TEMPERATURE ELEMENTS THERMOCOUPLES / RTD ASSEMBLIES

THERMOCOUPLE (T/C)

- It employes two dissimilar metals
- When two such dissimilar metals welded together at one end and subjected to heat, it develops a small DC voltage (EM corresponding to temperature difference between hot junction (measuring junction) and cold junction (reference junction).
- The temperature-EMF characteristics have an established pattern for different type of Thermocouple elements like T, J, K, N, E, R, S, etc.
- Temperature - EMF characteristics conform to ANSI MC 96.1 / IEC 584 / DIN 43710 standards.

RESISTANCE TEMPERATURE DETECTOR (RTD)

- It employs high purity electrical resistance wire, non inductively wound on ceramic or glass base.
- When RTD element is subjected to heat, it changes its electrical resistance value, corresponding to variationin temperature and its thermal coefficient (α) (Alpha).
- The temperature resistance characteristics have an established pattern for different resistance elements, like Copper, Nickel Platinum etc.
- Most commonly used resistance element is Platinum known as Pt 100 (100 ohms at 0°C).
- Temperature resistance characteristics conform to DIN 43760/IEC 751 / BSS 1904 / JIS C1604 standards.
- Conventional thermocouple or RTD elements pass through multi bore insulators, encased in outer protection sheath and connected to temperature measuring instrument.
- Mineral insulated (MI) sensors are insulated with tightly compacted high purity magnesium oxide powder, simplex or duplex, enclosed in various metal sheaths and connected to temperature measuring instrument

MINERAL INSULATED ELEMENTS

Mineral insulated (MI) sensors are insulated with tightly compacted magnesium oxide powder enclosed in various metal sheaths.

Hot Junction is formed in inert gas atmosphere and tested for Leakage with Nitrogen gas under pressure.

A. Simplex or Duplex assemblies.

B. Vibration-Proof, Fast-Response, High Insulation Resistance, Accurate and Stable.
Termination : Pot Seal with Flying Lead (PSFL), Male Female Connecor (MFC), Connection Head (HEAD) & Junction Box - *for multipoint assembly* - (J B).

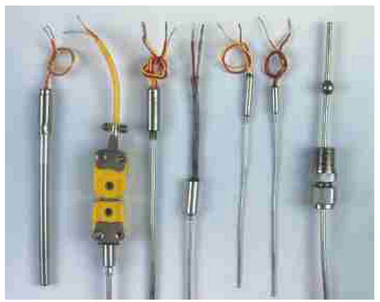
C. Sheaths can be bent, twisted and flattended to suit application.

D. Length can be from few inches to several meters.

- T/C type: K,T,J,E,N with sheath diameters from 1 mm to 19. mm.
- T/C Sheath material : SS 304, 316, 310, 321,446,*Inconel 600, *Incolloy 800/825.
- T/C Junctions can be Grounded or Insulated (Un-Grounded). RTD type : PT 100 simplex or duplex, two or three wire system.

ENCLOSURE

- Staninless Steel, Die Cast Aluminium with cable entry.
- **Protection :** IP, Flame Proof Gr IIA, IIB or IIC,Increased Safety.
  Termination : Brass/SS connectors with markings for polarity, colour codes and type of Thermocouples. Spring Loaded Terminal Block - if required.



SHEATH DIAMETER mm		SIMPLEX	DUPLEX	INSULATION RESISTANCE (MINI) Meg Ohm at room temp.	TERMINATION	RTD DIMENSIONS
T/C	RTD					
1. 1/5. 2	-	YES	NO	10 at 500 V DC	PSFL, MFC, HEAD, JB	
3	-	YES	YES	100 at 500 V DC	PSFL, MFC, HEAD, JB	
6	6	YES	YES	100 at 500 V DC	PSFL, MFC, HEAD, JB	6x60 mm bulb with 5mm OD SS 316MI cable extention
8	8	YES	YES	500 at 500 V DC	PSFL, MFC, HEAD, JB	8x60 mm bulb with 5mm OD SS 316MI cable extention
12.7	-	YES	YES	500 at 500 V DC	PSFL, HEAD	

* Manufacturers' Trade Name

TEMPERATURE ELEMENTS THERMOCOUPLES / RTD ASSEMBLIES

BEADED ELEMENTS, with METAL SHEATH & FLANGE OR THREADED MOUNTING

CERAMIC TUBE SHEATH, SINGLE OR DOUBLE -WITH METAL TUBE PROTECTION

NIPPLE-UNION-NIPPLE (N-U-N) & THREADED THERMOWELL

NIPPLE-UNION-NIPPLE (N-U-N) & FLANGED THERMOWELL

NIPPLE-UNION-NIPPLE (N-U-N) & WELD-IN, ONE PIECE, THERMOWELL AND AIR VENT IN INSTRUMENT CONNECTION.

METAL SLEEVE IN MONEL / NICKEL / TITANIUM / TANTALUM ETC.

COATED WITH PTFE

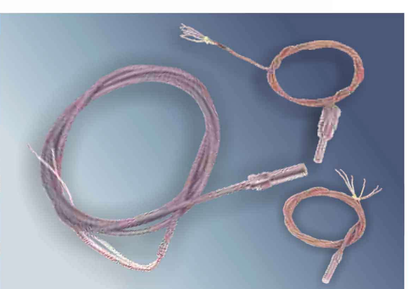
COATED WITH COBALT BASE ALLOY/ TUNGSTEN CARBIDE

FLANGED THERMOWELL, WITH OPEN END CERAMIC TUBE HAVING TWO DRILLED HOLES

COMPLETE ASSEMBLY IN STAINLESS STEEL INCLUDING ENCLOSURE (HEAD) NIPPLE-UNION-NIPPLE & THERMOWELL

RTD ASSEMBLY FOR BEARING TEMPERATURE

STANDARD ELEMENT	:	PT100, SIMPLEX or DUPLEX (2wire or 3wire)
CALIBRATION	:	DIN 43760, BS 1904, JIS C 1604 Gr II
SHEATH & MOUNTING	:	As per drawing
CABLE	:	PTFE - or - Fibreglass / SS braided with PTFE insulated conductors

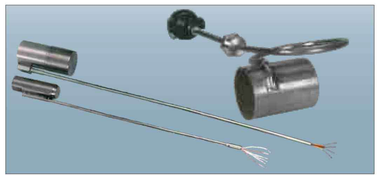


T/C, RTD ASSEMBLY FOR TURBINE, COMPRESSOR & PUMP

RTD ELEMENTS	:	PT 100, SIMPLEX or DUPLEX (2 wire or 3 wire)
THERMO COUPLE TYPE	:	J or K, Simplex or Duplex
MOUNTING	:	As per requirement
CABLE	:	PTFE - or - Fibreglass / SS braided with PTFE insulated conductors

	OD mm	LENGTH	SIMPLEX minimum	DUPLEX	IR VALUE minimum Meg Ohm at room temp. room temp.
SHEATH MATERIAL STAINLESS STEEL	2.5	12	2 or 3 wire	-	10 at 100 V DC
	2.5	20	2 or 3 wire	2 or 3 wire	10 at 100 V DC
	3 or 3.2	7	2 or 3 wire	-	10 at 500 V DC
	3 or 3.2	15	2 or 3 wire	2 or 3 wire	10 at 500 V DC
	4 and above	7	2 or 3 wire	-	100 at 500 V DC
	4 and above	15	2 or 3 wire	2 or 3 wire	100 at 500 V DC

TEMPERATURE ELEMENTS THERMOCOUPLES / RTD ASSEMBLIES



SKIN THERMOCOUPLES

- The Skin Thermocouples is Designed to Sense Surface Temperature of Boiler or Process Tubes.
- Typical Skin Thermocouple Assembly comprises of MI Thermocouple, welding pad and strap, intermediate loop (twice pipe diameter), adjustable threaded adapter and heavy duty enclosure.

ELEMENTS	K, Simplex or Duplex
SHEATH	SS 310, 446, *INCONEL 600, *INCOLOY 800/825 OD 6 mm to 12.7 mm
JUNCTION	GROUNDED or UN-GROUNDED
PAD SIZE	2" x ½" x ¼" ; 1" x 1" x ¾" Shaped to match pipe curvature
CLAMP / STRAP	1 ½" x ½" x ½" For anchoring Thermocouple
MOUNTING	Standard 1" NPT in SS 316
ENCLOSURE	Die Cast Aluminium, Cast Steel with Compression Fitting for gripping Thermocouple

- Thermocouple Junction is welded in the centre of pad
- Thermocouple is inserted in the pad

SKIN RTDs (MI) also could be offered on specific requirement.

* Manufacturers' Trade Name

MULTIPOINT ELEMENT ASSEMBLY

These T/Cs or RTDs are designed to measure temperatures of medium at different levels in vertical column for Petrochemical, Fertilizer, Steel & other industries.

METAL SHEATH THERMOCOUPLE
- MINERAL INSULATED
- Type K, T, E, J
- Sheath: Dia 1 mm to 12.7 mm OD in various materials.
- Simplex (up to 12.7 mm OD) & Duplex (3 to 12.7 mm OD)
- Junction : Grounded or Insulated (Un-Grounded)

METAL SHEATH RTD
- MINERAL INSULATED
- Type PT 100 (100 ohms at 0°C).
- Simplex or Duplex - 2 or 3 wire system
- Sheath: Dia 4 mm, 6 mm & 8 mm in SS 316.

MOUNTING
- FLANGED or THREADED with mechanical fittings.

ENCLOSURE
- Cast Aluminium with cable entry.
- Purge Tube: (optional) with proper mountings and inlet threaded commection.
- Protection: IP 65, Flame Proof Gr IIA, IIB or IIC, Increased Safety.
- Thermination : Brass connections with markings for polarity, colour codes and type of Thermocouple / RTD.

CONSTRUCTION
- Elements pass through multibore metal disc fittings, bunched together with SS binding wire. Thermocouples (above 6 mm OD) could be silver brazed - if required.

LENGTH
- From few feet onwards without thermowell.
- Upto 7 Mts with thermowell. (Larger lengths require special transportation facility)

LIMITS OF ERROR FOR THERMOCOUPLS

THERMOCOUPLE TYPE	TEMPERATURE RANGE °C	STANDARD Whichevere is Greater	SPECIAL Whichevere is Greater
T	0-350	±1°C or ±0.75%	±0.5°C or ±0.4%
J	0-750	±2.2°C or ±0.75%	±1.1°C or ±0.4%
E	0-900	±1.7°C or ±0.5%	±1°C or ±0.4%
K	0-1250	±2.2°C or ±0.75%	±1.1°C or ±0.4%
R or S	0-1450	±1.5°C or ±0.25%	±0.6°C or ±0.1%
B	800-1700	±0.5%	—

LIMITS OF ERROR FOR PLATINUM-RTD ELEMENTS

MEASURING TEMPERATURE	PERMISSIBLE DEVIATIONS			
	CLASS A		CLASS B	
°C	Ω	°C	Ω	°C
-200	± 0.24	± 0.55	± 0.56	± 1.3
-100	± 0.14	± 0.35	± 0.32	± 0.8
0	± 0.06	± 0.15	± 0.12	± 0.3
100	± 0.13	± 0.35	± 0.30	± 0.8
200	± 0.20	± 0.55	± 0.48	± 1.3
300	± 0.27	± 0.75	± 0.64	± 1.8
400	± 0.33	± 0.95	± 0.79	± 2.3
500	± 0.38	± 1.15	± 0.93	± 2.8
600	± 0.43	± 1.35	± 1.06	± 3.3

Reference junction 0°C. As per ANSI MC 96.1 (1982)

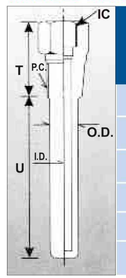
THERMOWELL

- THERMOWELL provides complete protection for the sensor (Temperature, Pressure etc) elements.
- THERMOWELL is designed considering optimum Pressure, Temperature, critical Frequency, the nature of Media (abrasive, corrosive etc) and intensity of flow of media.
- THERMOWELL allows removing or replacing of Sensing Instrument without draining or shutting down of process.

MOST COMMONLY USED - THERMOWELLS

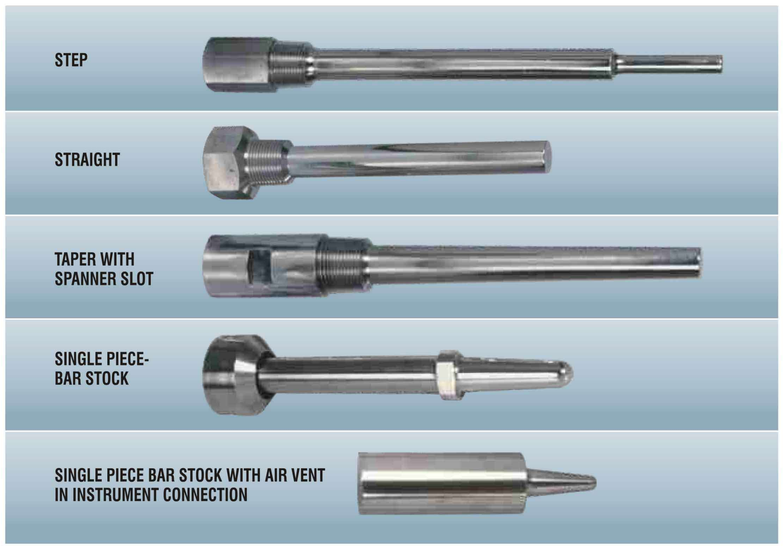
- THREADED THERMOWELL drilled from Bar Stock OR BUILT-IN.
- FLANGED THERMOWELL drilled from Bar Stock & welded flange
- FLANGED THERMOWELL drilled from Bar Stock and in one piece.

THREADED THERMOWELL - DRILLED BAR STOCK



LEG EXTN. T mm	PROC.CONN NPT / BSP	INSIDE BORE DIA mm	OUTSIDE DIAMETER Max / mm			LENGTH MAX U mm
			STRAIGHT	STEP	TAPER	
50	1/2"	6.5	16	16 - 12	16 - 12	300
TO	1/2"	6.5	16	16 - 12	16 - 12	300
225	3/4"	6.5	19	19 - 12	19 - 12	400
	3/4"	9.5	19	--	--	400
	1"	6.5	25	25 - 12	25 - 12	600
	1"	9.5	25	25 - 16	25 - 16	600

• STANDARD INSTRUMENT CONNECTION (IC) : 1/2" NPT/BSP/METRIC THREADS • LONGER 'U' LENGTHS OFFERED BY BUTT WELDED MULTIPLE SECTIONS • Other Requirements - Please Specify



THERMOWELL

FLANGED THERMOWELL - DRILLED BAR STOCK

LEG EXTN. T mm	NST. CONN. NPT / BSP	INSIDE BORE DIA mm	OUTSIDE DIAMETER mm		LENGTH MAX U mm
			STRAIGHT	TAPER	
50 TO 225	½" OR ¾"	6.5 TO 11	16 MIN TO 28 MAX	PARTIAL OR FULL	FULL FULL TAPER : 600mm STRAIGHT : 1000 mm / PARTIAL TAPER LONGER LENGTHS ARE BUTT

MATERIAL

WELL

- SS 304, 316, 304L,316L, 310, 321, 446
- INCONEL 600* or Eqvi.
- INCOLOY 800* or Eqvi.
- NICKEL
- MONEL* or Eqvi.
- TITANIUM
- HASTELLOY 'B' , 'C'* or Eqvi.
- CERAMIC TUBE
- Other - Please Specify

FLANGE

- FORGED ASTM Gr.A182 in SS 304, 316, 304L, 316L, 310, 321,446
- CARBON STEEL A105
- FORGED ASTM A182 Gr. F5, F11, F22, LF1
- NICKEL, INCOLOY 600
- MONEL, INCOLOY 800
- TITANIUM
- TANTALUM -Shield
- Other - Please Specify

FLANGE DETAILS

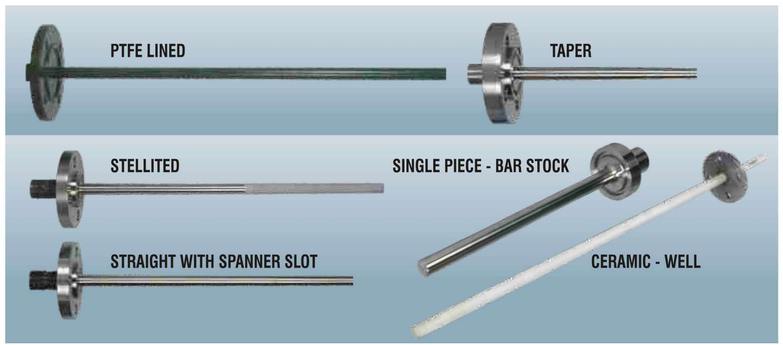
PIPE SIZE	:	1", 1 1/2", 2", 3" NB
PRESSURE RATING	:	150#, 300#, 400 to 600#, 900 to 1500#
FACING	:	RAISED FACE, FLAT FACE, RING JOINT
STANDARDS	:	ANSI B 16.5, DIN, JIS, BS Other Requirements - Please Specify

WELL PROTECTION

- **COBALT BASE ALLOY, Gr. ST6* OR Eqvi.,**
- **TUNGSTEN CARBIDE COATING, PTEE Lined.**
- **Sleeved in MONEL, NICKEL, TITANIUM, TANTALUM**

We can also offer Special Materials conforming to • UREA Grade as per ASTM A 262 Practice C or E (Corrosion Test) • NACE MR - 0175

• INCONEL, INCOLOGY, MONEL - Registered Trademark of INCO ALLOYS LTD., • HASTELLOY - Registered Trademark of CABOT CORPORATION
• STELLITE - Registered Trademark of STELLITE CORPORATION



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