Our Mineral Insulated Thermocouple Assemblies consist of two, four or six thermocouple wires embedded in compact MgO - mineral insulation, enclosed in a metallic tube. The assembly is compact, flexible enough to route, has a high insulation resistance and high thermal conductivity. Mineral insulated thermocouple assemblies are robust in construction and offer good mechanical strength.

<table>
<thead>
<tr>
<th>Thermocouple Grade</th>
<th>T/C Type</th>
<th>Temp range</th>
<th>Sheath OD</th>
<th>Sheath Material*</th>
<th>Std limits of error</th>
<th>Spl limits of error</th>
<th>Extension Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>J</td>
<td>0-700°C</td>
<td>2 mm, 3 mm</td>
<td>SS316, SS321, SS316</td>
<td>±2.2°C or ±1.1°C</td>
<td>±0.75% or ±0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>(-) 200°C to</td>
<td>1 mm, 1.5 mm</td>
<td>SS316, SS321, SS316</td>
<td>±2.2°C or ±1.1°C</td>
<td>±0.75% or ±0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>(-) 200°C to</td>
<td>2 mm, 3 mm</td>
<td>SS316, SS321</td>
<td>±1.7°C or ±0.75%</td>
<td>±1.0°C or ±0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>(-) 200°C to</td>
<td>2 mm, 3 mm</td>
<td>SS316, SS321</td>
<td>±1.0°C or ±0.5°C</td>
<td>±0.5°C or ±0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>0 to 1280°C</td>
<td>2 mm, 3 mm</td>
<td>Inconel 600®, nicrobel/pyrosil</td>
<td>±2.2°C or ±0.75%</td>
<td>±1.1°C or ±0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>0 to 1400°C</td>
<td>3 mm, 4.5 mm</td>
<td>Inconel® or ceramic</td>
<td>±1.5°C or ±0.5°C</td>
<td>±0.6°C or ±0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>0 to 1400°C</td>
<td>3 mm, 4.5 mm</td>
<td>Inconel® or ceramic</td>
<td>±1.5°C or ±0.5°C</td>
<td>±0.6°C or ±0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>800°C to 1700°C</td>
<td>3 mm, 4.5 mm</td>
<td>Inconel® or ceramic</td>
<td>±0.5%</td>
<td>None Established</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0-2320°C</td>
<td>3 mm, 4.5 mm</td>
<td>None Established</td>
<td>±4.5% or ±1.0%</td>
<td>None Established</td>
<td>No Std. Use ANSI Colour Code</td>
</tr>
</tbody>
</table>

Other sheath OD and sheath material available on request.

The recommendations made in this catalogue are to be used as intended guide. No guarantee of material can be undertaken since other factors may affect the performance. We reserve the right to change the specifications mentioned in this catalogue without any notice as improvements & development is a continuous process at General. Responsibility of typographical errors is specifically disclaimed.
Mineral Insulated Thermocouples

Specifications

Element: J, K, E, T, N, R, S, B type thermocouple, single, duplex (triplex on request)
Sheath OD: 1 mm, 2 mm, 3 mm, 4.5 mm, 6 mm, 8 mm, 9.5 mm, 10 mm, 12.7 mm
Sheath material: SS316, SS321, Inconel 600 as standard. Other sheath on request
Insulation: Mineral, Compact MgO (over 99% purity)
Calibration: In accordance with ANSI MC 96.1/IEC 584 (class B) (class A as option)
Junction: Grounded, ungrounded, exposed
Cold end: a) Pot seal with PVC or PTFE insulated flexible tails
           b) Quick connect / disconnect plug and Jack
           c) Ceramic spring loaded terminal block with silver plated brass terminals
           d) Ceramic to metal seal
           e) Other termination on request
Head: Diecast aluminium LM6 grade / SS304 / SS316, single or double entry with ¾" ET (F) or
       ½" NPT (F) cable entry as standard, ½" NPT (F) for well or nipple. Other materials on request
Protection: Weatherproof to IP-68 (IS : 13947 Part I)
           Flameproof to Grl, IIA IIB (Equivalent to NEC. C1, I, Div 2 Gr. C & D) - CCOE Certified
           Flameproof to IIC (Equivalent to NEC. C1, I, Div 2 Gr. B, C & D) - CCOE Certified
           Increased safety
           ATEX certified
           CE certified
Extension: Provided in the form of nipple or nipple - union - nipple in Cd plated CS or SS.
           Other extension on request
Optional: a) Thermowell (refer section on Thermowell)
          b) Head mounted temperature transmitter
          c) Adjustable compression fitting or flange.
Note: Beaded thermocouples also can be offered on request. (Specify conductor diameter in such case)
Tests*:

1) Calibration
2) Nitrogen leak test
3) Dimensional check
4) Insulation resistance (>100 MΩ @ 500 VDC at 25°C)
5) Hot IR test

* Refer separate sheet which mentions complete list of tests carried out.
### How to Order

**Standard Features:**
- a - Reference standard IEC 584 Class B
- b - Ungrounded junction
- c - Mineral (compact MgO) insulation

**Typical Model No:** TC-I-A-2J-3-S6-200-50-1-0-0

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>SHEATH OD</th>
<th>SHEATH MATERIAL</th>
<th>OPTION / SPECIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2, 3, 3.2, 4.5, 6, 8, 9.5, 10, 12.7mm</td>
<td>S6: SS316, S2: SS321, IH: Inconel® 600, IB: Incoloy® 600</td>
<td>1. Adjustable compression fitting in SS316 (specify the size)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Spring loaded bayonet fitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Lugs for tails</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Special limits of error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Grounded junction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Calibration standard (specify other than IEC-584)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7. Triplex element</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8. Bulk head connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9. Thermowell</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10. Any other requirement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0. None</td>
</tr>
</tbody>
</table>

**Extension Cable Type:**
- 1. PTFE insulated tails-55mm long
- 2. PTFE insulated, PTFE overall cable
- 3. PTFE insulated, overall PTFE & SS braided cable
- 4. FG insulated, overall FG cable
- 5. FG insulated, overall FG SS braided cable

**Extension Cable Length:** 

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Mineral Insulated Thermocouples

Standard Features:
- a - Ungrounded junction
- b - Reference standard IEC 584 Cl. B
- c - Mineral (compact MgO) insulation
- d - 1/2” NPT(M) connection

Typical Model No: TC-H-C-2K-6-S6-WAL-15N-250-S6-150-0

<table>
<thead>
<tr>
<th>TC</th>
<th>H-C</th>
<th>2K</th>
<th>6</th>
<th>S6</th>
<th>WAL</th>
<th>15N</th>
<th>250</th>
<th>S6</th>
<th>150</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How to Order:
- TYPE: TC-H-A
- TYPE: TC-H-B
- TYPE: TC-H-C
- TYPE: TC-H-D

Element OD:
- 4.5, 6, 8, 9.5, 10, 12, 12.7mm

Sheath Material:
- S6: SS316
- S2: SS321
- S3: SS310

Head:
- WAL: Aluminium (LM6 Gr.), Weatherproof (IP-66)
- WS4: SS304, Weatherproof (IP-66)
- WS6: SS316, Weatherproof (IP-66)

Connection Material:
- C - Cd plated CS
- S4 - SS304
- S6 - SS316

Cable Entry:
- 15N: 1/2” NPT(F)
- 20E: 3/4” ET(F)
- 15M: M20 x 1.5(F)
- 15B: 1/2” BSP(F)

How to Specify:
- Specify in mm
- Specify in mm

Option / Special Requirement:
- 1. Cable gland (specify material)
- 2. Two cable entries
- 3. Head mounted transmitter
- 4. Plug for cable entry (specify material)
- 5. Connection (other than specified)
- 6. FG/FG SS braided cable (specify length e.g. 6(3) i.e. 3 Mtr cable)
- 7. Grounded junction
- 8. Thermowell
- 9. Special limits of error
- 0. None

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Mineral Insulated Thermocouples

Swaged Type Special Thermocouple Assembly for Quick Response

Fully Spring Loaded Thermocouple / RTD Assembly for Vibration Application

BED Type Thermocouple Assembly

Swaged Type Special Thermocouple Assembly for Quick Response
Thermocouple Assembly with NORDSTRAM SHEAR Valve & Thermowell with BORON DIFFUSION HARD FACING (TMT-601)
MI Thickwall Thermocouple

The conventional thermocouple is used with an outer protecting tube or thermowell to protect it from aggressive and corrosive process condition. This improves longevity of the thermocouple. However, response time is poor. To overcome above problem, We have designed MI Thickwall Thermocouple having thicker wall with relatively larger conductor diameters. This construction enable the user to insert the thermocouple directly in the process without a protecting tube or thermowell, improving response time considerably.

Normal applications:
Furnaces, rotary kilns, recuperators,
skin temperature measurement of heater tubes.

Advantages:
- Faster response
- Longer lengths can be offered
- Pliable and easily routed
- Available in SS316, SS310, Inconel® 600,
  Incoloy® 800, SS446 sheath materials

Type of thermocouple offered under Thickwall:
- J (Iron constantan)
- K (Chromel alumel)
- E (Chromel constantan)

<table>
<thead>
<tr>
<th>SHEATH DIA</th>
<th>WALL THICKNESS*</th>
<th>CONDUCTOR DIA*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Nominal)</td>
<td>(Nominal)</td>
</tr>
<tr>
<td></td>
<td>Single Duplex</td>
<td>Single Duplex</td>
</tr>
<tr>
<td>8 mm</td>
<td>1.65 mm</td>
<td>1.12 mm</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>2.00 mm</td>
<td>1.40 mm</td>
</tr>
<tr>
<td>10 mm</td>
<td>2.10 mm</td>
<td>1.40 mm</td>
</tr>
<tr>
<td>12.7 mm</td>
<td>3.00 mm</td>
<td>1.80 mm</td>
</tr>
<tr>
<td>15 mm</td>
<td>3.60 mm</td>
<td>2.00 mm</td>
</tr>
<tr>
<td>17 mm</td>
<td>4.00 mm</td>
<td>2.20 mm</td>
</tr>
<tr>
<td>19 mm</td>
<td>4.50 mm</td>
<td>2.45 mm</td>
</tr>
</tbody>
</table>

* These are standard dimensions. Special dimensions available on request.
We degased the Skin Thermocouple assemblies first time in India. Tube Skin Thermocouples manufactured by us are reliable for measurement and control of tube surface temperature in fire heaters. Accurate temperature measurement is important for prolonging heater tube life, for ensuring safe and efficient operation. We have been supplying tube skin thermocouple assemblies in quantities to majority of the projects in India as well as exporting to various countries.

The basic thermocouple is normally of 12.7 mm OD with relatively higher sheath wall thickness, mineral insulated (compacted MgO) and in variety of sheath materials such as SS310, SS446, Inconel® 600, Incoloy® 800 etc. The junction is generally grounded. However ungrounded junction also is offered, as customer requires. Mineral Insulated (MI) thermocouple is manufactured by Cold drawing and annealing (heat treatment) process in controlled atmosphere. The heat treatment (which is controlled within +/- 2°C) is carried out in hydrogen atmosphere to avoid surface defects & partial oxidation of conductor.

Major user industries
- Refineries & Petrochemical
- Oil & Gas
- Chemical
- Fertiliser
- Metal (ferrous/non ferrous)

Different types available
- a. Knife edge wedge type
- b. Washer type
- c. Retractable type
- d. Assemblies with single or multiple expansion loop
**Technical Notes on Tube Skin Type Assembly**

1. **General** was the first company to actually indigenise the product. Earlier the product was fully imported. The product was started in Technical Collaboration with M/s BICC - Pyrotex of Hebburn UK. **General** has also supplied this assembly in very big quantities to several countries such as UK, Germany, Italy & Middle East. **General** has approval for this product from most consultants in India & abroad.

2. **Raw Materials:** There are basically three raw materials that go in to manufacturing of Tube Skin, Thermocouple, they are as given below.

   **Basic Mother Tube:** This is mostly SS310, SS446, Inconel® 600, Incoloy® 800 etc. This tube is required in seamless form and as it goes under several reduction, quality of input tube has to be very good. In view of this, tubes are procured only from established mills.

   **Insulators:** MgO is used as mineral insulation. The material is imported from a German company - Who are pioneers in this field worldwide. The purity is very important for long life of thermocouple. We use over 99% pure MgO.

   **Conductor:** Type K in most cases, conductors are of virgin quality. The initial conductor calibration as well as final calibration falls within half tolerance as a standard.

3. **Manufacturing Process of Mineral Insulated Thermocouple Thick-wall Cable (MITTC):** The manufacturing process involves cold drawing and heat treatment. The three raw materials are assembled as per requirement and are cold drawn on draw benches. The heat treatment process, in this case strand annealing, is the key area of concern as it decides the final quality of product. **General** has capability of drawing and annealing in very controlled conditions. The annealing is controlled within +/- 2°C. The heat treatment is requirement to be carried out in hydrogen atmosphere to avoid surface defects as well as partial oxidation of conductor material.

4. **Final product conforms to specification as given.**

5. **Bending Process & Welding:** After the thick-wall cable is bent on automatic bending machines to get even circular diameters. The bends (D & 2D) are the expansion loops of the thermocouple.
MI Tube Skin Thermocouple Assembly

Specifications

Sheath Materials Offered: SS446, Inconel® 600/601, SS310 (Other materials on request)

Sheath Diameter: 9.5, 12.7 mm (½”)
(Higher diameter on request)

Thermocouple Types: ANSI Type K, J, E, N

Conductor Diameter: 1.8 mm (nominal) for 12.7 mm O D

Sheath Thickness: 3.20 mm (nominal) for 12.7 mm O D

Insulation Material: Compact mass of MgO (99% min Purity)

Insulation Resistance: > 100 M Ohm @ 500VDC
(Before grounding)

Calibration: ANSI MC 96.1 / IEC 584
(Special Tolerance)

Response Time: 10 seconds (after grounding)

Heat Shield: Provided on request

Junction Type: Grounded, Knife Edge Wedge Type

Expansion Loop: Provided ex-factory
(In accordance with customer requirement)

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Welding Procedure

1. Grind the surface of heater tube in the area of thermocouple junction location for removing scale and rust. Clean the area.

2. Clamp the thermocouple in the desired location.

3. Centre of the wedge type pad must be ensured to be in contact with the heater tube.

4. Perform root weld pass on both sides of the pad using 1.57 mm dia filler rod. Welds must overlap each other & run full length of the pad.

5. Perform secondary weld pass on both sides of the pad using 2.36 mm dia filler rod. Welds to run full length of the pad.

6. Perform final weld pass on both sides of the pads using 2.36 mm dia filler rod. Welds must extend 9.5mm minimum above tube surface & run full length of the pad.

7. For transverse mounted thermocouple, locate the retaining clip at the tangent point of the thermocouple and tube & weld at both ends using 2.36 mm dia filler rod.

8. For Axial mounted thermocouple, locate the retaining clip as desired & weld as mentioned under point no. 7 above.

Recommended weld filler rod material for SS446 sheathed thermocouple

<table>
<thead>
<tr>
<th>HEATER TUBE MATERIAL</th>
<th>FILLER ROD MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A312 TP 304, TP 309, TP 310</td>
<td>SS309-AWS A5.9, Class ER 309</td>
</tr>
<tr>
<td>ASTM A321 (Ti Stabilised)</td>
<td>SS309-AWS A5.9, Class ER309</td>
</tr>
<tr>
<td>ASTM A3347 (Cb Stabilised)</td>
<td>SS309-AWS A5.9, Class ER309</td>
</tr>
<tr>
<td>ASTM A335 P11, P22, P5, P9, ASTM A106</td>
<td>Inconel® 82-AWS A5.14, Class ER Ni Cr 3</td>
</tr>
<tr>
<td>Incoloy® 800</td>
<td>Inconel® 82-AWS A5.14, Class ER Ni Cr 3</td>
</tr>
</tbody>
</table>

Note: Filler rods & welding procedures for other sheath materials, types of thermocouples will be furnished on request.
MI Tube Skin Thermocouple Assembly

Typical Installations of Tube Skin Thermocouple

Right angle / Straight Mounting

Wrap up angular mounting

Mounting with expansion loop

Special Skin Type Thermocouple Assembly
Conventional Tube Skin Thermocouple are to be welded to the heater tube. As this is hot working on heater tube, it poses several problems in terms of maintenance and longer shut down time. Each and every time a conventional tube skin thermocouple is installed, the heater tubes are required to be pressure tested as it has undergone welding.

Our retractable type thermocouples make replacement of thermocouple possible without any welding or any hot work on the tube. This results in significant amount of saving in terms of time as well as shut down costs.

Major differences between conventional knife edge type thermocouple and retractable type thermocouple:

<table>
<thead>
<tr>
<th>KNIFE EDGE TYPE</th>
<th>RETRACTABLE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Weld pad welded to thermocouple</td>
<td>■ Weld pad fabricated has guide assembly.</td>
</tr>
<tr>
<td>■ Weld Clips hold thermocouple in place can be used only once</td>
<td>■ Weld Clips can be reused.</td>
</tr>
<tr>
<td>■ Thermocouple cannot be removed without hot work on tube.</td>
<td>■ Thermocouples are replaceable without performing hot work on heater tube.</td>
</tr>
</tbody>
</table>

Typical installation

Retractable Type Tube Skin Thermocouples
Multipoint Thermocouple Assemblies

Features

- Ideal for measuring temperature at various elevations
- Fully tailor made
- Proven track record in cross section of industries
- Can be offered with practically any length

Where space limitations and cost consideration are of prime importance, multi-point thermocouple assemblies come into picture which are used for measuring and controlling temperature in a reactor having different temperature zones. Any thermocouple assembly with measuring junctions located at more than a one-immersion depth is commonly referred to as a multi-point. As the number of variations possible in multi-point assemblies is virtually limitless they are generally designed and manufactured to meet the requirements of individual applications. As different multi-point designs vary tremendously, careful consideration should be given to such variables as the positive location of measuring junctions and the ease/cost of replacement.

Cost effective & overcomes space limitation
Different thermocouples with varied MOC possible.
Construction enables user to remove thermocouple for maintenance

General with its vast experience has designed and developed several types of multipoint assemblies, which are performing satisfactorily at hundreds of installations in several parts of the world. Some designs allow for replacement of individual elements while others require replacement of the entire assembly. In either case, complete shut down of the process line may not be required depending upon important design considerations. Testing of multipoint is another specialised area. Our manufacturing set-up is equipped with all latest testing equipments to perform all stringent tests.

Major user industries: Refineries & Petrochemical, Oil & Gas, Chemical & Fertiliser.
Typical Constructions

Thermocouples at various levels inserted in individual guiding tubes which in turn are welded to outer protecting tube as shown.

Spring loaded (with the help of ‘S’ spring or leaf spring) thermocouples located at various points mounted on a plate enclosed in a protecting tube as shown above. The springs ensure proper contact with the protecting tube. As many as 33 points assembly was supplied as import substitution for a reputed fertiliser plant.
Multipoint Thermocouple Assemblies

In-House tests carried out for thermocouple assemblies

1. **Calibration**
   Thermocouple calibration in accordance with IEC 584 / ANSI MC 96.1 Class 1 & 2. Typical test is conducted at two points viz. 100°C & 600°C for J, K, E & at 100°C & 900°C or 1100°C for R, S & B type. Optionally for 3 points or more on request.

2. **Insulation Resistance Test at ambient at 500 VDC (MI type)**
   Should be more than 100 M ohms for sheath OD greater than 3 mm
   Should be more than 100 M ohms at 75 V DC in case of sheath OD 1 to 3 mm

3. **Insulation Resistance Test at 540°C at 500 VDC**
   IR should be more than 2 M ohms as standard.
   IR > 20 M ohms can also be offered on request.

4. **N₂ Leakage Test**
   For thermocouple tip sensor after cap welding the same test is conducted & no leakage should be observed at 40 kg/cm² as per IEC 1515.

5. **Response Time Test/Thermal Cycling/Thermal Inertia**
   As per IS7358 - ASTM E-839 (63.2% step change from ambient to 80°C)

6. **Flame Test**
   This test is applicable for multipoint thermocouple assembly to find out exact location of thermocouple in protecting tube and to ensure touching of thermocouple tip to tube.

7. **Continuity Test: By using continuity tester/multimeter**
   To confirm the element is proper and no open junction is observed.

8. **Grounding & Ungrounding Junction**
   By using continuity tester/multimeter.

9. **Ductility - (Bending Test) - (For MI thermocouple & MI RTD cable)**
   Minimum bending radius should be 5 times sheath O.D.

10. **Sheath Integrity Test - Water Immersion test**
    To check sheath integrity of mineral insulated (MI) thermocouple/RTD cable.

11. **Dye Penetration Test**
    For skin type Dye Penetration test for weld joints of weld pad and tip of sensor.

12. **Helium Leak Test** on request.
### Accessories

#### Standard Thermocouple Connectors

**Type:** Suitable for Thermocouple & RTD

**Construction:** Suitable for Thermocouple & RTD, Polarized Pins, Molded Barrier to Prevent Short Circuit. Spring Loaded to ensure full contact.

**Body Material:** Thermoplastic Compound

**Operating Temperature:** Permanent 200°C, Short Term upto 250°C

**Connection:** Stainless Steel Screws & Plates

#### Miniature Thermocouple Connectors

**Type:** Suitable for Thermocouple & RTD

**Construction:** Flat Pin, Polarized Pins, Molded Barrier to prevent short circuit. Spring Loaded to ensure full contact.

**Body Material:** Thermoplastic Compound

**Operating Temperature:** Permanent 200°C, Short Term upto 250°C

**Connection:** Stainless Steel Screws & Plates

#### Connector Colour Code

<table>
<thead>
<tr>
<th>Thermocouple Type</th>
<th>Iron - Constantan</th>
<th>Chromel - Alumel</th>
<th>Copper - Constantan</th>
<th>Pt PtRh 10%</th>
<th>Pt PtRh 13%</th>
<th>Uncompensated (Cu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T/C Code</td>
<td>ANSI</td>
<td>IEC</td>
<td></td>
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<tr>
<td>J type</td>
<td>Black</td>
<td>Black</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K type</td>
<td>Yellow</td>
<td>Green</td>
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<tr>
<td>T type</td>
<td>Blue</td>
<td>Brown</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>S type</td>
<td>Green</td>
<td>Orange</td>
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#### Wire Clamp Bracket

Wire clamp bracket will provide optimum strain relief. Construction allows a large difference in maximum and minimum wire diameter.

**Material:** Stainless Steel

**Type:** Available for Standard & Miniature Plug & Jacks

#### Crimp Bushing

Used for Clamping of extension and mineral insulated Thermocouple wires.

**Material:** Brass

**Typical Diameters:** 1.1 mm, 1.7 mm, 2.1 mm, 3.1 mm, 3.3 mm, 3.5 mm, 4.0 mm, 5.2 mm.

**Shapes:** Hex for Miniature & Square for Standard

#### Grommet

Fitted in entrance hole of the connector. Prevents moisture & dust or dirt particles from entering the connector, hence increasing reliability of functionality.

**Material:** Neoprene

**Types:** Available for Standard & Miniature Plug & Jacks

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