

**MI THERMOCOUPLE  
CABLES & PROBES**

**RESISTANCE TEMPERATURE  
DETECTORS (RTDs)**

**THERMOCOUPLES**

**THERMOWELLS**

**TEMPERATURE TRANSMITTERS**

**FIELD MOUNTED  
DIGITAL INDICATORS**

**SKIN TYPE THERMOCOUPLE /  
RTD ASSEMBLY**

**MULTIPOINT THERMOCOUPLE /  
RTD ASSEMBLY**

**ELECTRICAL HEATERS  
(UP TO 1000 KW)**

**Intertek**



Accurate temperature monitoring and control begins with a properly designed sensor. RTD - Resistance Temperature Detector used for temperature measurement (-) 200°C to 500°C (upto 800°C on request), must have the physical configuration necessary for optimum thermal response to the process fluid it is sensing and the resistive element compatible with instrumentation.

The system accuracy begins with proper primary sensor selection. The integrity of any temperature measuring device depends upon proper traceability.

Our fully equipped measurement and testing laboratory maintains primary reference standard calibrated and duly certified to national standards. These are used for the calibration of all RTDs we manufacture.

Various considerations apply to the design of RTD assemblies. The element should be protected from shock and vibration, yet free of expansion stresses that may shift the reading. The element assembly needs to be isolated without obstructing heat flow. The outer sheath has to withstand pressure, erosion and vibration, yet it should be small enough for easy installation and rapid response to temperature changes.

### Features

- State-of-the-art Laser Welding adopted to weld element to transducer case and bulb to sheath.
- High integrity construction.
- High accuracy, repeatability.
- High insulation resistance (> 100 M ohm @ 500 VDC at 25°C)
- Wide operating range i.e. (-) 200°C to 800°C
- Fast response
- Mineral insulated construction enables the sheath to be bent / routed to suit installation without affecting performance.
- Available in variety of sheath diameters.
- Two, three and four wire configuration
- Calibration in accordance with IEC 751
- Class A type or 1/3<sup>rd</sup> DIN with special limits of error optional#.
- Suitable for head mounted transmitters.

# Refer our precision RTD section.



Laser Welding Machine

# Mineral Insulated RTDs

## Specifications

- Element : 1Pt 100 or 2 Pt 100 - single or duplex (triplex on request)
- Element OD : 3.2 mm , 6 mm, 8 mm, for the elements portion of 60 mm, with leadout MI cable of 2.8 mm, 5 mm respectively  
Straight construction with continuous OD of 6 mm , 8 mm, 10 mm also available.
- Sheath material : SS316
- Insulation : Mineral, compact MgO (over 99% purity)
- Calibration : In accordance with IEC-751 / DIN 43760 (class B or A)
- Conductor : Copper (Nickel on request\*)
- Configuration : Two wire, three wire or four wire
- Open end : Pot seal or quick connect-disconnect plug and jack or terminal block with PTFE insulated copper conductor flexible tails .  
(Terminal block- ceramic spring loaded 41mm OD, 33 PCD with two M4 screws, silver plated brass terminals).
- Head : Diecast aluminium (LM6 Gr.) / SS304 / SS316, single or double entry with 3/4" ET (F) cable entry as standard, 1/2" NPT (F) for well or nipple.
- Protection : Weatherproof to IP-67 (IS :13947 Part I)  
: Flameproof to Gr. I, IIA IIB (equivalent to NEC class I Div II Gr. C & D)  
: Flameproof to IIC (equivalent to NEC class I Div II Gr. B, C & D)  
: Increased safety  
: ATEX certified  
: CE Marked
- Extension : Nipple or nipple - union - nipple standard 150mm long, 1/2" sch. 40 /80 in A106 Gr. B, Cd plated or SS304 or SS316 or adjustable compression fitting.
- Optional : a) Thermowell (refer - section on Thermowell )  
b) Head mounted temperature transmitter
- Routine tests : a) Calibration  
b) Nitrogen leak test  
c) Dimensional check  
d) Insulation resistance (>100 M ohm @ 500VDC at 250C)  
e) Continuity
- Type tests : a) Vibration test  
b) Drop / Shock test  
c) Self heating error test  
d) Response time test (In situ-water flowing @ 20 ltr. per second)  
e) Autoclave test  
f) Hot IR

\* Refer detailed note on this, mentioned separately.



In continuation with its endeavour to provide products of best quality to clients, we have developed RTD with Nickel conductor in Mineral Insulated Construction for the first time in India.

The basic difference between the conventional & Nickel conductor is material of conductor. In conventional, it is copper as against Nickel in newly developed MI.

## Advantages of Nickel conductor MI RTD

1. Most important advantage is that the RTD element is welded on to conductors and not brazed. As such same RTD can be used for much higher temperature of up to 600°C. In conventional RTD with copper conductor, brazing does not allow use of RTD above 450°C, after which brazing starts softening and RTD loses its contact with cable conductors. In Nickel conductors, as Nickel can be welded, contact is much more stronger even at higher temperature.
2. Nickel conductor cables are annealed at higher temperature than that of Copper. The cable therefore is much more softer. Hence RTDs made with nickel conductor are more pliable and easier to use.
3. Nickel has much more strength than copper. Hence, they can be directly terminated in the terminal block avoiding another connection of flexible leads. RTDs with Nickel conductors give steady readings and chances of loose connection of flexible leads to copper wires is avoided.
4. As Nickel conductors are welded to RTD element, it is a much more stable design than brazed RTD. This advantage is very important in applications where vibrations are present.
5. Copper can get easily oxidised causing fluctuations in readings. Nickel being much more inert chemically, is not so prone to oxidation and hence gives stable readings over a longer period of time.

Property	Copper	Nickel
Resistivity at room temp	1.694 x 10 <sup>-8</sup> Ohm - m	6.9 x 10 <sup>-8</sup> Ohm - m
Melting point	1085°C	1455°C
Density @ 20°C	8.96 gm / cc	8.9 gm / cc
Young's Modulus	129.8 GPa	199.5 GPa
Poisson's Ratio	0.343	0.312



# Mineral Insulated RTDs

## Special Assemblies

### Skin temperature RTDs:

Combines a precision element with low cost, easily installable accessories and flexible thermal cable with an ability to produce fast response surface sensing.

### Bearing temperature measurement RTDs :

Miniature detector for embedment in thrust pads-spring loaded holder with fluid seal easily adjustable for a proper loading at any hole depth. These are installed in babbit layer of large bearing for immediate warning of possible failure.

### Room temperature measuring RTDs:

RTD assemblies with a suitable protecting tube and surface mounted junction box are available for temperature measurement in cold storages installations, textile factories, air conditioned environment.

### RTD with local indication:

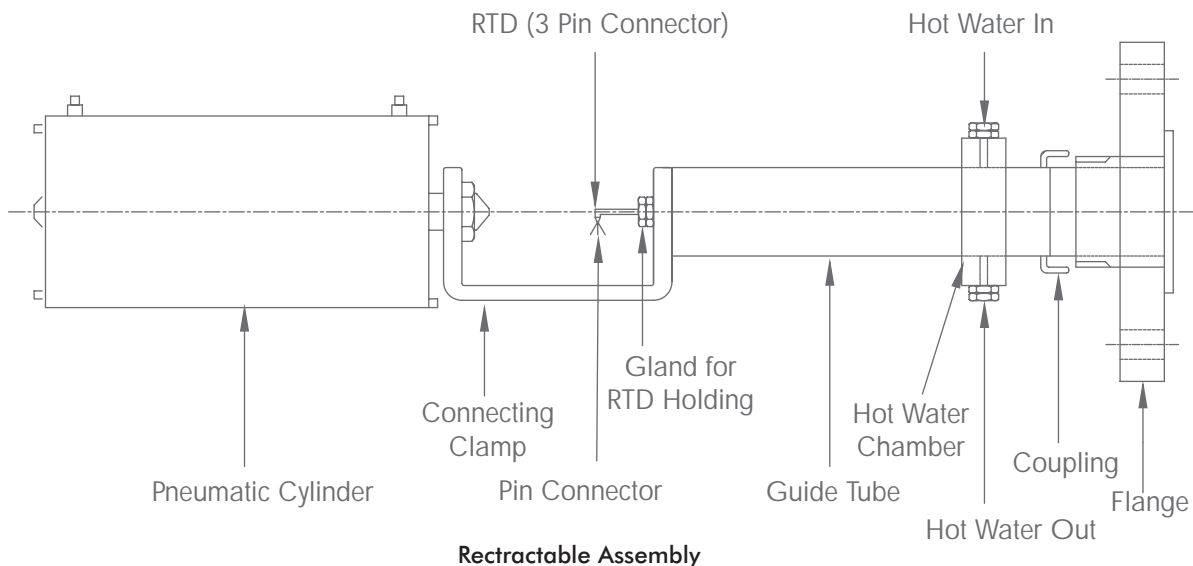
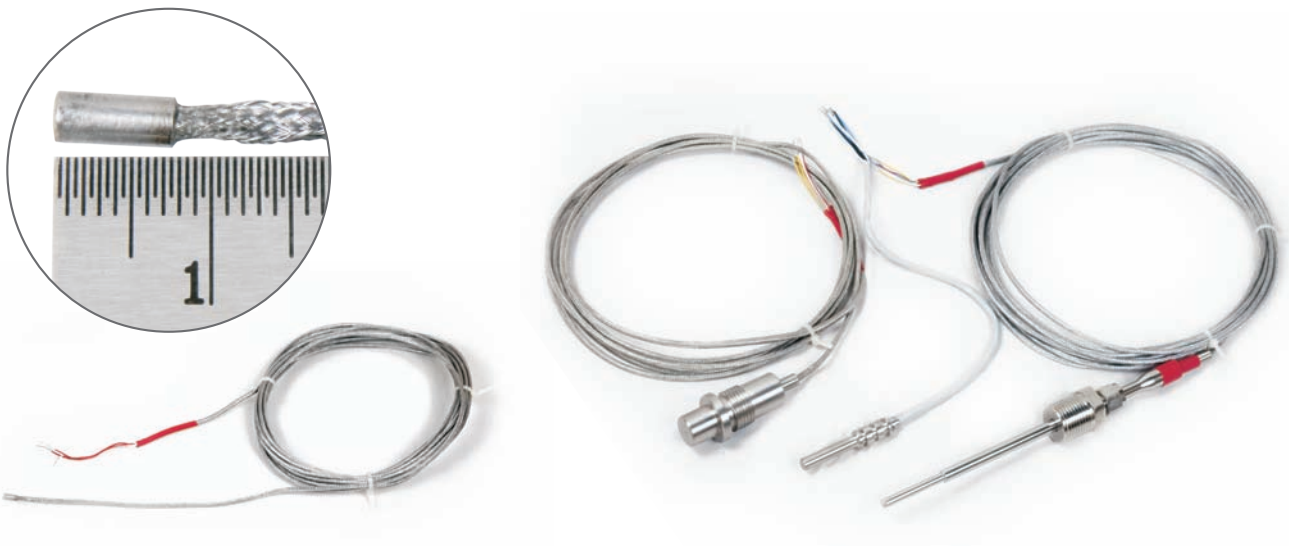
Refer our detailed section

### Multipoint RTD assembly:

Multi elements are located at different heights in a reactor or storage tanks (e.g. Ammonia storage). Fully tailor-made designs are available to suit the specific requirement.

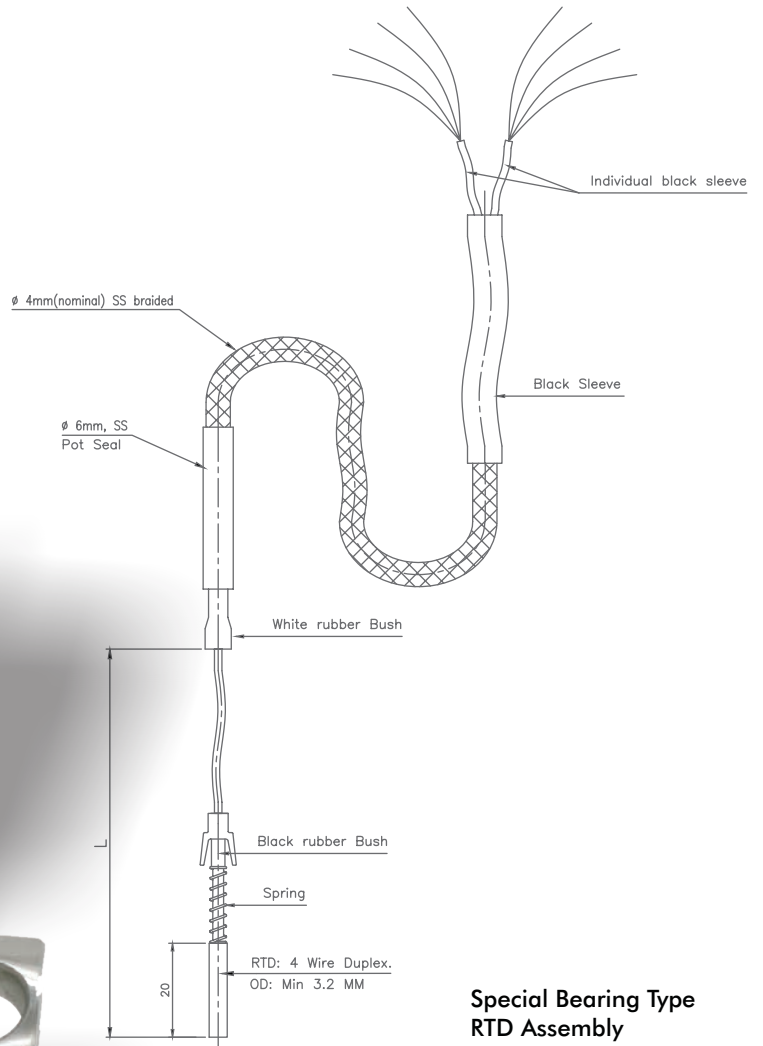
### Retractable telescopic assembly:

Special assembly design has been developed for polymer manufacturing units as import substitution. The system comprise of a RTD assembly, actuator, solenoid valve and another hardware. (contact our design department for details).





Hygiene Assembly



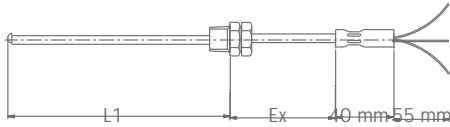
Special Bearing Type  
RTD Assembly



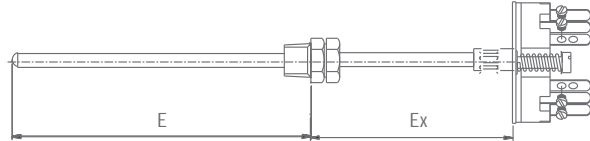
RTD Assembly with plug and jack connector

# Mineral Insulated RTDs

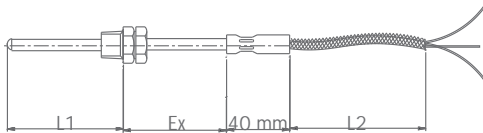
## How to Order



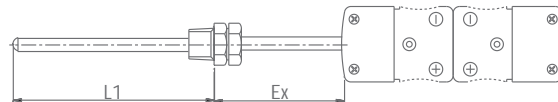
TYPE : RTD IA



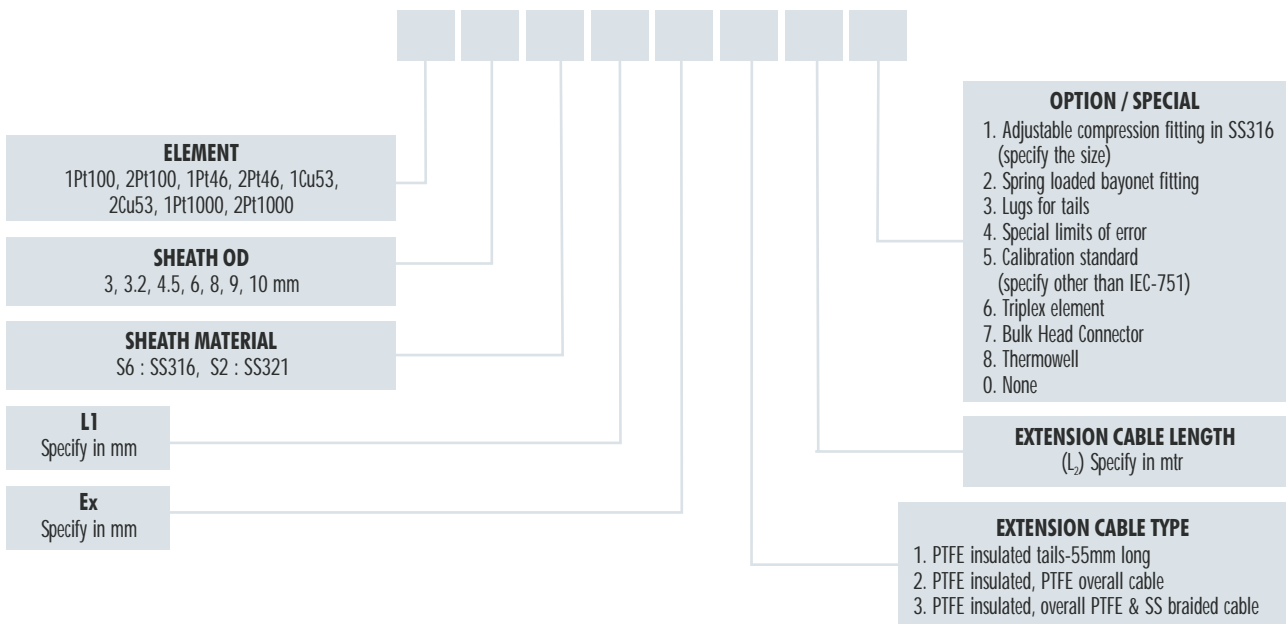
TYPE : RTD-I-TB



TYPE : RTD IB

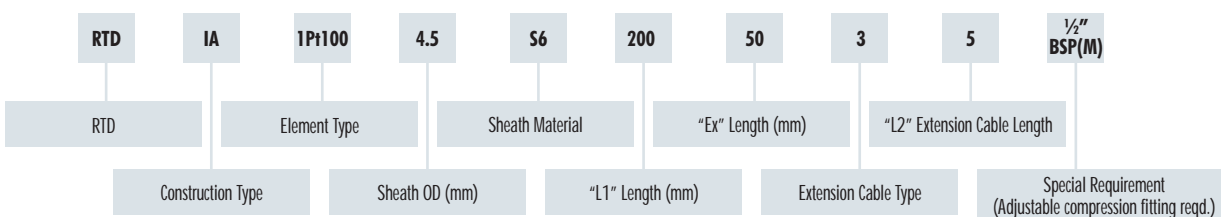


TYPE : RTD-I-PJ

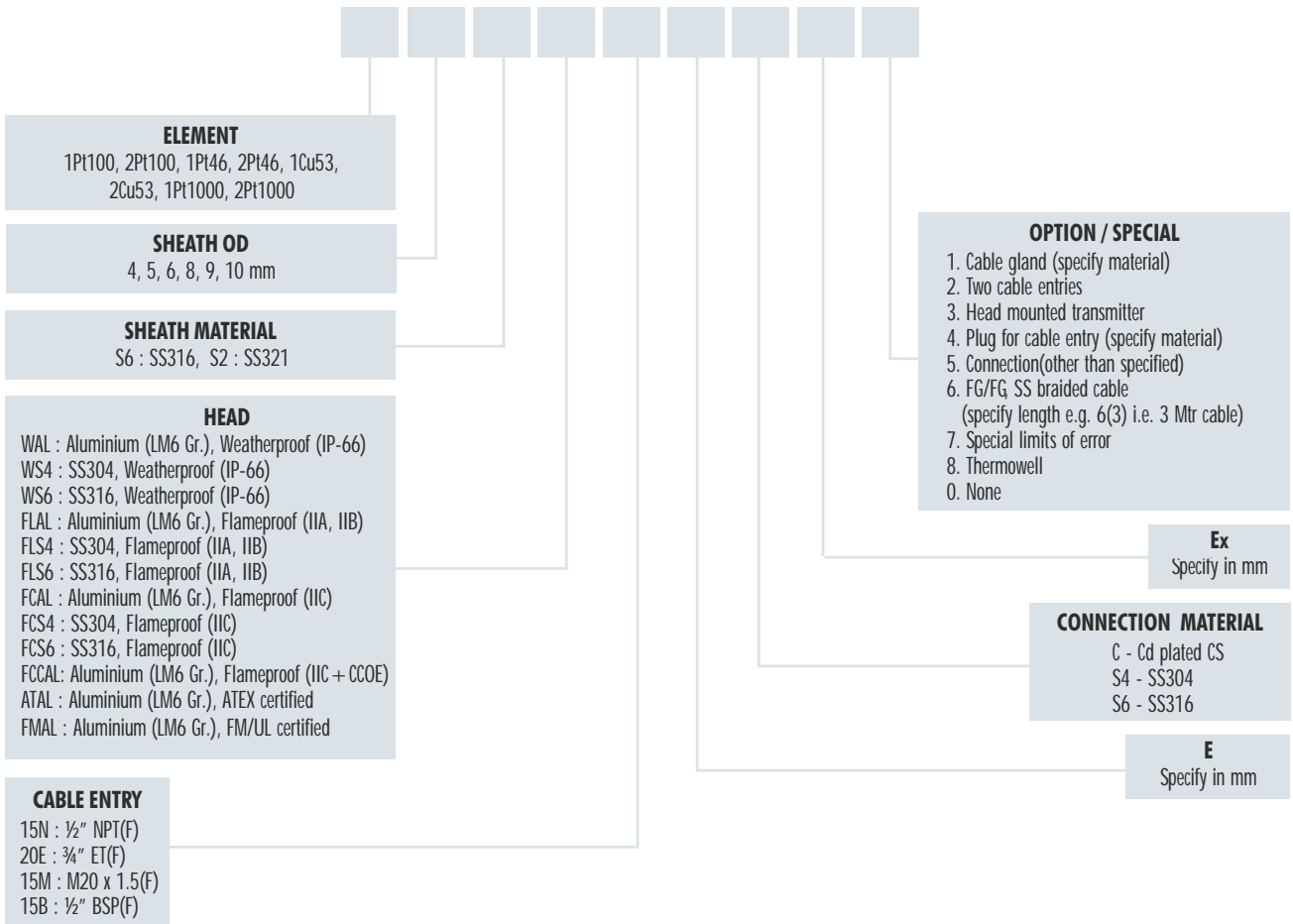
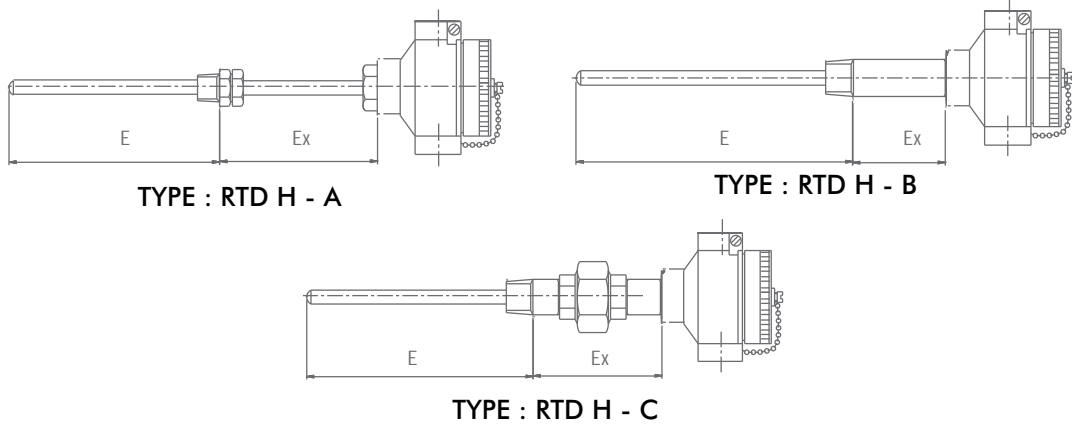


**Standard Features :** a - Mineral insulated (compact MgO) construction  
b - 3 Wire System  
c - Reference standard IEC 751 Class B

**Typical Model No :** RTD-I-B-1Pt100-4.5-S6-200-50-3-5-1/2" BSP(M)

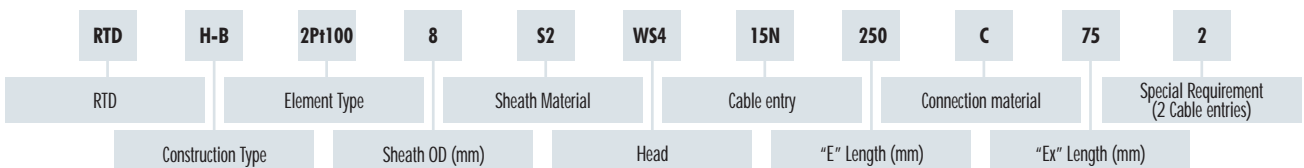


## How to Order



**Standard Feature** : a - Reference standard IEC 751 Class B  
b - Mineral insulated (compact MgO) construction  
c - 1/2" NPT(M) connection  
d - 3 Wire System

**Typical Model No** : RTD-H-B-2Pt100-8-S2-WS4-15N-250-C-75-2





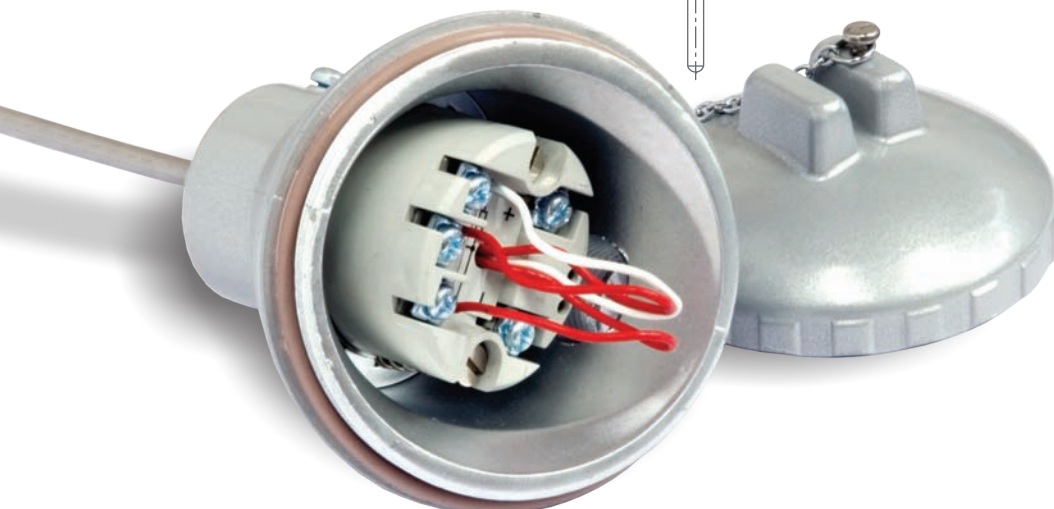
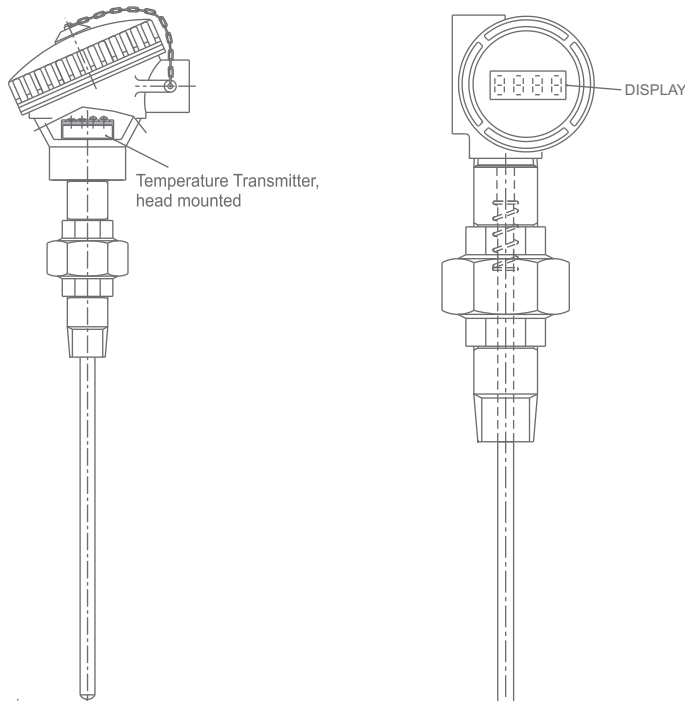
# Temperature Element Assemblies

(Suitable for Temperature Transmitter)

## Special Assemblies

We have the capability of supplying temperature Element (T/c as well as RTD) assemblies suitable for temperature transmitters. The transmitter either can be mounted in the enclosure (Head) or connected to the extension (in the form of Nipple-union-nipple) that comes with built in enclosure. (with or without indication) The assemblies are offered complete with element, head & thermowell. In either case, the spring loading is provided ensures proper contact of the element to the bottom of thermowell. Moreover the assembly (if the transmitter is in our scope) will be duly calibrated.

The assemblies are generally suitable for various models of reputed make. We have been supplying these to major transmitter manufacturers across the globe.



## Features

- Battery or mains operated.
- Special magnetic key for battery operated model to save battery consumption.
- Combination of local indication with provision for parallel remote indication.
- Weatherproof or flameproof case.
- Longer length of sensor available.
- Accuracy better than 1% full scale.

## Specifications

Sensor	: RTD or thermocouple, single or duplex
Enclosure	: a) SS304 for battery operated b) Diecast Aluminium (LM6 Gr.) for mains operated
Protection	: a) Weatherproof to IP - 67 (IS - 13947 Part I) b) Flameproof to Gr. I, IIA, IIB CMRI Dhanbad approved CCOE (equivalent to NEC Cl.1 Div.2, Gr.C & D) only in Diecast Aluminium (LM6 Gr.) case.
Display	: 3½ digit, 12 mm LCD
Resolution	: 1°C / 0.1°C
Range	: (-) 25°C to 500°C for RTD, 0 to 1000°C for thermocouple (other ranges available on request)
Accuracy	: Better than 1% of full scale ± 1 digit
Power supply	: a) 9 V battery b) Mains - 230 V AC / 110 V AC c) Loop powered - 24 V DC
Special feature	: a) Power on / off provided by magnetic key for all battery operated models. b) Duplex element with local indication and provision for remote indication and 4-20 mA Signal
Process connecting	: ½" NPT (M) as standard (or as specified)
Mounting	: Local or surface
Accessory	: Thermowell (refer section on Thermowell)



S/S Case Weatherproof



Aluminium LM6 grade Flameproof

# Temperature Transmitter

## RTD With Temperature Transmitter

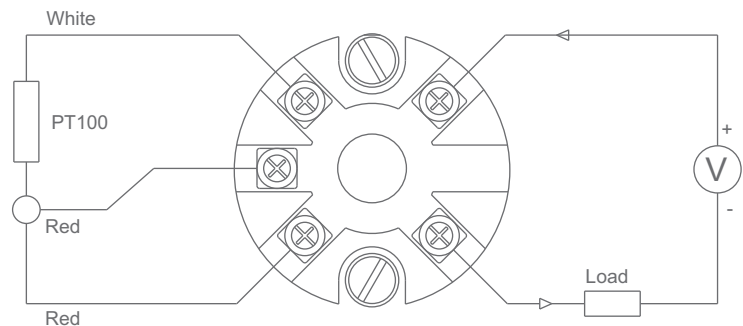
RTD temperature transmitters convert the RTD resistance measurement to a current signal, eliminating the problems inherent in RTD signal transmission via lead resistance. Errors in RTD circuits (especially two and three wire RTDs) are often caused by the added resistance of the lead wire between the sensor and the instrument. Transmitter input, specifications, user interfaces, features, sensor connections, and environment are all important parameters to consider when searching for RTD temperature transmitters.

Transmitter input specifications to take into consideration when selecting RTD temperature transmitters include reference materials, reference resistance, other inputs, and sensed temperature.

The transmitter is mounted on the Head of the temperature Sensor & converts it into a linear current loop signal of 4 to 20mA DC, capable of driving a load of up to 600 Ohms. The instrument operates in two-wire configuration.

### Specifications

Input	: RTD, PT100, 3 Wires
Output	: 4-20mA, Loop powered
Range	: -200°C to 850°C
Accuracy	: $\pm 0.2^\circ\text{C}$ , $\pm 0.2\%$ of reading
Response Time	: 0.5 s
Supply	: 8-30V DC
Mounting	: Head Mounted
Ambient Temp.	: -40°C to 85°C



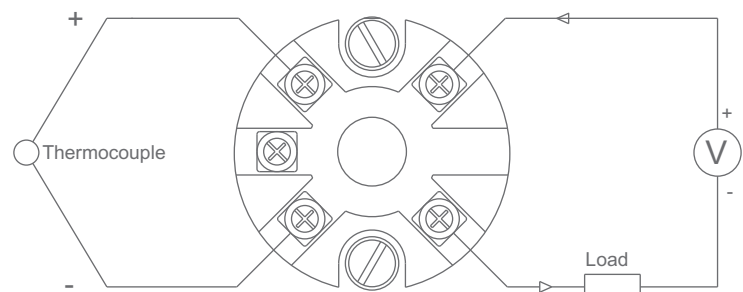
## Thermocouple with Temperature Transmitter

Thermocouple temperature transmitters convert the small millivolt (mV) output of a thermocouple to a current signal (typically 4-20mA DC) that is immune to noise and voltage drops over long distances. They are used with thermocouple temperature probes, bimetallic devices that are suitable for various temperature sensing

applications. Isolated thermocouple temperature transmitters eliminate ground loop problems by isolating the transmitter input from the transmitter output. Output options include analog current, analog voltage, or relay/switch output.

### Specifications

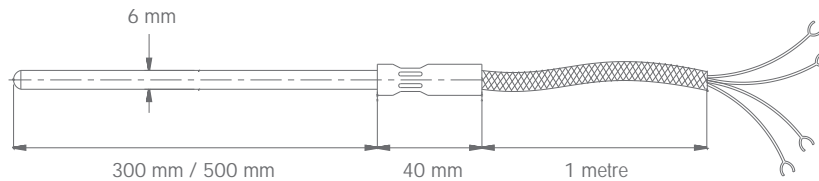
Input	: Thermocouple (Please specify the type)
Output	: 4-20mA, Loop powered
Range	: -200°C to 1760°C
Accuracy	: $\pm 0.5^\circ\text{C}$ , $\pm 0.04\%$ of reading
Response Time	: 500 mS
Supply	: 8-30V DC
Mounting	: Head Mounted
Ambient Temp.	: 0°C to 70°C



We also offer PC Programmable, re-rangable Temperature Transmitter.

Any industrial installation has several electrical thermometers such as Thermocouples & RTDs. At a regular interval, these instruments are required to be checked against a 'Standard Industrial RTD', which has accuracy to the level of 1/10th DIN. *General* with its vast experience in design and manufacturing of precision instruments has developed 'Standard PT100 Industrial

RTD' which caters to such requirements of client. These RTDs are traceable to National Physical Laboratory (NPL) and are either provided with Original Calibration Certificate from NPL with very low level of uncertainty or Internal Certificate traceable to National laboratory. These Standard RTDs are manufactured with 4 wire design to deliver highest performance.



## Specifications

Resistance	: Nominal 100 ohms at 0°C (PT100) Four Wire System.
Temperature Coefficient	: 0.00385 ohms/ohm/°C nominal
Temperature Range	: (-)200°C to 500°C (transition and cable temperature 150°C maximum)
Resistance Stability	: ±0.20 °C at 0°C after 1000 hours at 400°C
Sheath Material	: Inconel 600
Leads	: Teflon™-insulated, silver-plated stranded copper, 22 AWG. Colour Coded as 2 White / 2 Red
Termination	: Four gold-plated spade lugs are standard. Other options available.
Hysteresis	: 0.04% maximum between (-)200°C and 500°C
Time Constant	: Four seconds maximum for 63.2% response to step change in water moving at 1 mps.
Conductor	: Pure Silver
Calibration	: Includes National Physical Laboratory Certificate in Original. (Calibration points (-)25°C, 0°C, 100°C, 200°C, 300°C, 400°C & 500°C) Any other points optional.
Probe Accuracy	: Includes calibration uncertainty and short-term stability (-)25°C ±0.070°C, 0°C ±0.030°C, 200°C ±0.10°C, 300°C ±0.15°C
Immersion Effects	: Reading will not vary more than 0.02°C when the probe immersion is varied between 50 mm and 150mm in an ice bath.
Size	: PIR01-300: 300 mm L C 6.0 mm Dia. PIR01-500: 500 mm L C 6.0 mm Dia.

Temperature	Class B (Full Tolerance)	Class A (Half Tolerance)	1/4th Tolerance	1/10th Tolerance
0° C	± 0.12 Û ± 0.3° C	± 0.06 Û ± 0.15° C	± 0.030 Û ± 0.075° C	± 0.012 Û ± 0.03° C
100° C	± 0.32 Û ± 0.8° C	± 0.13 Û ± 0.35° C	± 0.065 Û ± 0.175° C	± 0.032 Û ± 0.08° C
300° C	± 0.64 Û ± 1.8° C	± 0.27 Û ± 0.75° C	± 0.135 Û ± 0.375° C	± 0.064 Û ± 0.18° C
500° C	± 0.93 Û ± 2.8° C	± 0.38 Û ± 1.15° C	± 0.190 Û ± 0.575° C	± 0.093 Û ± 0.28° C

## Precision Industrial RTDs

### In-House tests carried out for RTD assemblies

1. Calibration: RTD calibration can be done as per IEC 751/DIN 43760 Class A & B. Normally test is conducted for two points (i.e. 0°C & 100°C) 3 point calibration or more on request.
2. Insulation Resistance Test at ambient (room temperature) at 500 VDC - should be more than 100 M ohms. Higher value of request.
3. Insulation Resistance Test at 320° C at 100 V DC - IR should be more than 2 M ohms. More than 20 M ohms also can be offered.
4. N<sub>2</sub> leakage Test: For RTD sensor, after cap welding the N<sub>2</sub> leakage test should be carried out no leakage should observed at 40 kg/cm<sup>2</sup>.
5. Response Time Test: Response time test as per IEC 751 - (63.2% step change from ambient to 80°C) for RTD without transmitter - 6 to 9 sec up to 6mm OD of sheath. For RTD with thermowell the response time will be 35 to 45 sec.
6. Special Test - Autoclave Test: RTD kept in steam @ 125°C & at 1.2 kg/cm<sup>2</sup> for about 1 hour. IR should be more than 5 M Ohms.
7. Continuity Test: By using continuity tester / multimeter - This test is used to confirm the element is connected properly to the RTD transducer cable.
8. Sheath Integrity Test - Water Immersion Test: To check sheath integrity of thermocouple / MI RTD cable.
9. Response Time Test: For RTD with RTD connected to pipe on its outside surface to which water is flowing @ 20 ltrs. per second and @ 80°C. Acceptance norm is less than 20 seconds.
10. Self Heating Error Test: Done in accordance with IEC 751
11. Radiography: At Junction (on request)
12. Cryogenic Temperature Calibration: At (-)196°C

## Accessories

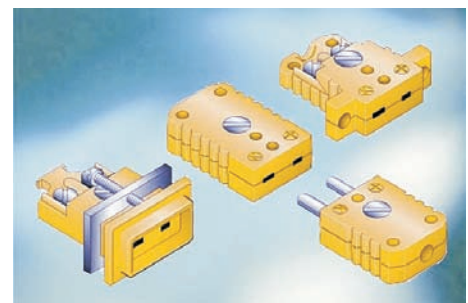
### Standard Thermocouple Connectors

Type : Suitable for Thermocouple & RTD  
 Construction : To Prevent Short Circuit. Spring Loaded to ensure : Solid Round Pin, Polarized Pins, Molded Barrier  
 Body Material : Thermoplastic Compound  
 Operating Temperature : Permanent 200°C, Short Term upto 250°C  
 Connection : Stainless Steel Screws & Plates



### Miniature Thermocouple Connectors

Type : Miniature - Suitable for Thermocouple & RTD  
 Construction : To Prevent Short Circuit. Spring Loaded to ensure : Solid Round Pin, Polarized Pins, Molded Barrier to prevent Short Circuit.  
 Body Material : Thermoplastic Compound  
 Operating Temperature : Permanent 200°C, Short Term upto 250°C  
 Connection : Stainless Steel Screws & Plates



### Connector Colour Code

Thermocouple Type	Iron-Constantan	Chromel – Alumel	Copper – Constantan	Pt PtRh 10%	Pt PtRh 13%	Uncompensated (Cu)
T/C Code ANSI IEC	J type Black Black	K type Yellow Green	T type Blue Brown	S type Green Orange	R type Green Orange	U White White

### 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

