminum head |
| D-XD | Dual entry Aluminum explosion proof (CSA,FM,ATEX,IECE'x approved) |

| 7. INSTRUMENT X CONDUIT CONN. | |
|---|---|
| CODE | |
| 55 | 1/2" NPT X 1/2" NPT |
| 57 | 1/2" NPT X 3/4" NPT |
| 77 | 3/4" NPT X 3/4" NPT |
| 5M | 1/2" NPT x M20 X1.5 |
| 7M | 3/4"NPT x M20 X1.5 |

| 8. ELEMENT BUSHING STYLE | |
|---|---|
| CODE | |
| 01 | Fixed bushing |
| 02 | Spring loading bushing |
| 03 | Oil seal spring load bushing |

| 9. BUSHING MATERIAL | |
|---|---|
| CODE | |
| PS | Plated Steel |
| MS | Mild Steel |
| SS | Stainless Steel |

| 10. HEAD TERMINATION | |
|---|---|
| CODE | |
| 0 | When Ordering Wthout Terminnal block or transmitter and with integral transmitter head code 06,07,06x,07x,09 |
| TB | Ceramic Terminal Block |
| TRM | Standard 4-20 mA Transmitter |
| TRM-H | Standard 4-20 mA Transmitter w/ Hart |