



**TEMPERATURE
SENSORS**



Introduction



Welcome to *Goa Instruments* Industries Pvt. Ltd., established by Mr. M. T Kulkarni, it is a family owned company. He is a Mechanical Engineer with over 42 years of experience of manufacturing process control instruments for measurement of Temperature, Pressure, Flow, Level & Instrumentation Valves.

We are the leaders in manufacturing various types of Thermowells for all types of Temperature Sensors and Gauges for Industrial applications like Sugar, Power, Oil, Gas, Petrochemical, Fertilizer and other process Industries.

The company has many sets of excellent mechanical processing equipments and modern inspection and testing equipments for our products.

A-State-of-the-Art manufacturing facility, continuous Research & Development, innovative technology & stringent quality control at every stage have been some of the key factors in the manufacturing of our products.

We are not only the manufacturer but the solution providers.

We have built world class reputation of total understanding of customers requirements and needs, thus delivering excellent products and services at competitive prices.

For us, commitment and integrity are valued the most, which reflects in the philosophy of achieving total customer satisfaction. With our presence in major cities in India and a growing international network across all continents, we are in a position to reach clients all over the world.

Our Products have been supplied to the following Industries

- Bhabha Atomic And Research Center
- Oil & Gas Refineries & Petrochemical Industries
- Chemical, Process, Sugar Industries
- Thermal Power & Atomic Power Plants
- Fertilizers & Agro Chemicals
- Pharmaceuticals & Laboratories
- Steel & Metallurgical Plants
- Original Equipment Manufacturers
- EPC Contractors
- Water & Effluent Treatment Plants
- Pulp, Paper & Fibre Industries
- Defence
- And Many More



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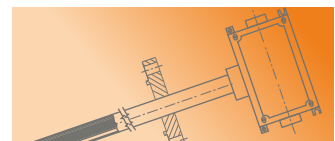
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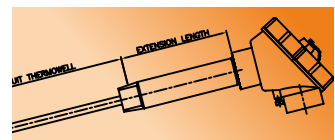
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THERMOCOUPLE TYPE	CHEMICAL COMPOSITION	
E	+ve Leg	-ve Leg
Chromel	Ni, 10%Cr	Cu, 45%
Constantan		

Different Mountings of RTDs and Thermocouples 11



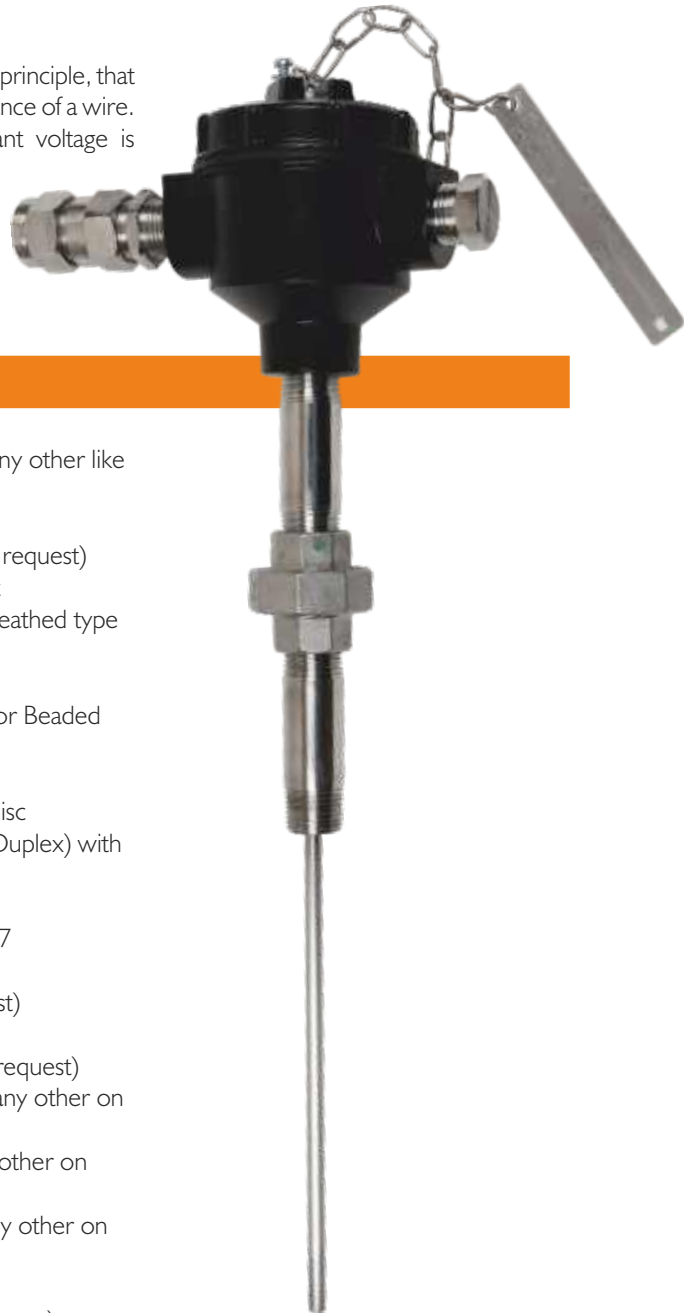
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- Torrent Industries
- DCW Ltd
- Godrej Industries Ltd
- Ciba Speciality Chemicals

Mineral Insulated Resistance Temperature Detector

A Resistance Temperature Detector (RTD) senses heat, based on the principle, that a change in temperature, results in a corresponding change in the resistance of a wire. A small excitation current is passed along the element, the resultant voltage is measured and converted to units of temperature.

RTDs have achieved a well deserved reputation in various Industries for their superior stability and accuracy. The result makes these devices well suited for a wide variety of applications.



Technical Specifications

Element	: 1 x Pt100 or 2 x Pt100 (Simplex or Duplex) (any other like Pt1000, Pt46 etc on request.)
STD Range	: 0 to 500 Deg C
Sheath OD	: 3.2mm, 5mm, 6mm, 8mm (any other size on request)
Sheath Material	: SS316 as Standard, SS316L, SS321 on request
Insulation	: Compact Mgo (Over 99% Purity) for Metal sheathed type and Ceramic for Beaded type
Calibration STD	: IEC-751/DIN 43760 (Class A or B)
Conductor	: Copper for MI type and Silver / Copper only for Beaded type, Nickel for MI type on request
Configuration	: 2 Wire, 3 Wire, 4 wire
Open End	: Pot Seal, Plug & Jack, Terminal Block with SS Disc
Head	: Die Cast Aluminium, SS304, SS316 (Simplex/Duplex) with one or two cable entries
Protection	: Weatherproof to IP 67 Flameproof IIA, IIB as per IS/IEC:60079-1:2007 Flameproof IIC as per IS/IEC:60079-1:2007
Cable Entry	: 3/4" ET, 1/2" NPT, 3/4" NPT (any other on request)
Extension	: Nipple Union Nipple Assembly In Cd plated Cs, SS304, SS316 (any other on request) Minimum 100mm but 150mm as a standard (any other on request) : Nipple 75mm / 100mm long as standard, any other on request : In Cd plated Cs, SS304, SS316 as standard (any other on request)
Process Connection	: 1/2", 3/4" as standard (any other on request) : Adjustable Gland (NPT, BSP) (any other on request) In SS304, SS316 (any other on request)
Accessories	: Single / Double Compression Cable Gland in Ni Plated Brass, SS304, SS316 (any other on request) : Metallic Plug for Head in Aluminium, SS304, SS316 (any other on request)
Optional	: Can be provided with Head / Remote Mounted Transmitter : Can be provided with all types of Thermowell

Note For Beaded Type Of RTD : Resistance Temperature Detectors with Conductors of Silver / Copper, in Ceramic Beaded Construction, packed with MgO powder and encapsulated in a sensing Metallic Tube in SS316. (any other material on request) can be supplied

Some Special RTD Assemblies



Bearing RTD's

Bearing RTDs are designed for areas where there are space limitations. They are small, compact and are often used to detect temperature in bearings, thrust bearing plates, shafts and motor windings. They are miniature low mass sensors which are fast responding.

Bearing sensors are manufactured using thin film technology and by design are tip sensitive and vibration resistant. They can be spring loaded into a bearing housing or held in position with a high temperature epoxy resin. Various types of fittings including Bayonet can be provided with the assembly. SS braided cable of varying lengths and Diameters can also be provided as per the requirement.

RTD's with Temperature Transmitters

Temperature Transmitters with or without Local Indication can be supplied with RTD's and Thermocouples. The TT can either be Head Mounted (Integrated) or Remote Mounted (External).

Such assemblies are provided with Spring Loading arrangement to ensure proper contact. The said assembly is duly calibrated for the Temperature Range as per the requirement.



Winding Temperature RTD's

RTD element is a thin, wide and flat flexible element, specifically designed to be inserted in the windings of a stator of a generator or motor. This is used for measuring the winding Temperature and stopping the system in case of overheating.

These detectors would be embedded into the winding slot and their resistance varies with the temperature

Tests on RTD's and Thermocouples

Routine Tests

- Continuity Test
- Calibration
- Insulation Resistance Test at Room Temperature
- Insulation Resistance Test at High Temperature
- N2 Test
- Response Time

Lab-Certified Tests

- Seismic Vibration Test
- Non Seismic Vibration Test
- Shock Test

In-House Tests

- Repeatability Test
- Reproducibility Test
- Lead Pull Out Test
- High Voltage Test
- Self Heating Error Test
- Helium Leak Test for Weld Joints
- Rattling Test
- Autoclave Test
- Sheath Integrity Test
- Humidity- Temperature Chamber Test

Mineral Insulated Thermocouple

A **thermocouple** is a device that is used for measuring temperature. It basically consists of two dissimilar metals, that are joined to form a junction, which when heated, produce a thermoelectric voltage. This voltage changes as the temperature increases or decreases. Thermocouples are self powered and require no external form of excitation.

Thermocouples are widely used in science and industry applications include, temperature measurement for kilns, gas turbine exhaust, diesel engines and other industrial processes.



Technical Specifications

Element	: J, K, E, T, N Type (Simplex or Duplex)
Sheath OD	: 3mm, 6mm, 8mm, 10mm (any other size on request)
Sheath Material	: SS316, SS321, INC 600, SS310 (any other on request)
Insulation	: Mineral Insulated, Compact Mgo (Over 99% Purity)
Calibration STD	: IEC-584 / ANSI MC 96.1 (Class 1 or 2)
Junction	: Grounded, Ungrounded, Exposed
Open End	: Pot Seal, Plug & Jack, Terminal Block with SS Disc
Head	: Die Cast Aluminium, SS304, SS316 (Simplex/Duplex) with one or two cable entries
Protection	: Weatherproof to IP 67 Flameproof IIA, IIB as per IS/IEC:60079-1:2007 Flameproof IIC as per IS/IEC:60079-1:2007
Cable Entry	: 3/4" ET, 1/2" NPT, 3/4" NPT (any other on request)
Extension	: Nipple Union Nipple assembly In Cd plated Cs, SS304, SS316 (any other on request) Minimum 100mm but 150mm as a standard (any other on request) : Nipple (75mm / 100mm long) as standard (any other on request) In Cd plated Cs, SS304, SS316 as standard (any other on request)
Process Connection	: 1/2", 3/4" as standard (any other on request) : Adjustable Gland (NPT, BSP) (any other on request) In Ss304, SS316 (any other on request)
Accessories	: Single / Double Compression Cable Gland in Ni Plated Brass, SS304, SS316 (any other on request) : Metallic plug for head in Aluminium, SS304, SS316 (any other on request)
Optional	: Can be provided with Head / Remote Mounted Transmitter : Can be provided with all types of Thermowell
Notes	: 1. Normal Ceramic Beaded Thermocouples packed with MgO powder and encapsulated with sensing Metallic Tube can also be supplied. 2. For selection of Thermocouple with respect to temperature please refer our selection Table A and B

High Temperature Thermocouples

High Temperature Thermocouples are especially designed for the temperature range from 600 °C up to 1600 °C. Noble metal thermocouples (also called rare metal thermocouples) are used to make the thermocouples. The most common types are R, S & B rare metal thermocouple assemblies. Major applications include, Glass Industry, Steel Plants, Electric arc furnace etc.



Technical Specifications

Element	: R, S, B (Pt, Pt Rh Type) (Simplex or Duplex)
Sheath OD	: 6mm, 8mm, 10mm, 12mm
Sheath Material	: Inconel 600, SS310, KER 710
Insulation	: Ceramic Beaded, KER 710 Insulation packed with Mgo Powder
Calibration STD	: IEC-584/ ANSI MC 96.1 (Class 1 or 2)
Junction	: Ungrounded
Open End	: Terminal Block with SS Disc
Head	: Die Cast Aluminium, SS304, SS316 (Simplex or Duplex) with one or two cable entries
Protection	: Weatherproof to IP 67 Flameproof IIA, IIB as per IS/IEC:60079-1:2007 Flameproof IIC as per IS/IEC:60079-1:2007
Cable Entry	: 3/4" ET, 1/2" NPT, 3/4" NPT (any other on request)
Extension	: Nipple Union Nipple assembly In Cd plated Cs, SS304, SS316 (any other on request) Minimum 100mm to 150mm as a standard (any other on request) : Nipple (75mm/100mm long) as standard (any other on request) SS304, SS316 (any other on request) In Cd plated Cs, SS304, SS316 as standard (any other on request)
Process Connection	: 1/2", 3/4" as standard (any other on request) : Adjustable Gland (NPT, BSP) (any other on request) In SS304, SS316 (any other on request)
Accessories	: Single / Double Compression Cable Gland In Ni Plated Brass, SS304, SS316 (any other on request) : Metallic plug for head In Aluminium, SS304, SS316 (any other on request)
Optional	: 1) Can be provided with Head / Remote Mounted Transmitter : 2) Provided with Protecting Tubes made out of a. KER 710 b. Barstock Inconel 600 c. Fabricated in Inconel 600 with sensing portion in Bar stock

Mineral Insulated Thickwall Thermocouples

Thermocouples are generally used with an outer protecting tube or pocket / thermowell to protect it from corrosive process conditions. This improves the life of the thermocouple. However, response time is compromised.

To overcome above problem, **MI Thickwall Thermocouple** are designed having thicker wall with relatively larger conductor diameters. This construction enables the user to insert the thermocouple directly in the process medium without a protecting tube or pocket / thermowell, thus improving the response time to a great extent in some process conditions.

Thickwall thermocouple offers high performance and longer life in harsh process environments, providing improved resistance to temperature, vibration, impact, corrosion and abrasion.

These type of thermocouples are very well suited to harsh, high temperature process environments such as incinerators, heat treatment furnaces and industrial ovens, and hence can be used effectively for measuring the temperature of molten metal also.

In such type, the gap between the element and the thick wall sheath is densely filled with high purity magnesium oxide (MgO), which prevents any residual air from penetrating the sheath and enables the product to withstand severe conditions, providing excellent corrosion and heat resistance.

This enables faster response times compared to conventional standard thermocouple assembly. The thermocouple element is protected by the thick wall sheath and high purity magnesium oxide, which can be supplied in large diameters with a very thick wall sheath providing a high resistance to vibration and impact shocks.



Types of Thermocouples offered:

Element	: J (Iron constantan) K (Chromel alumel) E (Chromel constantan)
Sheath Material	: SS316, SS310, INCONEL 600, INCOLOY 800, SS446
STD Sheath Diameter	: 10mm, 12.7mm, 15mm, 17mm, 19mm

Tube Temperature (Skin) Type Thermocouple

Such type of thermocouples are ideal for the reliable measurement of tube wall temperatures in fired heaters which is important for prolonging tube life and ensuring safe and efficient operation.

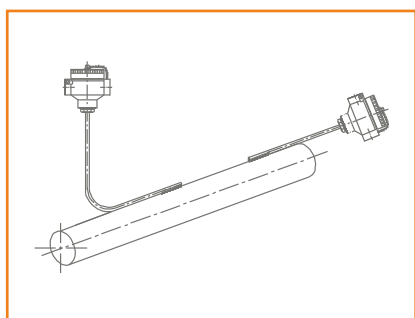
The tube temperature thermocouple is designed to be responsive to tube wall temperature by placing the thermo-junction in fused contact with the tube wall thus providing a direct and total metallic heat transfer path from the sheath to the Tube wall.

Such type of thermocouples provides better accuracy, superior reliability, improved longevity and ease of installation.

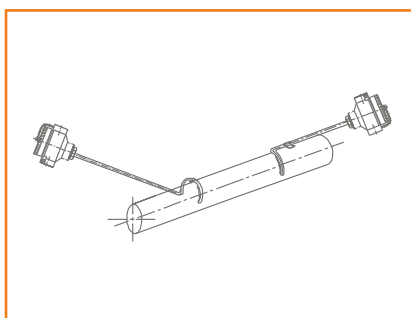
Tube or Skin type thermocouples can be designed and factory formed to suit nearly any installation or application based on the clients requirement.



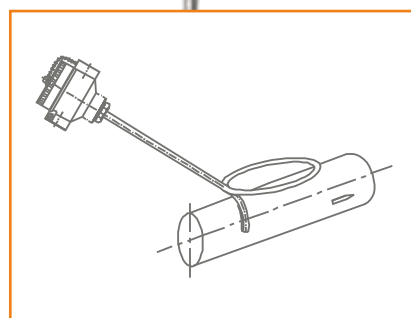
Mounting Types of Tube Thermocouples



STRAIGHT



ANGULAR



EXPANSION LOOP

Weld Pads

The weld-pad (tube skin) termination allows a temperature sensor to be welded directly onto piping or other metal surfaces to sense the surface temperature. Weld pads are most commonly used in fired heater tubes, refinery heater tubes, boilers and furnaces in refineries and industrial boilers. However, they can be used in virtually any application requiring surface temperature measurement. We excel at creating custom designs and engineered solutions to fit your requirements

Choose from a variety of junction styles (knife-edge shaped, transverse shaped etc.), materials, wrap-around angles, expansion loops, stem lengths and spring loaded covers. Our weld pads allow severe service temperature measurement with minimum drift and minimum radiant heat impingement. Weld Clamps and Retaining Clips complete the assembly.



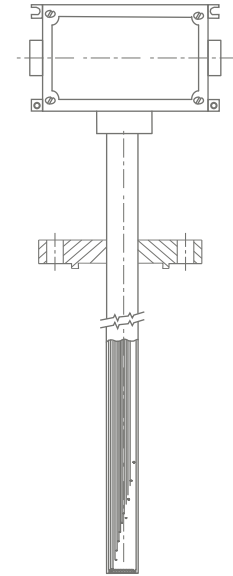
Thermocouple and RTD Multipoint Sensing Assemblies

Quite often there is a need to measure a temperature profile across a large tank or vessel. This can be done effectively by using MultiPoint assemblies which is an arrangement of Thermocouple / RTD positions with measuring junctions at various depths. The purpose is to monitor a number of temperatures at various points with all thermocouples or RTD's contained in one assembly.

These type of assemblies are used in Catalytic Crackers, Limekilns, Distillation Columns, Pressurized Reactor Vessels and a host of other applications where such profiles are necessary.

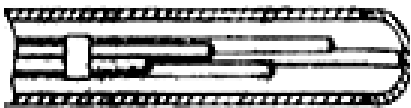
Multipoint assemblies can be miniaturized or they can be of any length according to the specific requirement.

These assemblies generally consist of a Junction Box suitable for terminating the sensors and joining them to cables running back to the measuring instruments, the sensors arranged at various depths and a pipe protection well capable of resisting the pressures and corrosives in the vessel.



Types

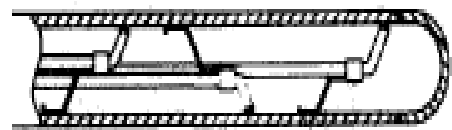
FREE HANGING



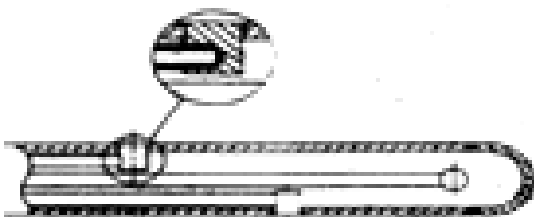
Sensors are manufactured to the desired lengths, then bundled together with straps. The bundle is secured with a clamp located in the junction box and hangs freely inside the protection tube. The measuring junction absorbs the dead air temperature within the tube.

SPRING LOADED

The flexibility or coiling capability of this design simplifies the installation and shipping. The Sensors are simply uncoiled and guided into a thermowell, thereby eliminating complex and costly installation methods usually prevalent in long length assemblies. The spring loaded construction ensures proper contact of the measuring junction with the thermowell inner wall for rapid response to any temperature change.



WITH MULTITUBE



This design provides high Mechanical strength and thus can be used in High Pressure, High Temperature or extremely Adverse conditions. The sensors bottom on the measuring junction blocks which are integral parts of the thermowell wall providing high sensitivity to temperature change. Replacement of individual sensor can be accomplished quickly without disassembling the entire unit.

Technical Information on Type of Thermocouples and their Limits

Table A

THERMOCOUPLE TYPE	CHEMICAL COMPOSITION		TEMPERATURE RANGE Deg C	STD LIMITS OF ERROR whichever is greater
	+ve Leg	-ve Leg		
E Chromel Constantan	Ni, 10%Cr	Cu, 45%Ni	0 To 900	+/-1.7 Deg C or +/-0.5%
J Iron Constantan	Fe	Cu, 45%Ni	0 To 750	+/-2.2 Deg C or +/-0.75%
K Chromel Alumel	Ni, 9.2%Cr, 0.4%Si	Ni, 2.5%Si, Co 1.2%	0 To 1250	+/-2.2 Deg C or +/-0.75%
T Copper Constantan	Cu	Cu, 45%Ni	0 To 350	+/-1.0 Deg C or +/-0.75%
S	Pt	Pt, 10% Rh	0 To 1450	+/-1.5 Deg C or +/-0.25%
R	Pt	Pt, 13% Rh	0 To 1450	+/-1.5 Deg C or +/-0.25%
B	Pt, 30% Rh	Pt, 6% Rh	870 To 1700	+/-0.5%

Wire Size V/s Upper Service Temperature

Table B

Type	8 Gauge/ 3.25mm Diameter	14 Gauge/ 1.63mm Diameter	20 Gauge/ 0.81mm Diameter	24 Gauge/ 0.51mm Diameter	28 Gauge/ 0.38mm Diameter ³
E	870 Deg C	650 Deg C	540 Deg C	430 Deg C	400 Deg C
J	760 Deg C	590 Deg C	480 Deg C	370 Deg C	370 Deg C
K	1260 Deg C	1090 Deg C	980 Deg C	870 Deg C	820 Deg C
N	1260 Deg C	1000 Deg C	980 Deg C	870 Deg C	820 Deg C
T	400 Deg C	370 Deg C	260 Deg C	200 Deg C	200 Deg C
S	-	-	-	1480 Deg C	1480 Deg C
R	-	-	-	1480 Deg C	1480 Deg C
B	-	-	-	1700 Deg C	1700 Deg C

Different Mountings of RTDs and Thermocouples

WITH HEAD ENCLOSURE

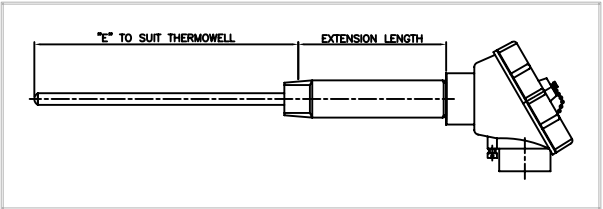


Fig. 1

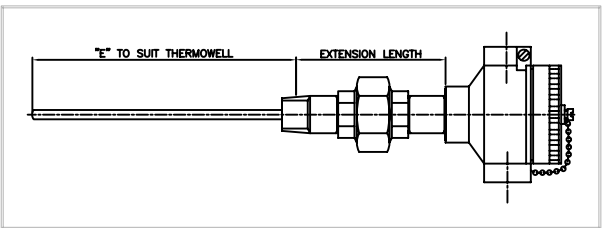


Fig. 2

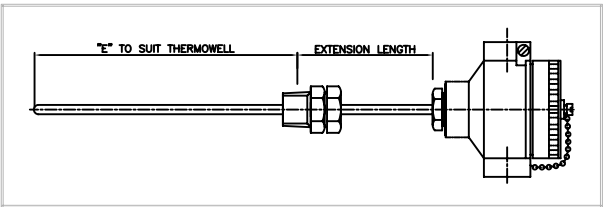


Fig. 3

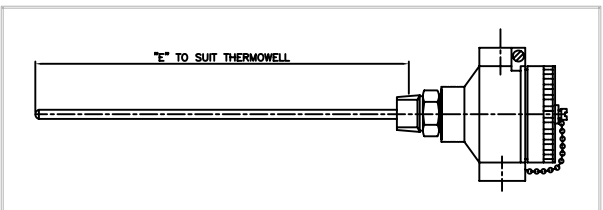


Fig. 4

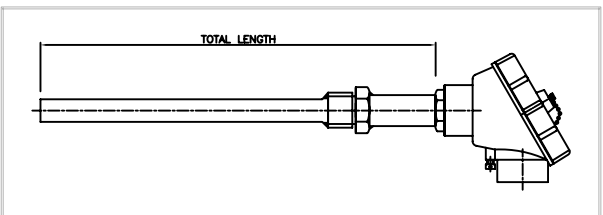


Fig. 5

WITHOUT HEAD ENCLOSURE

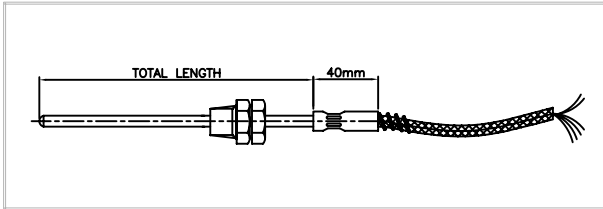


Fig. A

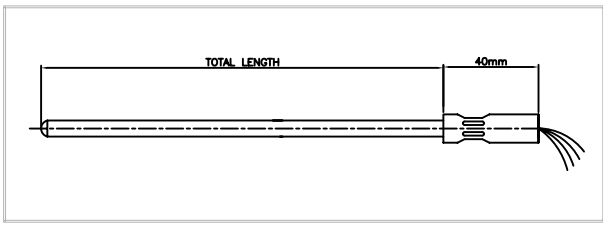


Fig. B

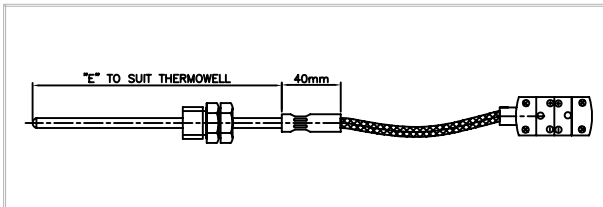


Fig. C

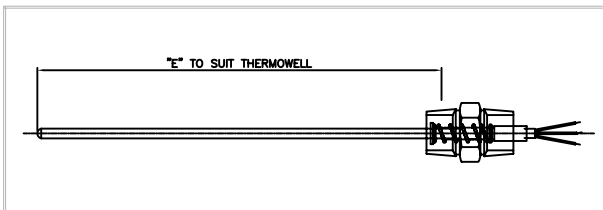


Fig. D

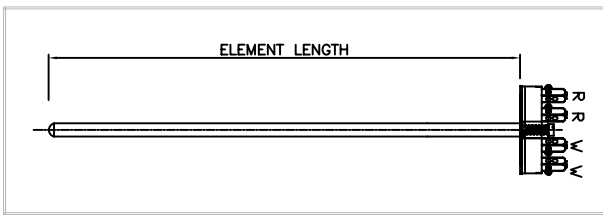


Fig. E

Some of our Valued Customers

- ❑ Bharat Petroleum Corporation Ltd
- ❑ Essar Oil Ltd
- ❑ Hindustan Petroleum Corporation Ltd
- ❑ India Oil Tanking Ltd
- ❑ Manali Petrochemicals Ltd
- ❑ Indian Oil Corporation Ltd
- ❑ The Andhra Petrochemicals Ltd
- ❑ Reliance Industries Ltd
- ❑ Chennai Petroleum Corporation Ltd
- ❑ Mangalore Refinery & Petrochemicals Ltd
- ❑ Ingersoll-Rand (India) Ltd
- ❑ Dresser Rand Ltd
- ❑ Torrent Pharmaceuticals Ltd
- ❑ DCW Ltd
- ❑ Godrej Industries Ltd
- ❑ Ciba Speciality Chemicals India Ltd
- ❑ Gujarat Fluorochemicals Ltd
- ❑ Gujarat Alkalies & Chemicals Ltd
- ❑ Hindustan Unilever Ltd
- ❑ India Glycols Ltd
- ❑ Shree Renuka Sugars Ltd
- ❑ Nirma Ltd
- ❑ Punjab Alkalies & Chemicals Ltd
- ❑ Finolex Industries Ltd
- ❑ Thirumalai Chemicals Ltd
- ❑ Bhabha Atomic Research Centre
- ❑ Bhushan Power & Steel Ltd
- ❑ Bilt Power Ltd
- ❑ JSW Energy Ltd
- ❑ Lanco Kondapalli Power Pvt Ltd
- ❑ BGR Energy Systems Ltd
- ❑ Nuclear Power Corporation of India Ltd
- ❑ National Thermal Power Corporation Ltd
- ❑ Coromandal Fertilizers Ltd
- ❑ National Organic Chemical Industries Ltd
- ❑ Chambal Fertilizers & Chemicals Ltd
- ❑ Gujarat Narmada Valley Fertilizers & Chemicals Ltd
- ❑ Indial Farmers & Fertilizers Co-operative Ltd
- ❑ Paradeep Phosphates Ltd
- ❑ Technimont ICB Pvt. Ltd
- ❑ Seshasayee Paper Boards Ltd
- ❑ National Peroxide
- ❑ United Phosphrous Ltd
- ❑ Syngenta India Ltd
- ❑ Zuari Industries Ltd
- ❑ Shalina Laboratories Pvt Ltd
- ❑ Hindalco Industries Ltd
- ❑ Jindal Steel & Power Ltd
- ❑ The Kerala Mineral & Metals Ltd
- ❑ BMM Ispat Ltd
- ❑ Air Liquid Engg. India Pvt Ltd
- ❑ Charam Techno Chem & Equipments Pvt Ltd
- ❑ Driplex Water Engineering Ltd
- ❑ Elster Instromet India Pvt Ltd
- ❑ Forbes Marshall Pvt Ltd
- ❑ Inox India Ltd
- ❑ Cethar Vessels Ltd
- ❑ CICB-Chemicon Pvt Ltd
- ❑ Emerson Process Management Pvt Ltd
- ❑ Enpro Industries Ltd
- ❑ National Fertilizers Ltd
- ❑ GEA Process Engineering (India) Pvt Ltd
- ❑ Greenesol Power Systems Pvt Ltd
- ❑ Kirloskar Pneumatic Co Ltd
- ❑ Southern Lubrication Pvt Ltd
- ❑ Thermax Ltd
- ❑ Triveni Engineering & Industries Ltd
- ❑ Va Tech Wabag Ltd
- ❑ Lincoln Helious India Ltd
- ❑ Praj Industries Ltd
- ❑ TD Power Systems Pvt. Ltd
- ❑ Toyo Engineering India Ltd
- ❑ Technofab Engineering Limited
- ❑ ABB Ltd
- ❑ Bharat Heavy Electricals Ltd
- ❑ ISGEC John Thomson
- ❑ Larsen & Toubro Ltd
- ❑ Samsung Engineering Co Ltd
- ❑ Siemens Ltd
- ❑ Garden Silk Mills Ltd
- ❑ Teva Api India Ltd
- ❑ Nirmal Industrial Controls Pvt Ltd





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BRANCHES

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