

# Temperature Sensors

## Description

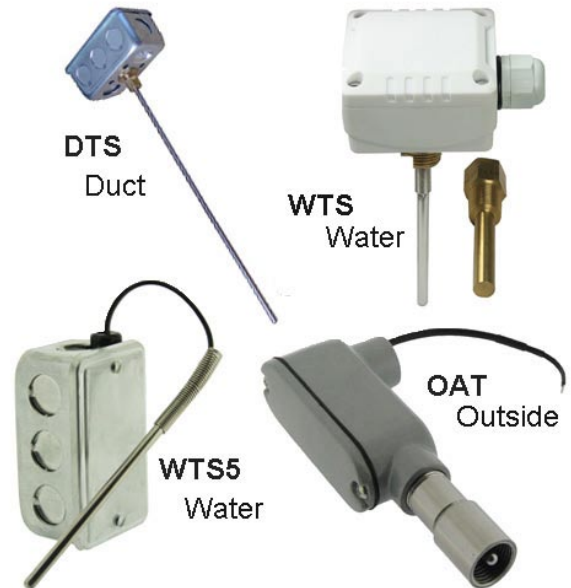
Temco Controls manufactures temperature sensors for the air conditioning industry.

This document shows the enclosures and temperature vs. resistance curves for the standard sensors.

## General

The sensors employ precision interchangeable thermistors and RTD which are compatible with all the major building automation systems.

- Designed for temperature sensing in an HVAC and light industrial control applications.
- Precision interchangeability eliminates the necessity for individual circuit calibration.
- Data sheets for the standard items appear on the web at [www.temcocontrols.com](http://www.temcocontrols.com).
- Temco is able to produce custom sensors in small volume at standard sensor pricing.



There are several sensor element ranges to choose from, which guarantee compatibility with all popular DDC systems. The sensor elements are precision thermistors or platinum RTDs. Field calibration is not generally required. The probe is epoxy sealed to prevent moisture from migrating into the probe. Custom probe lengths, wire types and sensor elements are available for large OEM projects. Ask about our plastics & metal manufacturing capabilities for custom housings as well.

Part # Suffix	Sensor	Typical User
2	100 ohm Platinum 3-wire	Honeywell
5	1,801 ohm Thermistor	t.a.c. / CSI
6	3,000 ohm Thermistor	Alerton
-7	10,000 ohm Thermistor 'Type2'	Trane, Automated Logic, Temco, t.a.c., CSI, Solidyne, Alerton
9	100,000 ohm Thermistor	Siemens(Landis & Staefa)
11	LM334 IC sensor	t.a.c. / CSI
12	1000 ohm Platinum	Invensys(siebe), Honeywell, Johnson Controls, Siemens (Landis & Staefa)
13	1000 ohm Nickel	Johnson Controls
20	20,000 ohm Thermistor	Honeywell
21	LM335 IC Sensor	Solidyne, IECC
-24	10,000 ohm Therm, 'Type 3'	Andover, AAM, Teletrol, Invensys(Siebe), Multinet, Delta, Carrier, KMC, Temco

## Specifications:

Sensor Property	Specification
Thermistor Accuracy	+/- 0.2°C
Platinum RTD Accuracy	+/- 0.4°C
Thermistor Range	-70°C to 150°C
Platinum RTD Range	-200°C to 300°C
Probe Material	Stainless Steel
Cable Properties	FT4, 80°C, 600V

## Duct Temperature Sensor

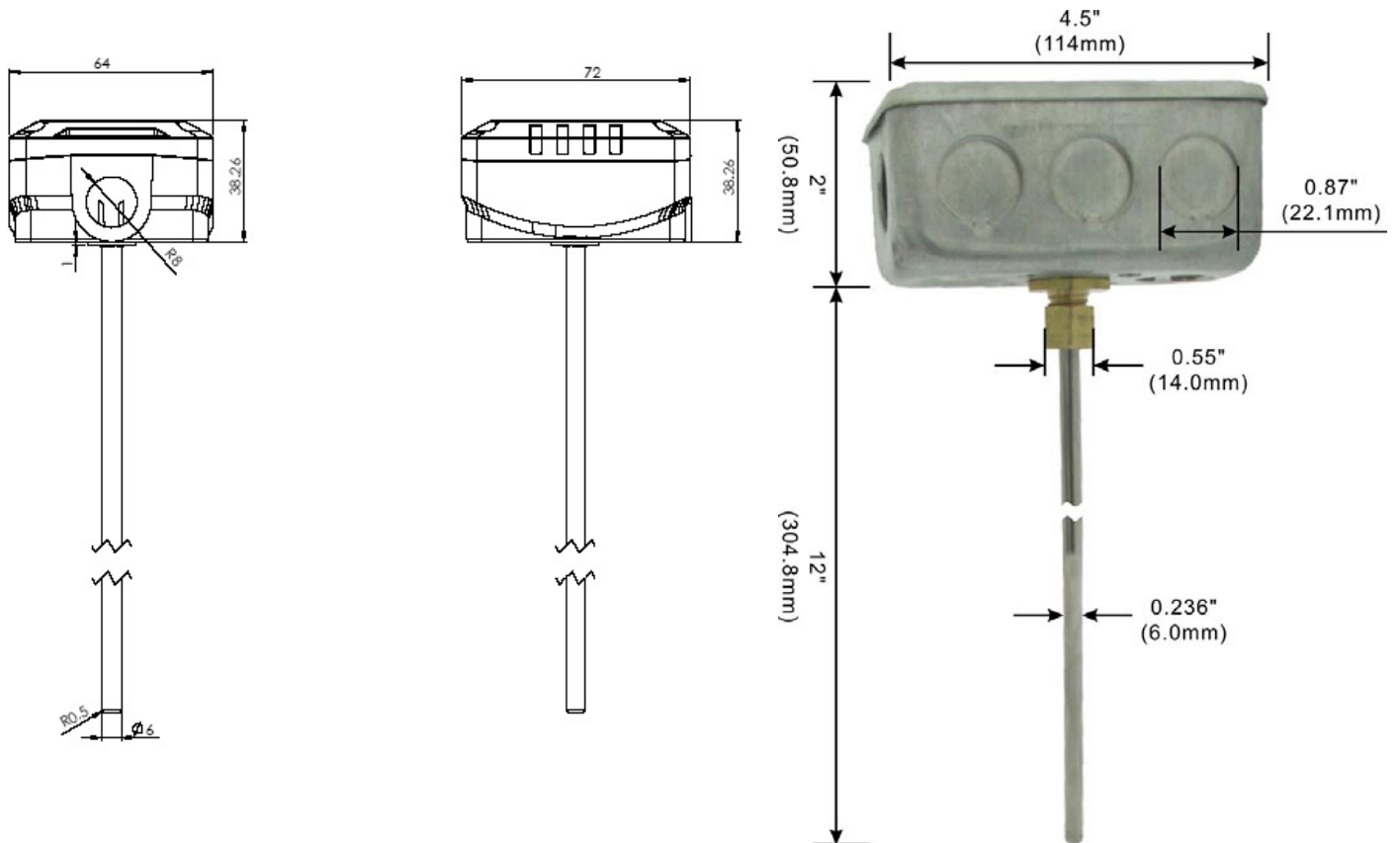
Plastic Water Resistant Box:

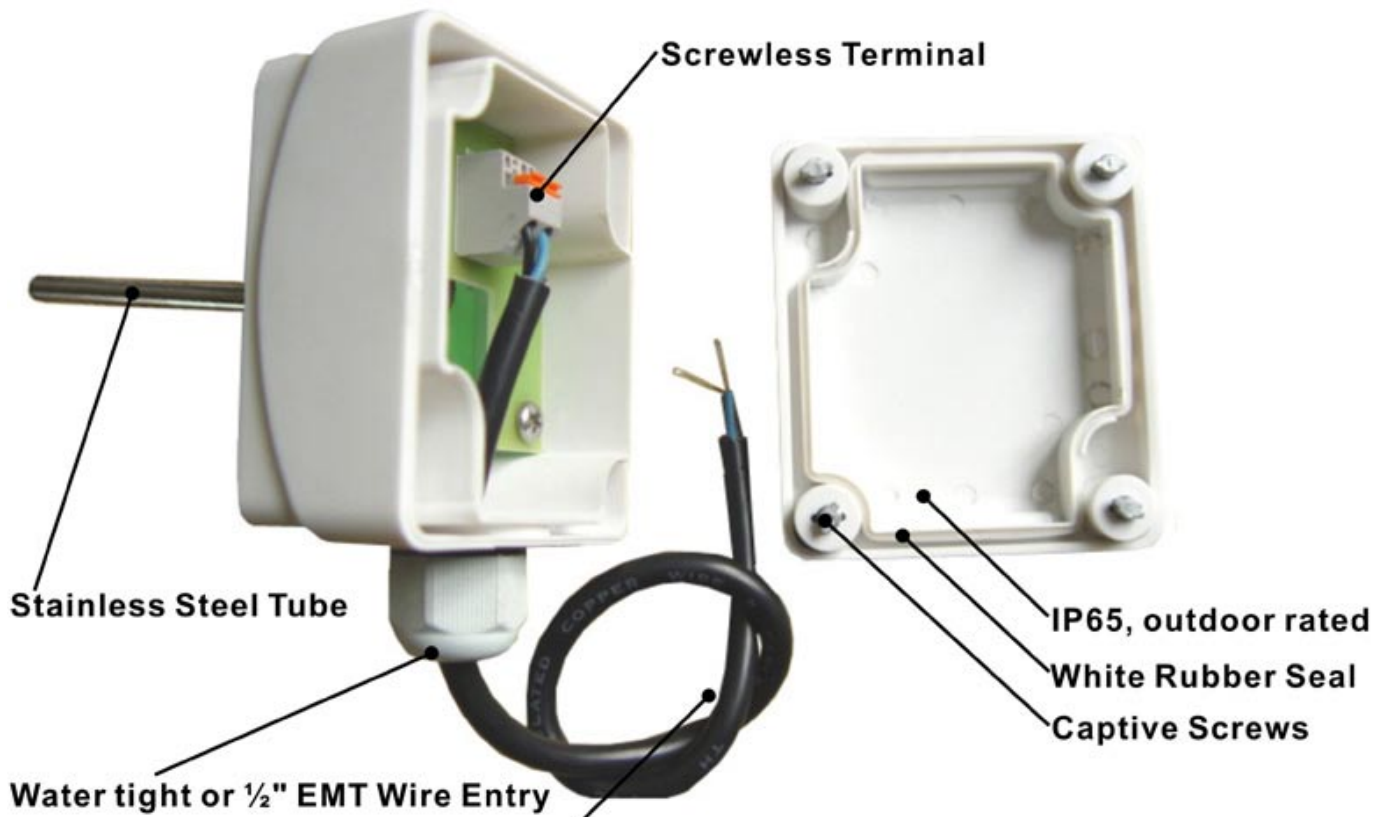


Metal Electrical Box:



## Dimensions(mm):





Cable showing only to demonstrate the connection method only, not included.

Ordering Information:

**DTS - PE - 7 - 12**

Code	Description
DTS	Duct Temperature Sensor

Code	Enclosure
PE	Plastic Box for EMT Connection
PW	Plastic Water Resistant Box
-	Electrical Box

Code	Temp. Curve
7	Type 2
12	1Kohm RTD
24	Type 3

Code	Probe Size
8	8" Probe
12	12" Probe

## DTS-FL: Flange Mount Duct Temperature Sensor

### Descriptions

This sensor is used to measure the supply and return temperature in HVAC system. The flange mount design makes it easy to install the sensor in tight quarters. There are several sensor elements to choose from which guarantee compatibility with all popular DDC systems. The probe in the photo is out standard model which is always in stock, it has a 8 inch probe and 6 inch long cable, and employs either a precision thermistor or platinum film sensor field calibration is not generally required. The 10ft(3m) cable is plenum rated.



### Construction

The sensor is a high quality unit manufactured to high standards, using materials and assembly techniques. The probe material is stainless steel with a welded and ground tip. The DTS probe is baked and then epoxy sealed to eliminate long term moisture problems. The flange accepts two #6 screws, and is made from glavanized steel.

### Ordering Information:

DTS-FL-12-12-7

Code	Description	Code	Description	Code	Probe Size	Code	Wire Size	Code	Temperature Curve
DTS	Duct Temperature Sensor	FL	Flange Mount	4	4" Probe	6	6" Wire	6	3 Kohm RTD
				8	8" Probe	12	12" (1ft) Wire	7	Type 2
				9	9" Probe	120	120" (10ft) Wire	12	1 Kohm RTD
				12	12" Probe			24	Type 3

## OAT: Outside Air Temperature Sensor

### Descriptions

This sensor is used to measure the outside air temperature to allow the DDC system to coordinate the mechanical systems with actual building load conditions, enabling such strategies as free cooling, optimum start / stop, and supply temperature reset.

The housing is made from PVC electrical fittings which shield the probe from direct sunlight. The probe is manufactured to industrial standards. There are three thermistor based models, and one RTD version to provide compatibility with the majority of DDC systems. The sensors are accurate enough that calibration is not usually required.



### Specifications

Sensor Property	Specification
Thermistor Accuracy	±0.2 °C
Platinum RTD Accuracy	±0.4 °C
Thermistor Range	-70 ~ 150 °C
Probe Material	Stainless Steel
Cable Properties	FT4, 80 °C, 600V

### Construction

The sensor probe is made from stainless steel which is welded, ground down, and finally pressure tested before assembling. The probe is then baked and epoxy sealed to provide long term protection from moisture.

The sensor housing is a PVC electrical enclosure which is UL approved for outdoor use. The housing extends over the probe to protect from sunlight radiation.

The sensor lead extends 12" from the enclosure, making it long enough to reach a junction box and terminate inside the building. The thermistor models are accurate to 0.2 °C while the platinum RTD is accurate to 0.5 °C.



### Installation

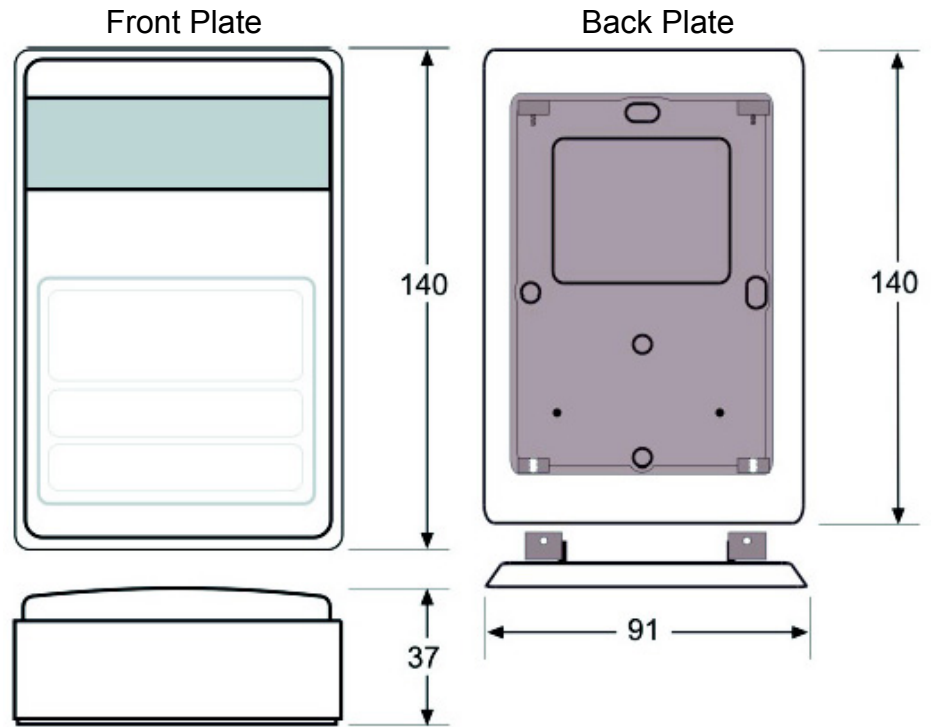
The OAT sensor can be mounted on the outside of the building using the following guidelines:

- Choose a spot on the north face which will be out of sunlight for as much of the day as possible.
- Mount the sensor where it can be serviced, staying away from exhaust ducts. Point the probe downwards to avoid catching rain.
- To install the sensor, drill a 3/4" (20mm) hole through the wall, and pipe the sensor to an electrical junction box on the inside of the wall. The sensor has a female 1/2" NPT threaded fitting to accept a short length of 1/2" pipe or PVC. Two conductors are required, 18ga, unshielded twisted pair is common.

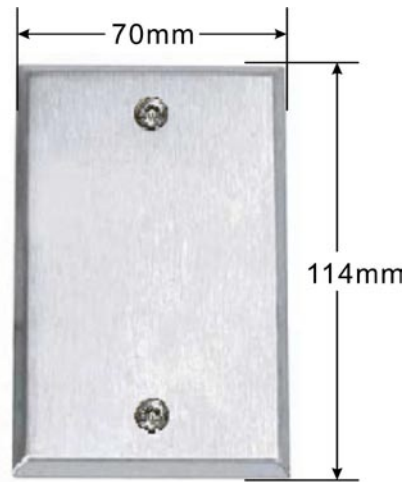
Room Temperature Sensor

Dimensions(mm):

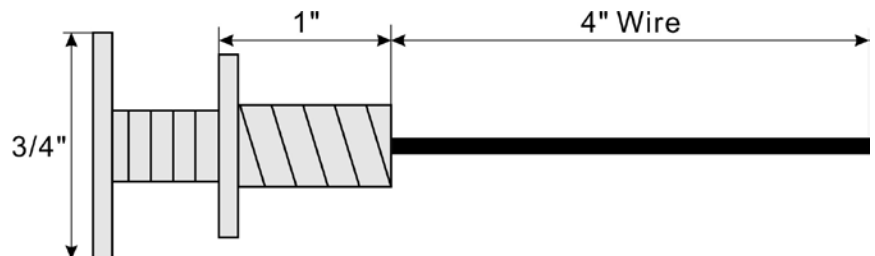
RTS:



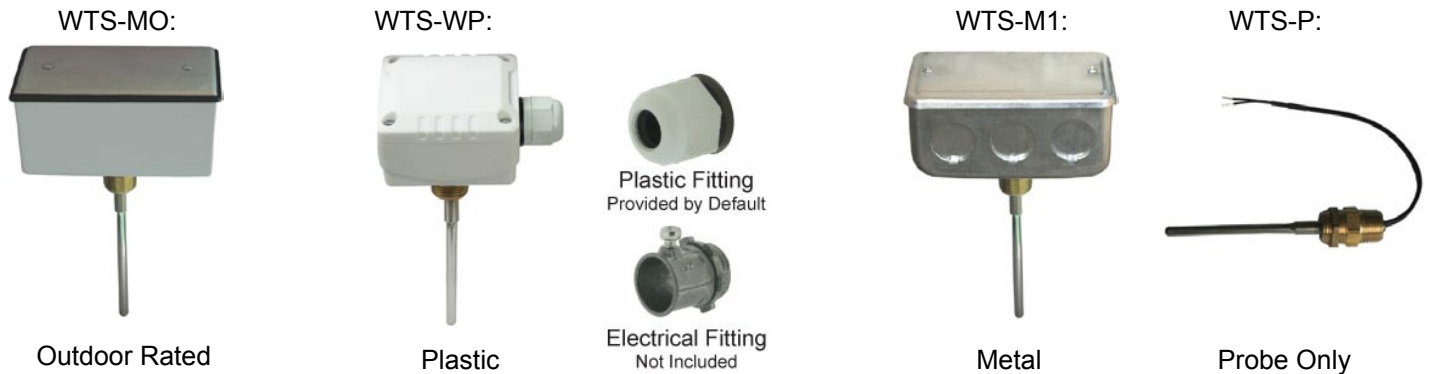
RTS1:



RTS3:



## WTS Series Water Temperature Sensor



### Installation:

Locate water temperature sensor at least a few pipe diameters downstream any heat or cooling source:

- A 1/2" NPT female pipe fitting is welded into the pipe. These fittings are usually supplied and installed by the piping trade under direction of the controls trade.
- Choose an orientation where any condensation will not collect, such as the top of a horizontal pipe section or at a 45° angle from horizon.
- Before threading the sensor into the well, deposit some thermal paste in the bottom of the well to improve heat conduction between the metal parts.
- The sensor is wired with two conductors, normally 18ga unshielded twisted pair.

## WTS5 Series Strap on Water Temperature Sensor



### Installation:

For measuring water temperature, the probe is strapped with plastic tie wraps or a metal strap onto the outside of the pipe and covered with insulation. The electrical box is mounted on a strut bar or on the wall near the pipe. Two conductors are required, 18ga, unshielded twisted pair is common.

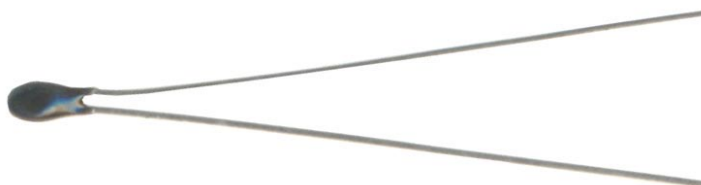
## RTS-Raw 10K NTC Thermistor

### Specifications:

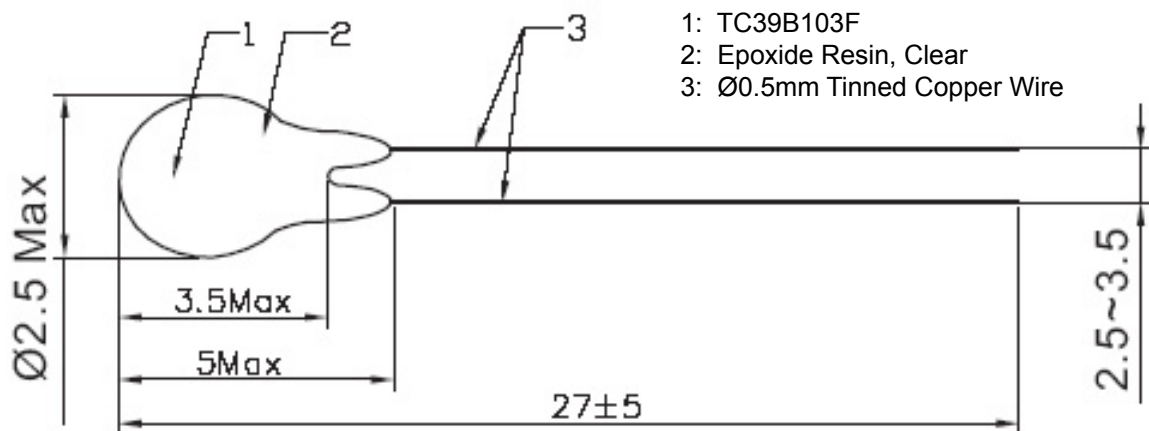
**Rated Resistance:**  $R_{25}=10.00\text{K}\Omega\pm 1\%$

**B-Value:**  $B_{25/50}=3950\Omega\pm 1\%$

**Operating Temperature:**  $-30 \sim +80^{\circ}\text{C}$



### Dimensions (mm):



## RTS-Bead-4: Thermistor bead, 4"(10cm) lead, 10mm wire trimmed and tinned, 0.2DegC accuracy

### Specifications:

**Zero Power Resistance:**  $R_{25}=10.00\text{k}\Omega \pm 1\%$

**B-Value:**  $B_{25/50}=3950\text{K} \pm 1\%$

**Operating Temperature Range:**  $-30 \sim +80^{\circ}\text{C}$

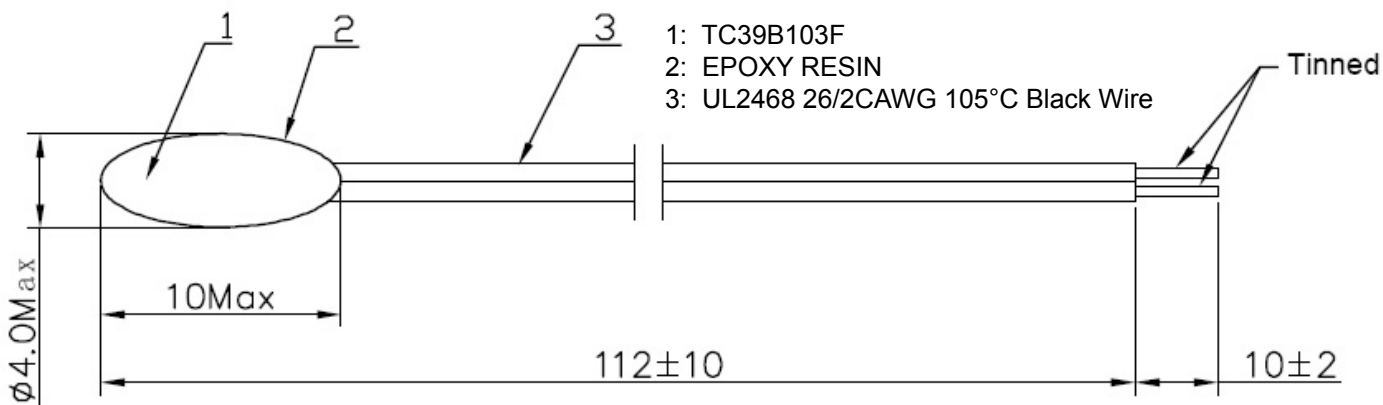
**Insulated Resistance:** 500VDC in water,  $>100\text{M} \Omega$

**Breakdown Voltage:** 1500VAC in water, 1 minute.

No flash over (Leak Current: 1mA Max).



### Dimensions (mm):



## PRB-2-10-6 Temperature Sensor: 0.6" SS probe temp sensor, 10K thermistor, Type 2

### Specifications:

**Nominal Resistance:**  $R_{25}=10.00k\Omega\pm 1\%$

**B Value:**  $B_{25/50}=3950K\pm 1\%$

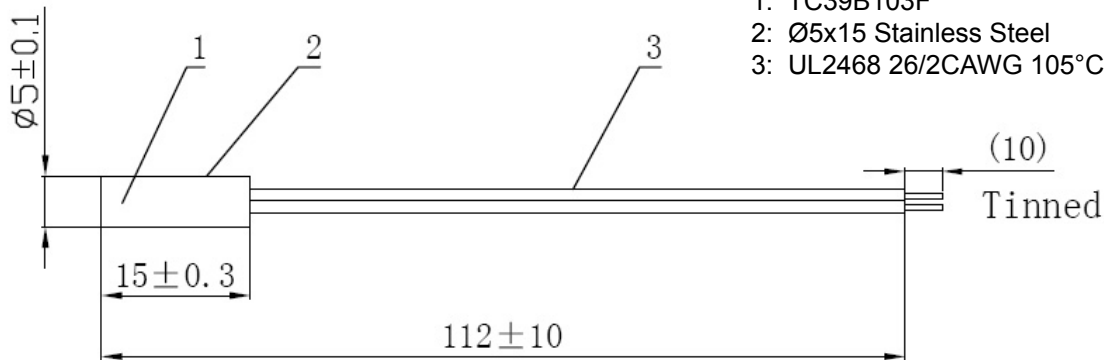
**Optimal Operating Temperature Range:**  $-30 \sim +80^{\circ}C$

**Insulated Resistance:** 500VDC in water,  $>100M\Omega$

**Breakdown Voltage:** 1500VAC, 1min.



### Dimensions (mm):



- 1: TC39B103F
- 2: Ø5x15 Stainless Steel
- 3: UL2468 26/2CAWG 105°C Black Wire

## OAT3000 Temperature Sensor

### Specifications:

**Nominal Resistance:**  $R_{25}=10.00k\Omega\pm 1\%$

**B Value:**  $B_{25/50}=3950K\pm 1\%$

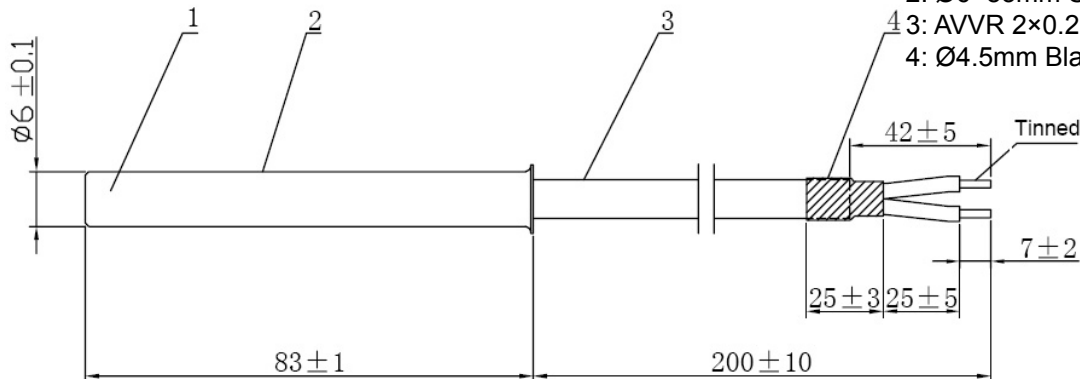
**Optimal Operating Temperature Range:**  $0 \sim +50^{\circ}C$

**Insulated Resistance:** 500VDC in water,  $>100M\Omega$

**Breakdown Voltage:** 1500VAC, 1min.



### Dimensions (mm):



- 1: TC39B103F
- 2: Ø6x83mm Stainless Steel Enclosure
- 3: AVVR 2x0.2mm<sup>2</sup>, 105°C black tube
- 4: Ø4.5mm Black, 125°C, Heat-shrink tube

PRB - 2 - 10 - 6

Code	Description	Code	Type	Code	Thermistor	Code	Probe Size
PRB	Probe	2	Standard Type 2	10	10K Thermistor	6	0.6" Probe

**Temperature Curves:**

<b>Thermister Type, Ohms / Part Number Suffix</b>						
<b>Part # -&gt; DegC</b>	<b>3K -6</b>	<b>10K Type2 -7</b>	<b>10K Type3 -24</b>	<b>20K -20</b>	<b>100K -9</b>	<b>1K RTD -12</b>
-40	100,701	335,671	239,700	814,000	4,067,212	843
-35	72,658	242,195	187,500	578,600	2,890,843	863
-30	53,005	176,683	135,300	415,600	2,077,394	882
-25	39,073	130,243	107,105	301,000	1,508,530	902
-20	29,092	96,974	78,910	220,600	1,106,485	922
-15	21,868	72,895	63,225	163,600	819,378	941
-10	16,589	55,298	47,540	122,380	612,366	961
-5	12,694	42,314	38,515	92,300	461,683	980
0	9,795	32,650	29,490	70,200	351,017	1,000
5	7,618	25,395	23,460	53,800	269,041	1,020
10	5,971	19,903	18,790	41,560	207,807	1,039
15	4,714	15,714	15,130	32,340	161,702	1,059
20	3,748	12,493	12,260	25,340	126,729	1,078
25	3,000	10,000	10,000	20,000	100,000	1,105
30	2,416	8,056	8,194	15,884	79,428	1,117
35	1,959	6,530	6,752	12,696	63,489	1,136
40	1,597	5,324	5,592	10,210	51,058	1,155
45	1,310	4,366	4,655	8,258	41,301	1,175
50	1,080	3,601	3,893	6,718	33,598	1,194
55	896	2,985	3,327	5,494	27,479	1,205
60	746	2,487	2,760	4,518	22,593	1,232
65	625	2,082	2,375	3,734	18,669	1,244
70	526	1,751	1,990	3,100	15,502	1270.7
75	444	1,480	1,724	2,586	12,932	1,290
80	377	1,256	1,458	2,186	10,837	1308.9
85	321	1,070	1,271	1,824	9,121	1,328
90	275	916	1,084	1,542	7,709	1,347
95	236	787	950	1,308	6,542	1,366
100	204	679	817	1,114	5,574	1385
105	176	587	720	953	4,767	1,404
110	153	510	624	818	4,093	1422.9
115	133	445	553	705	3,525	1,442
120	117	389	481	609	3,046	1,460

## Wells (Brass and Stainless Steel):

### Descriptions:

The Stainless Steel and Brass thermowells are designed for mounting temperature sensors in pipes and tanks. The thermowells are designed to reduce the stress encountered in a flowing fluid installation which produces a constantly oscillating force that can eventually crack a probe unless mounted within one of these wells. The wells are designed to handle the stress, while providing good thermal contact with fluid. They also provide isolation, if the sensor needs to be serviced the system can remain in operation without having to drain the lines.

### Features & Options:

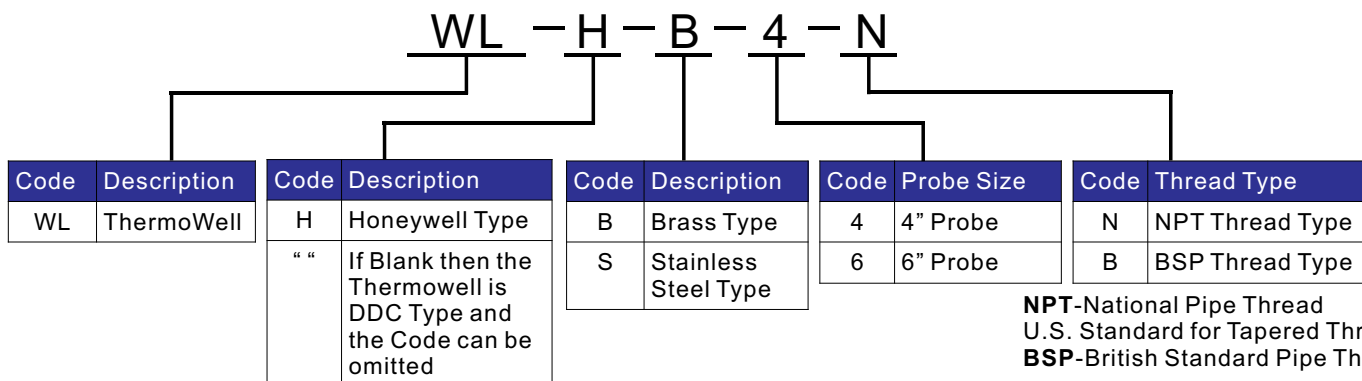
- Three Lengths: 2", 4" and 8" (Fit Standard Immersion Unit Lengths)
- Stainless Steel (304 or 316) or Brass
- Two Part (Welded) or Machined Construction
- Other Lengths or Materials Available Upon Request
- Limited Lifetime Warranty



2 Part (Welded) Temcowell Standard Temcowells available from Temco include 304 Stainless Steel (machined), 316 Stainless Steel (machined), brass (machined), and two part (welded) stainless steel. These wells are offered in 2", 4" and 8" lengths with 1/2" NPT and 1/2" BSP external. Other lengths and thread diameters are available upon request. The Thermowell chosen for the installation is governed mainly by the corrosion conditions the well will face. The machined stainless steel wells all come with a mirror polish to provide maximum corrosion resistance. Occasionally, the material consideration is one of strength rather than corrosion. For example, a machined stainless steel well may be required for high pressure water service where otherwise a brass or two part stainless steel well would be satisfactory from a corrosion standpoint. market require.

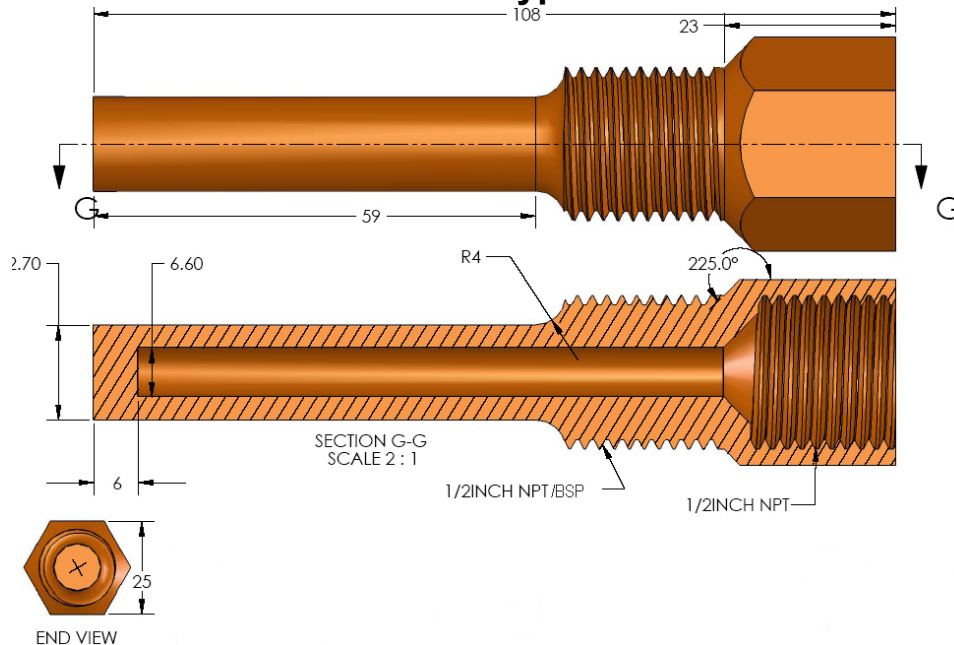
Well failures, in most cases, are not due to the effects of pressure or temperature on the well. The calculations necessary to provide adequate strength, under given conditions, are familiar enough to permit proper choice of wall thickness and material. The values shown in Table 1 are conservative, and intended primarily as a guide.

Wells are also safe if the resonant frequency is well below the wake frequency or if the fluid velocity is constantly fluctuating through the critical velocity point. Even so, if the installation is not hampered by the use of a sufficiently stiff well.



Dimensions

DDS Type



Honeywell 10mm Capillary Tube

