

## TE.25 High Accuracy Sensor Assembly c/w Opened-end Thread Thermowell

**The Platinum Resistance Temperature Detector (RTD)**, Pt100 to IEC 60571 advantages include chemical stability, relative ease of manufacture, the availability of wire in a highly pure form and excellent reproducibility of its electrical characteristic. The result is a truly interchangeable sensing resistor which is widely commercially available at a reasonable cost.

Installation of RTD is simplified since special cabling and cold junction considerations are not relevant. Similarly, instrumentation consideration are less complex in term of input configuration and enhanced stability. The Platinum RTD is one of the most linear and practical temperature transducer in existence.

**The Callendar - Van Dusen coefficients** A, B and C for a standard sensor are stated in **IEC751**. If a standard sensor is not available or if a greater accuracy is required then can be obtained from the coefficients in the standard, the coefficients can be measured individually from each sensor.

The simple coefficient can be determined as below,

$$R_t = R_0 [1 + At + Bt^2 + C(t-100)t^3]$$

In which C is only applicable when  $t < 0^\circ\text{C}$ .

$$A = \alpha + \frac{\alpha^2}{100} \quad B = -\frac{\alpha^2}{100^2} \quad C = -\frac{\alpha^2}{100^4}$$

According to this equation the error will be less than  $0.03^\circ\text{C}$  in the measurement of temperature between  $0$  to  $50^\circ\text{C}$  ranges.

Tolerance of PT 100,  $\frac{1}{10}$  DIN, as per IEC 60751

Temp ( $^\circ\text{C}$ )	Resistance ( $\Omega$ )	Tolerance ( $\pm^\circ\text{C}$ )
0.01	100.004	0.03
15.00	105.849	0.0375
29.765	111.581	0.0498

**Thermistors** are temperature Sensors that are made from a variety of metal-oxide semiconductor materials. The semiconductor material used determines the temperature range, sensitivity and resistance ranges involved in its application.

In order to achieve the accurate temperature reading, the resistance / temperature curve of the device also need to use the **Steinhart-Hart equation and coefficients** for approximation;

$$\frac{1}{T} = a + b \ln(R) + c (\ln(R))^3$$

$$a = \left( \frac{1}{T_0} \right) - \left( \frac{1}{B} \right) \ln(R_0) \quad b = \left( \frac{1}{B} \right) \quad c = 0$$

Where the temperature are in Kelvin and  $R_0$  is the resistance at temperature  $T_0$  ( $25^\circ\text{C} = 298.15^\circ\text{K}$ )

According to this equation the error will be less than  $0.03^\circ\text{C}$  in the measurement of temperature between  $0$  to  $50^\circ\text{C}$  ranges.

Resistance @  $+25^\circ\text{C} = 10,000 \text{ Ohm}$  ( $10\text{k} \Omega$ ) Nominal

Temperature coefficient @  $+25^\circ\text{C} = -4.4\% / ^\circ\text{C}$

Temp ( $^\circ\text{C}$ )	Resistance ( $\Omega$ )	Tolerance ( $\pm^\circ\text{C}$ )
0.01	32650	0.05
15.00	15711	0.05
29.765	8139	0.05

\*Combines Uncertainty  $\pm 0.03 \text{ Deg C}$

### Standard Lead Wire

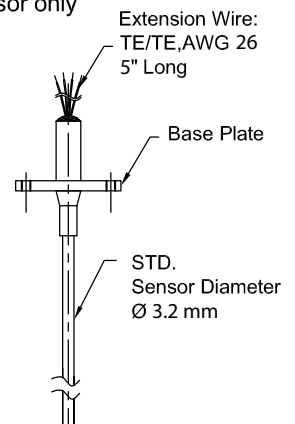
All standard RTD sensor is stranded as Teflon insulation. Teflon insulated leads are rated at  $200^\circ\text{C}$  maximum.

### Connection Head Type

Recommended to use polypropylene material rather than die cast aluminum in order to prevent the heat loss which will cause when it is passing through the housing. Standard colour for polypropylene is white and die cast aluminum head is available as either blue or silver upon requested



### Insert sensor only



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Sensor Type												
R	RTD , PT 100 , 1/10 DIN , ±0.03°C at 0°C											
T1	Thermistor 10 K , ±0.05°C at (0 to 50°C)											
Tolerance Type												
1	± 0.03°C at 0 °C ( For 1/10 DIN ) , IEC 751 , combined uncertainty +/- 0.03°C											
2	± 0.05°C at ( 0 to 50 °C ) For Thermistor 10 K , combined uncertainty +/- 0.03°C											
Sensor Sheath												
TU1	Tubing-RTD-Ø 3.2 mm -Single-4 Wires-SS 316											
TU3	Tubing-10K Thermister-Ø 3.2 mm -Single-2 Wires-SS 316											
*Note: 10K Thermistor, 4 wires available upon request												
Wire Junction												
U	Ungrounded ( Std for this design )											
Complete design												
W	With Open-end Thread thermowell											
WO	Thermowell is not required											
B	Base plate and terminal block											
L1	Epoxy holder and lead wire ( TE/TE, AWG 26 ) , 125 mm (STD)											
( Note : 150 mm , 200 mm , 250 mm and 300 mm are available as option )												
Process connection (PC)												
PC1	1/2" NPT M											
PC2	1/2" BSP M											
-	Not Applicable											
Y2	Special version to be specified											
Thermowell Stem Dimensions												
TW1	Root Dia : Ø14 mm , Tip Dia : Ø10.5 mm , Bore Dia : Ø6.6 mm											
-	Not Applicable											
Y3	Special version, to be specified											
Thermowell Insertion Length/Sensor Length if thermowell is not require												
XXXX	To be specified ( e.g 0125 mm for 125 mm long )											
Lagging length "T"												
T	45 mm (STD )											
Y4	Special version to be specified											
Accessories												
T1	Test Plug Size : 1/4 " NPT M , Material : SS 316											
V1	Ball valve Size : 1/4" NPT F , Material : SS 316											
VT	Ball valve (V) and Test plug (T) , size : 1/4" NPT											
-	Not Applicable											
Y5	Special version, to be specified											
Housing / Enclosure												
W1	Weather Proof , IP65, Polypropylene , White colour											
W2	Weather Proof , IP65, Die Cast Aluminum , Blue colour											
W2	Weather Proof ,IP 65, Die Cast Aluminum , Silver colour											
-	Connection head is not required											
Y6	Special version to be specified											
Accessories ( from customer to assembly with )												
TX	Head mounted transmitter											
-	Not Applicable											
Documents ( Optional )												
Calibration Certificate {RTD,PT100 , 1/10 DIN}												
1	Three Points ( 0 to 50°C)											
(Note : Non-Singlas / Singlas Calibration / Factory Test report is available upon request )												
TE25	Order Code											
1	2	3	4	5	6	7	8	9	10	11	12	13