

# Temperature Sensors

## Description

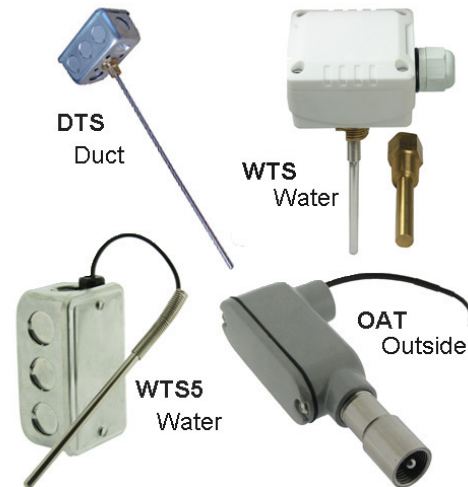
Temperature sensors are used to measuring the temperature for the air conditioning industry.

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.



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 Thermistor, 'Type 3'	Andover, AAM, Teletrol, Invensys(Siebe), Multinet, Delta, Carrier, KMC, Temco

## Specification

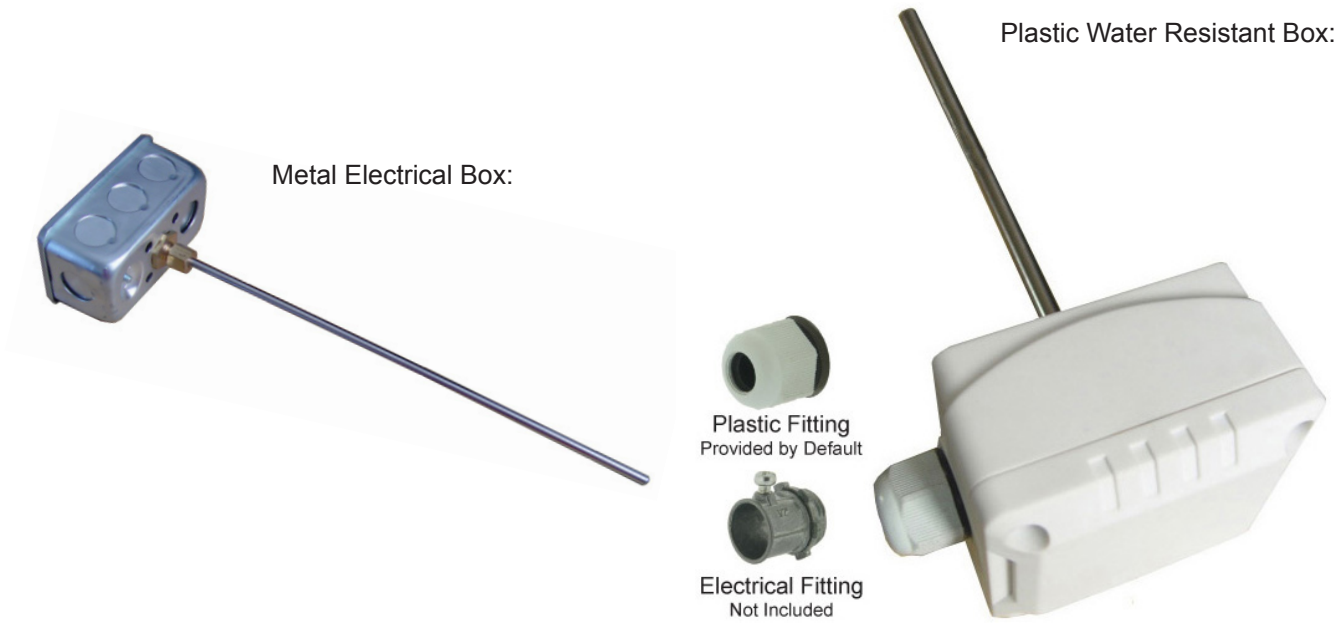
Sensor Type	Accuracy	Operating Temperature Range
10,000 ohm Thermistor 'Type2'	+/- 0.2°C	-40°C to 125°C
10,000 ohm Thermistor, 'Type 3'	+/- 0.2°C	-50°C to 105°C
100,000 ohm Thermistor	+/- 0.3°C	-40°C to 125°C
1000 ohm Platinum	+/- 0.4°C	-200°C to 300°C
100 ohm Platinum	+/- 0.4°C	-200°C to 300°C
Probe Material	Stainless Steel 304, 1mm thick wall	
Cable Property	FT4, 105°C, 300V standard or 200°C, 300V high temperature on request.	
Cable Material	PVC standard or High temperature silicon available on request.	
Exposure Rating	IP65, for outdoor use	

## Temperature Sensors

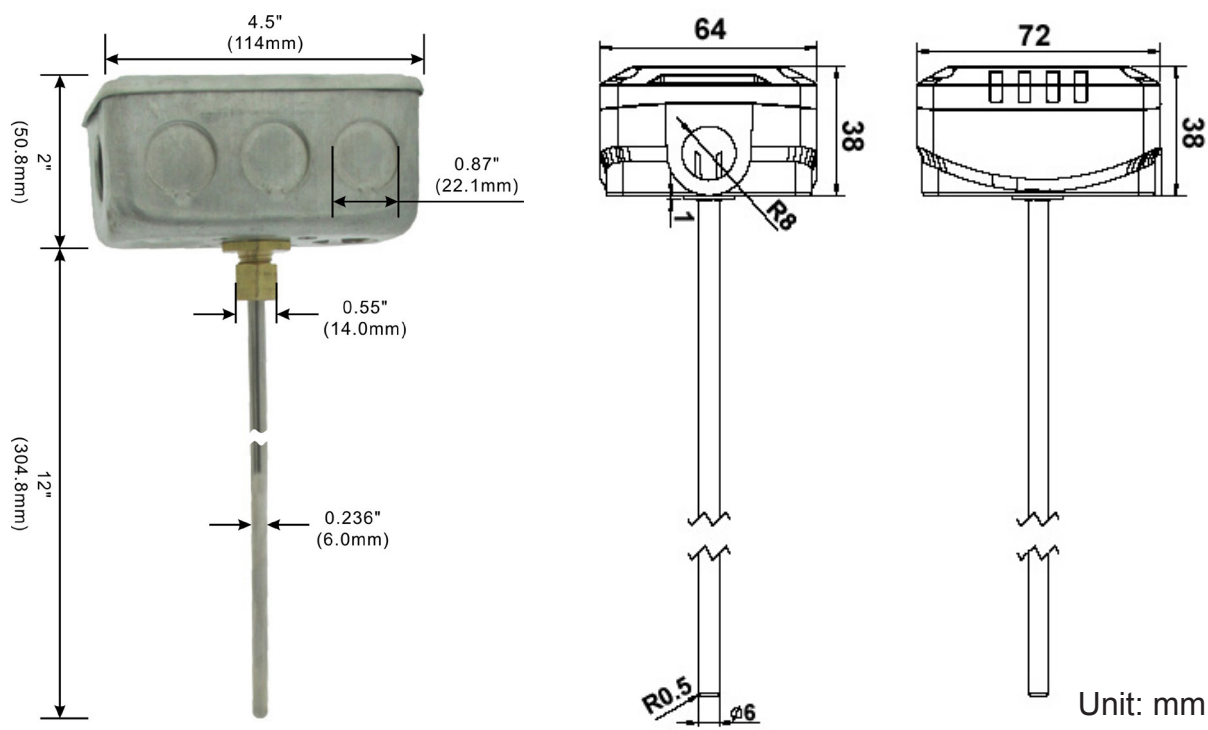
### Temperature Curves:

Thermister Type, Ohms / Part Number Suffix						
Part # -> DegC	3K 6	10K Type2 7	10K Type3 24	20K 20	100K 9	1K RTD 12
-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

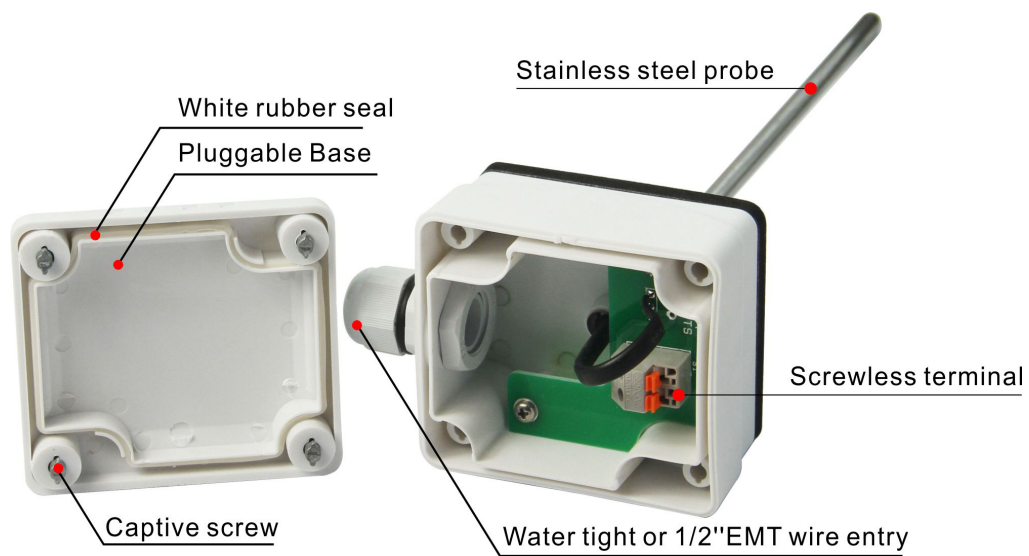
Duct Temperature Sensor



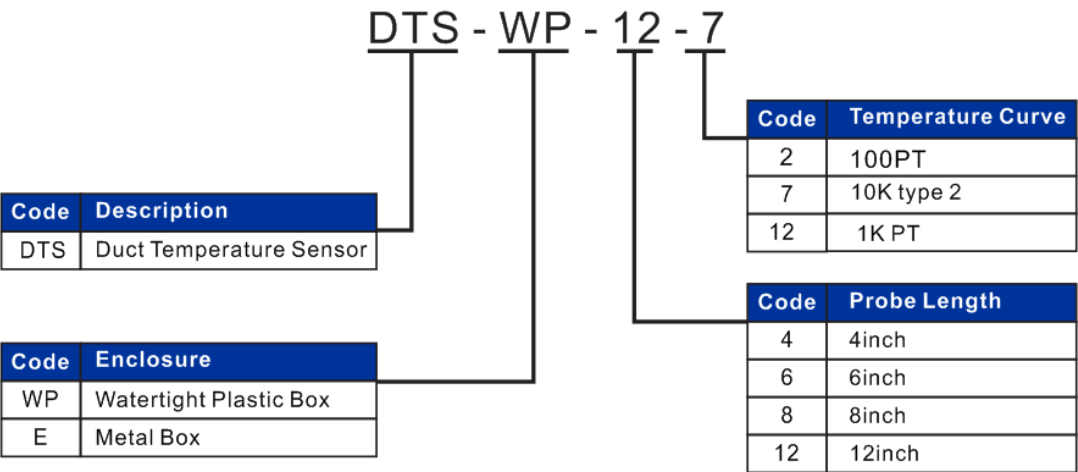
Dimension:



Temperature Sensors



Part Number Scheme:



\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.



DTS-FL: Flange Mount Duct Temperature Sensor

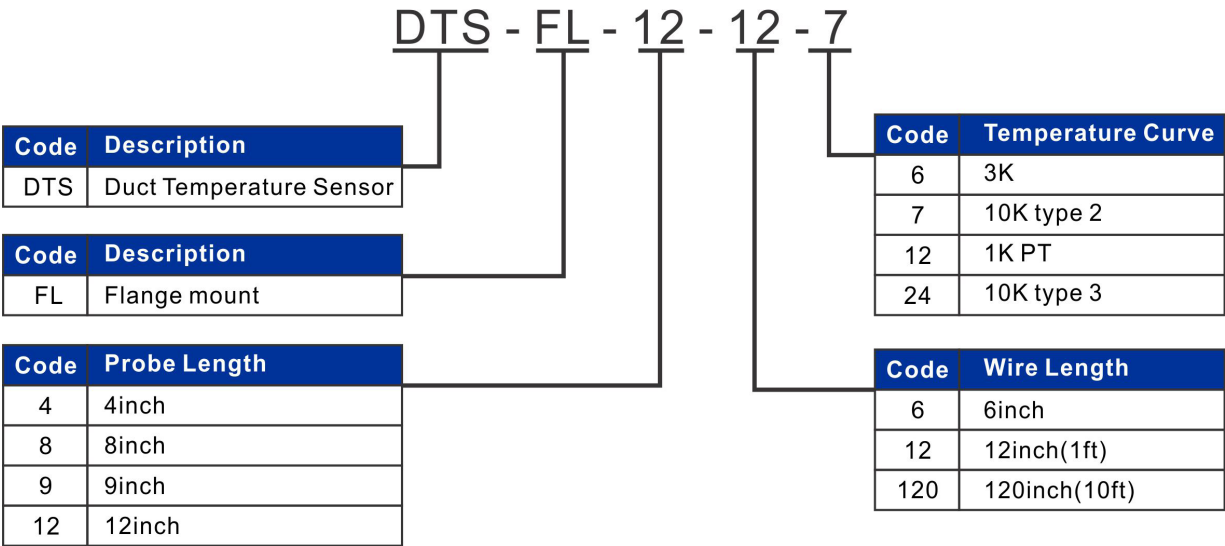
Description:

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.



Contruction:

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.



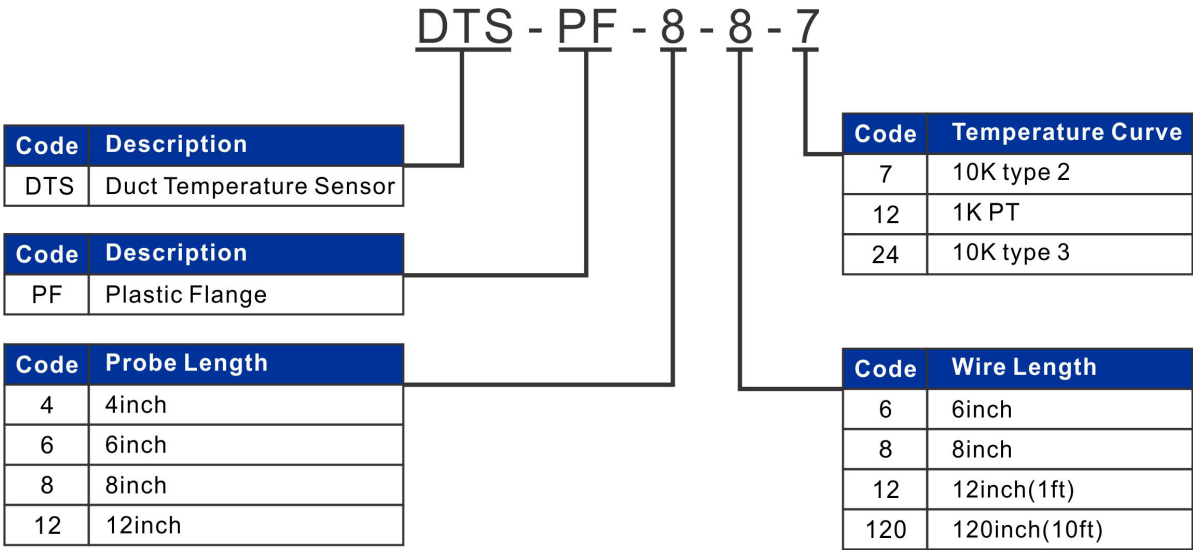
\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

DTS-PF: Plastic Flange Duct Temperature Sensor

This sensor is used to measure the supply and return temperature in HVAC system. The plastic 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 8 inch long cable, plenum rated cable, 10K type 2 thermistors.



Part Number Scheme:



\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

### OAT: Outside Air Temperature Sensor

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.



#### 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.



#### Installation:

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.

OAT: Outdoor Air Temperature Sensor

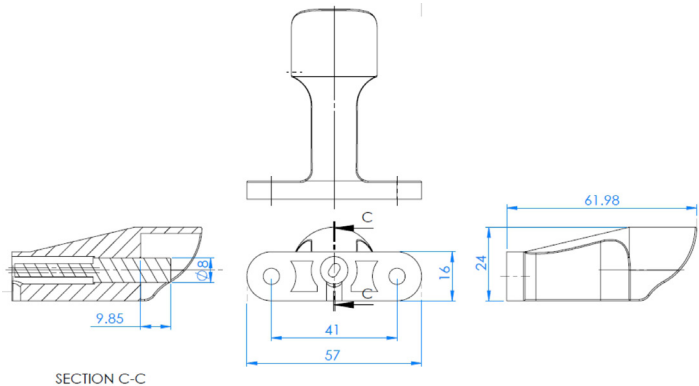


Description:

The temperature sensor is designed to measure outdoor air temperature. The sensor is designed for mounting in a standard 1/2" knock out. The temperature sensor uses a 10K  $\Omega$  thermistor. The thermistor is enclosed in a plastic housing. The sensor has a short 20AWG black leads. It is designed for use in residential and commercial building automation controls. It features a fast response, precision thermistor sensing element that is totally sealed against the outdoor elements. The PVC sun-shield prevents false readings from direct sunlight. An optional weatherproof electrical box allows for simple installation and provides an extra rugged and reliable sensor for energy management and HVAC applications.

Features:

- General purpose outdoor air temperature sensor
- Available in threaded PVC version with rugged weatherproof electrical box
- Easy installation - just threads into mounting hole or standard handy box installation
- Fully potted metal housing protects sensing element and provides fast, accurate temperature sensing
- Cost efficient design
- Sturdy construction - all plastic housing with PVC solar shield with optional weatherproof electrical box



Part Number Scheme:

OAT - M - 7

Code	Description
OAT	Outdoor Air Temperature Sensor

Code	Enclosure
M	Metal Enclosure
P	Plastic Enclosure

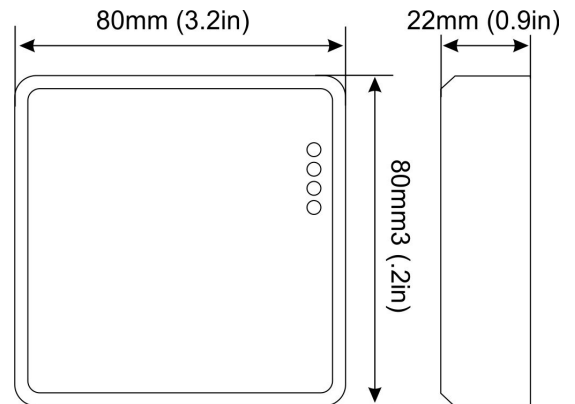
Code	Temperature Curve
6	3K
7	10K type 2
9	100K
12	1K PT
24	10K type 3

\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

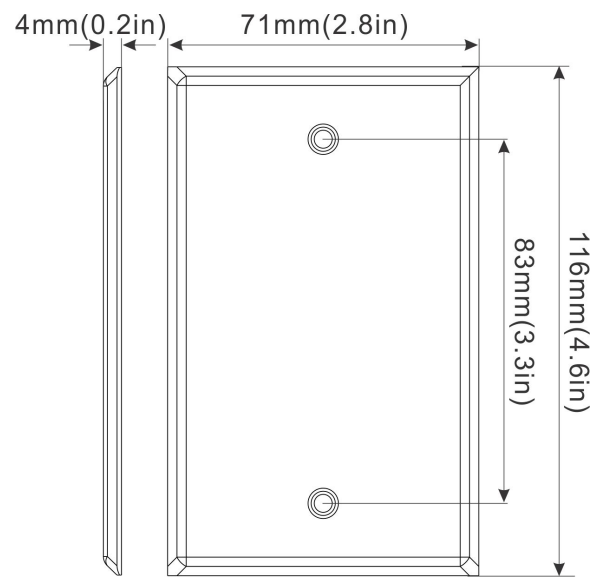
## Temperature Sensors

### Room Temperature Sensor

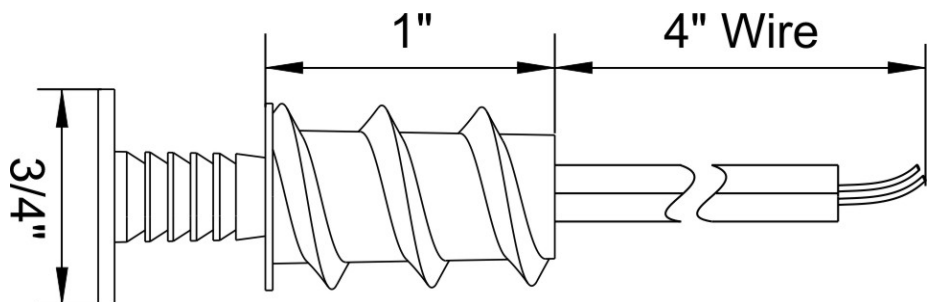
RTS: Room temperature sensor, 10K type 2



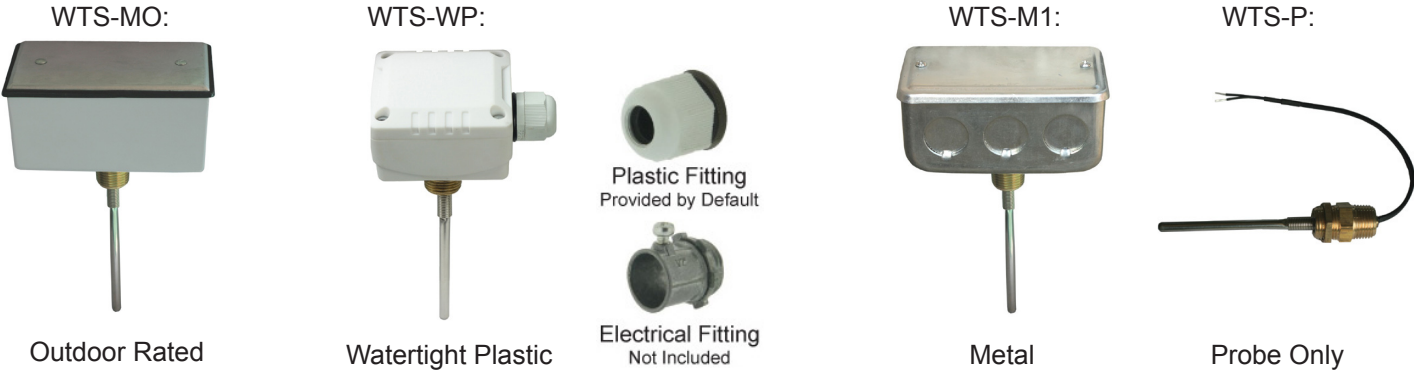
RTS1: Tamper proof room temperature sensor, 10K type 2



RTS3: Flush mounting sensor, 10K type 2



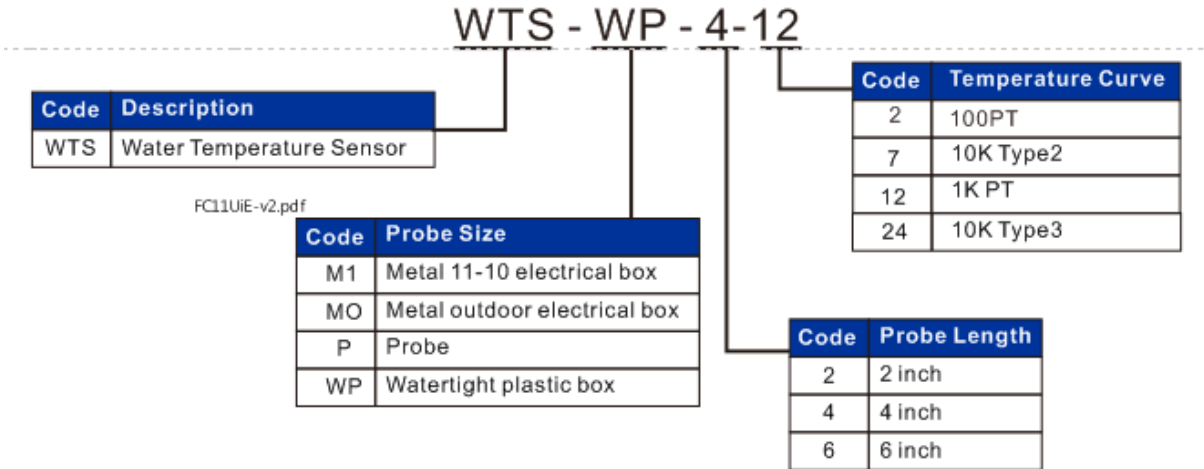
WTS Series Water Temperature Sensor



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.

Part Number Scheme:



\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

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.

Part Number Scheme:

WTS5 - WP - 7

Code	Description
WTS5	Strap-on Water Temp Sensor

Code	Probe Size
M1	Metal 11-10 electrical box
WP	Watertight plastic box

Code	Temperature Curve
7	10K Type2

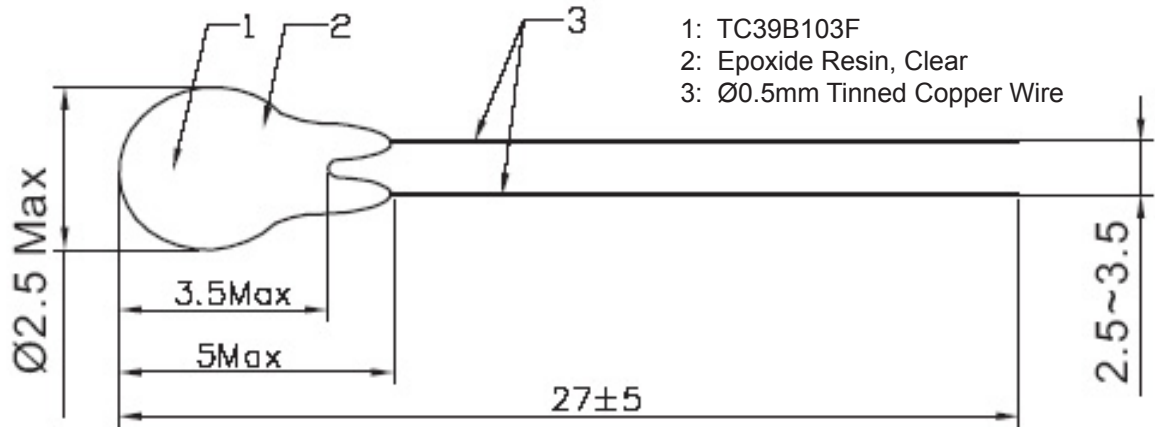
\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.



RTS-Raw 10K NTC Thermistor, Temco's standard thermistor element



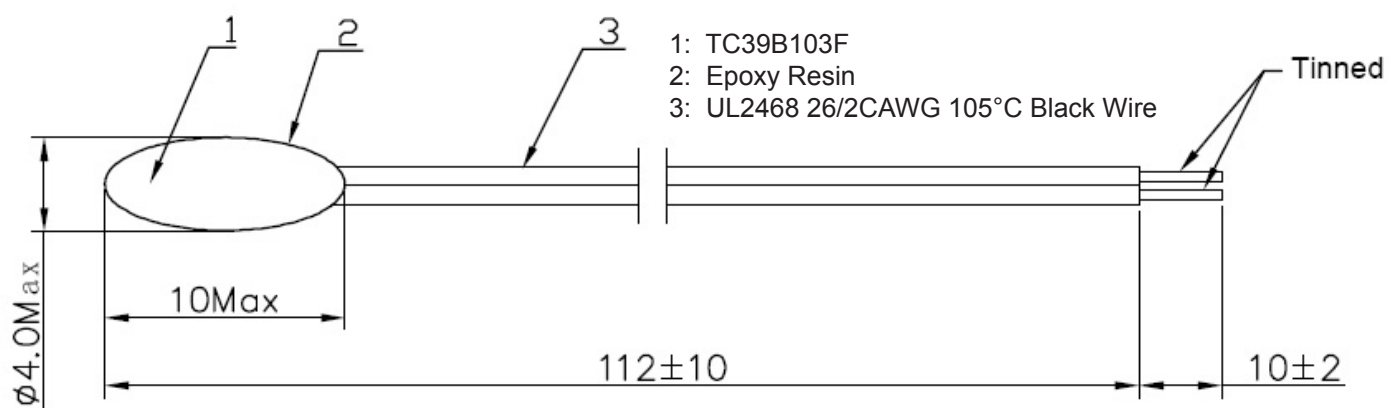
Dimensions (mm):



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



Dimensions (mm):



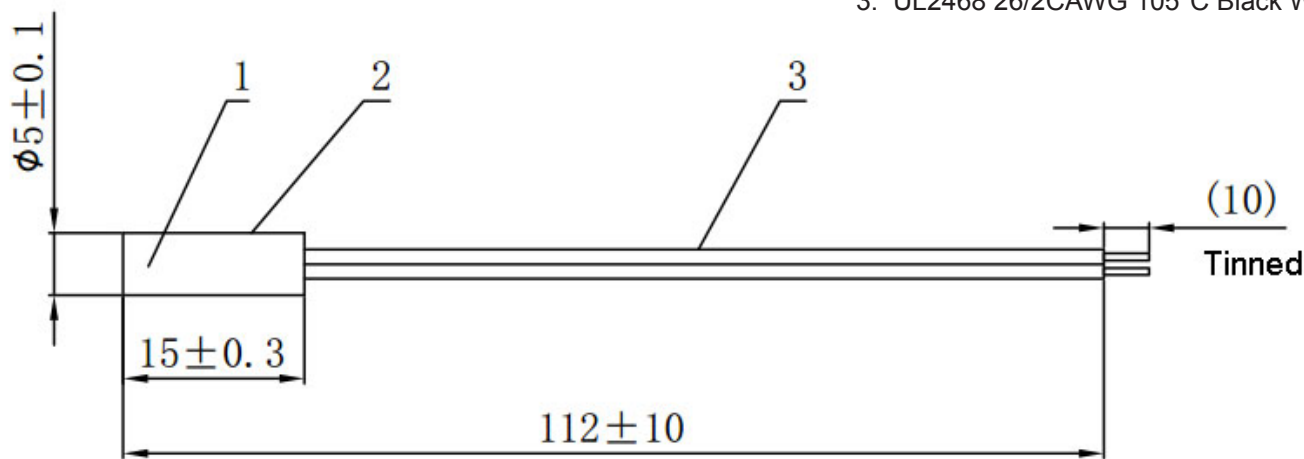
\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

PRB-0.6-7 Temperature Sensor: 0.6” SS probe temp sensor, 10K thermistor, Type 2



Dimensions (mm):

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



Part Number Scheme:

PRB - 0.6 - 7

Code	Description
PRB	Temperature Probe

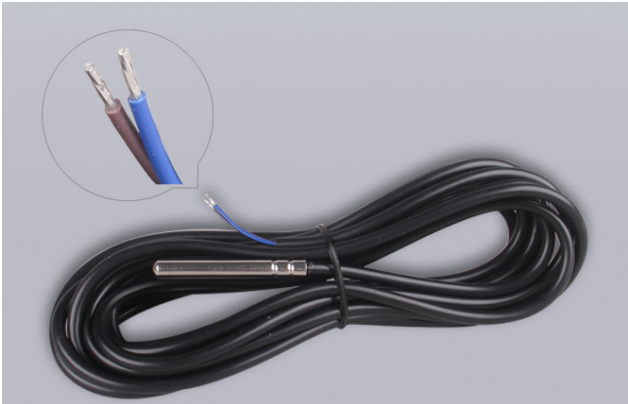
  

Code	Probe Size
0.6	0.6" stainless steel probe
*	Other lengths available, consult factory

Code	Temperature Curve
6	3K
7	10K Type2
9	100K
12	1K PT
24	10K Type3

\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

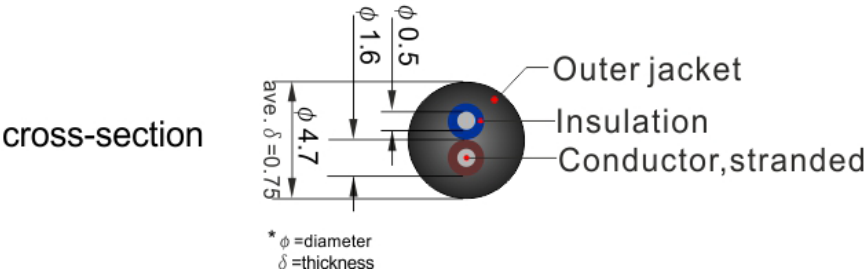
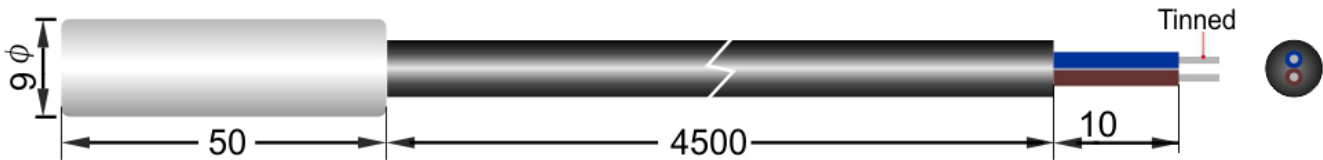
PRB-50-45-7 Temperature Sensor: ID6 X 50mmprobe temp sensor, 10K thermistor, Type 2



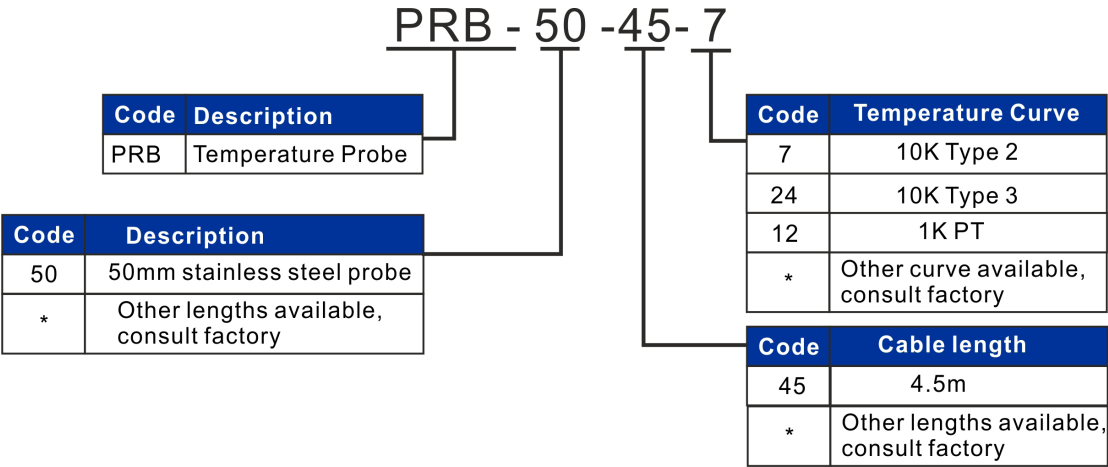
Dimensions:

unit:mm

- 1: Ø6x50 Stainless Steel
- 2: UL2464 20/2CAWG 105°C Black Wire

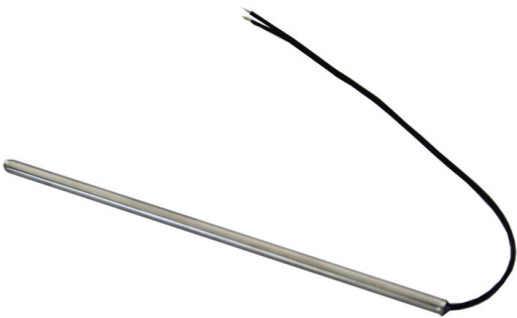


Part Number Scheme:

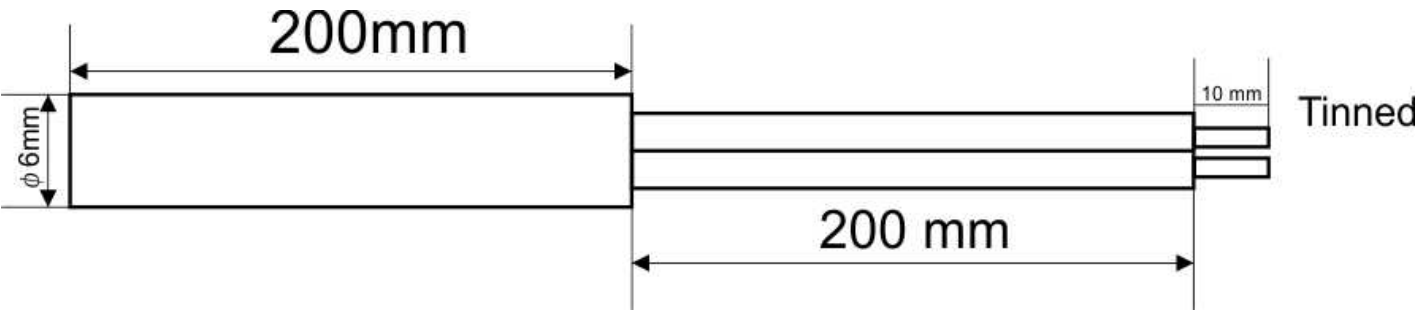


\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

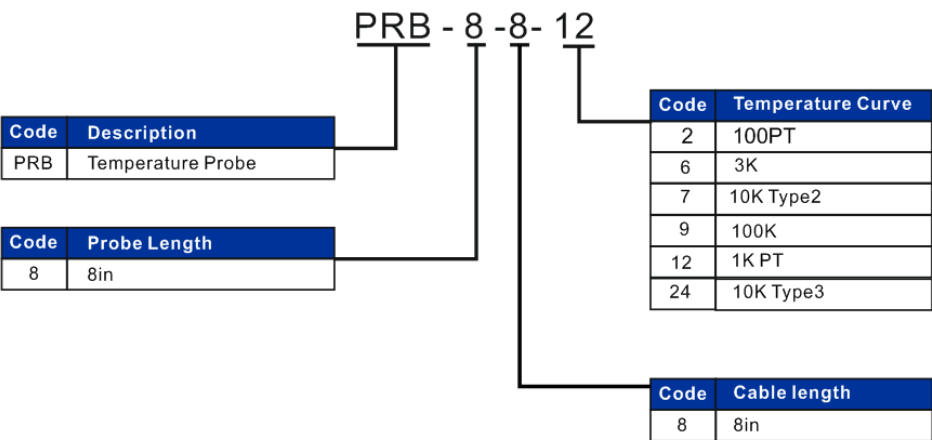
PRB-8-8-12 Temperature Sensor: ID6mm X 200mm probe temp sensor, 1K Platinum thermistor



Dimensions (mm):



Part Number Scheme:



\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

## Accuracy Table:

ACTUAL	RTD ACCURACY +/- °C PT100 Ω ALPHA 0.003850 to DIN 43760 IEC751 DIN EN 60 751			
	B GRADE	A GRADE	BAND 3 (1/3 DIN)	BAND 5 (1/10 DIN)
-200 °C	1.30 °C	0.55 °C	0.39 °C	0.38 °C
-150 °C	1.05 °C	0.45 °C	0.23 °C	0.21 °C
-100 °C	0.80 °C	0.35 °C	0.15 °C	0.12 °C
-90 °C	0.75 °C	0.33 °C	0.14 °C	0.10 °C
-80 °C	0.70 °C	0.31 °C	0.13 °C	0.09 °C
-70 °C	0.65 °C	0.29 °C	0.12 °C	0.08 °C
-60 °C	0.60 °C	0.27 °C	0.11 °C	0.07 °C
-50 °C	0.55 °C	0.25 °C	0.10 °C	0.06 °C
-40 °C	0.50 °C	0.23 °C	0.10 °C	0.06 °C
-30 °C	0.45 °C	0.21 °C	0.09 °C	0.05 °C
-20 °C	0.40 °C	0.19 °C	0.09 °C	0.04 °C
-10 °C	0.37 °C	0.17 °C	0.08 °C	0.03 °C
0 °C	0.30 °C	0.15 °C	0.08 °C	0.03 °C
10 °C	0.35 °C	0.17 °C	0.09 °C	0.04 °C
20 °C	0.40 °C	0.19 °C	0.10 °C	0.04 °C
30 °C	0.45 °C	0.21 °C	0.11 °C	0.05 °C
40 °C	0.50 °C	0.23 °C	0.12 °C	0.06 °C
50 °C	0.55 °C	0.25 °C	0.13 °C	0.07 °C
60 °C	0.60 °C	0.27 °C	0.14 °C	0.08 °C
70 °C	0.65 °C	0.29 °C	0.16 °C	0.09 °C
80 °C	0.70 °C	0.31 °C	0.17 °C	0.10 °C
90 °C	0.75 °C	0.33 °C	0.18 °C	0.11 °C
100 °C	0.80 °C	0.35 °C	0.19 °C	0.12 °C
110 °C	0.85 °C	0.37 °C	0.20 °C	0.13 °C
120 °C	0.90 °C	0.39 °C	0.21 °C	0.14 °C
130 °C	0.95 °C	0.41 °C	0.22 °C	0.15 °C
140 °C	1.00 °C	0.43 °C	0.24 °C	0.15 °C
150 °C	1.05 °C	0.45 °C	0.25 °C	0.16 °C
160 °C	1.10 °C	0.47 °C	0.26 °C	0.17 °C
170 °C	1.15 °C	0.49 °C	0.27 °C	0.18 °C
180 °C	1.20 °C	0.51 °C	0.29 °C	0.19 °C
190 °C	1.25 °C	0.53 °C	0.30 °C	0.21 °C
200 °C	1.30 °C	0.55 °C	0.31 °C	0.22 °C

## Wells (Brass and Stainless Steel):

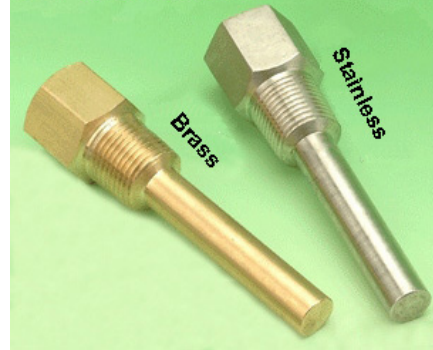
### Description:

The stainless steel and brass thermowells which is machined from a single piece of bar stock, no welds, 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.

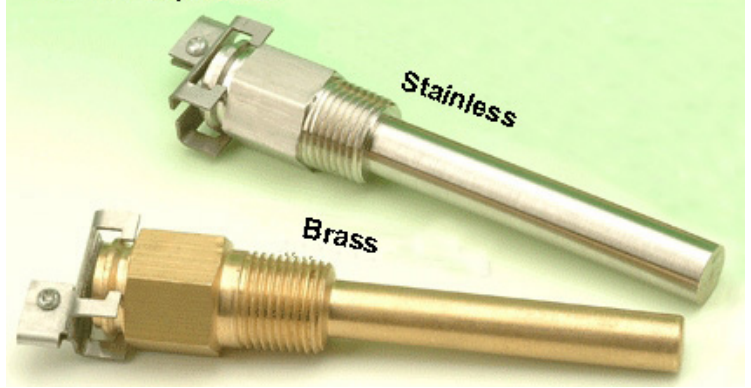
### Features & Options:

- Five Lengths: 2", 3", 4", 6", and 8"
- Stainless Steel (304) or Brass
- Construction: machined from a single piece of bar stock, no welds.
- Other Lengths or Materials Available Upon Request
- Limited Lifetime Warranty
- NPT or BSP thread need to be specified when order

DDC type, 6mm probes



10mm for aquastats

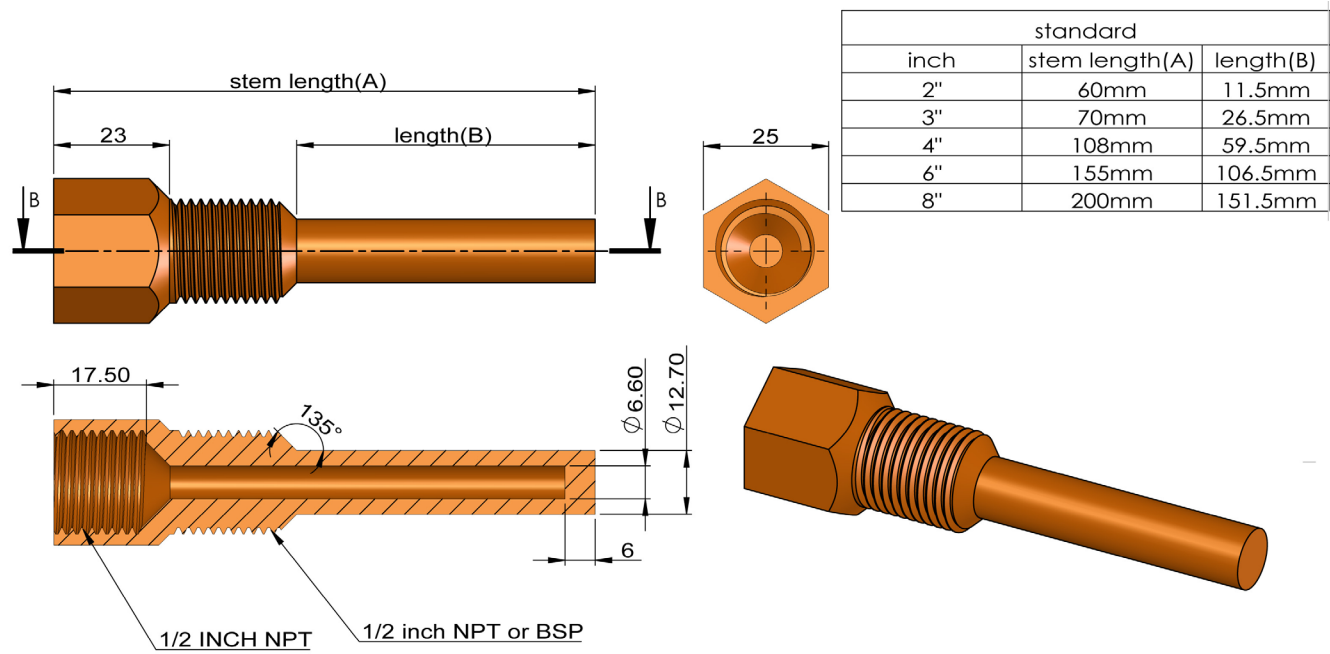


### Specifications:

Maximum Fluid Velocity (Stainless steel 304)				
Thermowell lengths	2.5"	4"	6"	10"
Steam, air, gas& fluids with similar density	300 ft/sec	109 ft/sec	39.5 ft/sec	20.1 ft/sec
Water flow (safe values)	148 ft/sec	82.2 ft/sec	39.5 ft/sec	20.1 ft/sec

Maximum Fluid Velocity (Stainless steel 304)				
Temperature	70F	200F	400F	600F
Pressure	1600 psi	1600 psi	1600 psi	1600 psi

Dimensions



note  
internal thread is standard for NPT



Part Number Scheme:

WL-H-B-4-N

Code	Description
WL	Thermo well

Code	Inner Diameter
H	10mm for aquastats
-	DDC type, 6mm probes

Code	Material
B	Brass
S	Stainless steel 304

Code	Thread
N	NPT tapered thread
B	BSP British standard

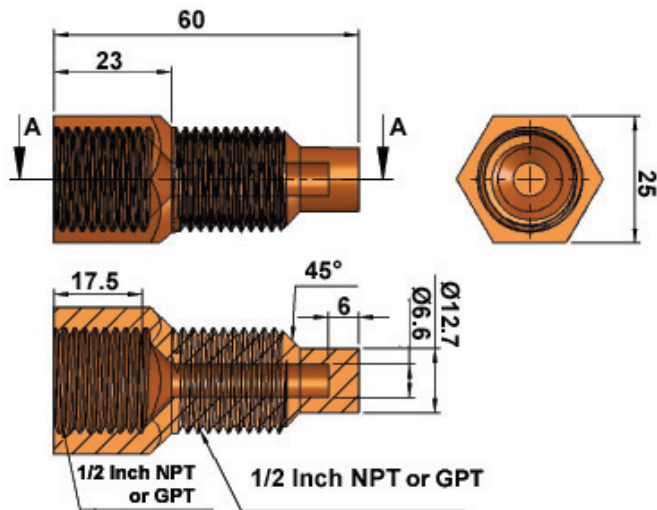
Code	Probe Length
2	2 inch probe
3	3 inch probe
4	4 inch probe
6	6 inch probe
8	8 inch probe

\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

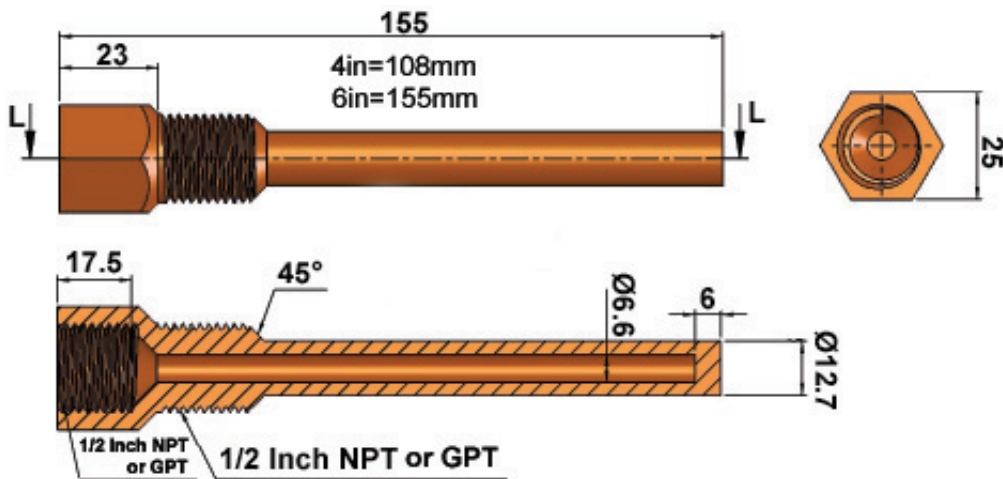


## DDC Type:

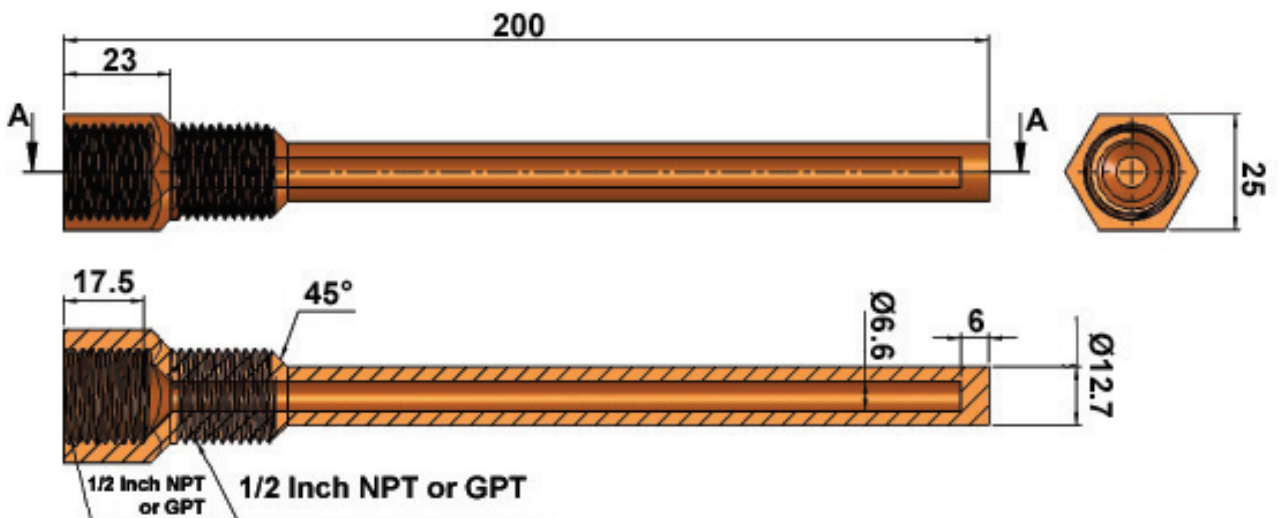
2 inch Dimensions (mm):



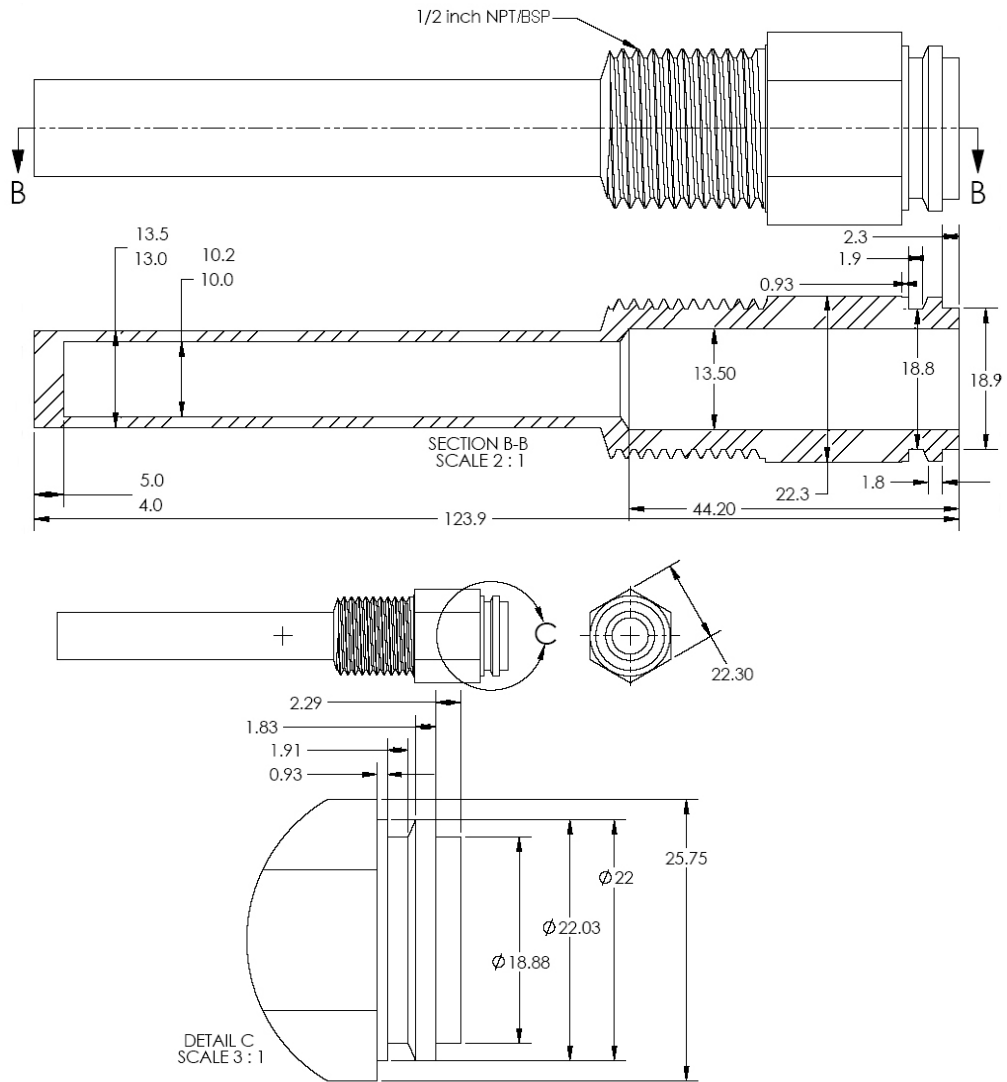
4 inch & 6 inch Dimensions (mm):



8 inch Dimensions (mm):



10mm for aquastats:



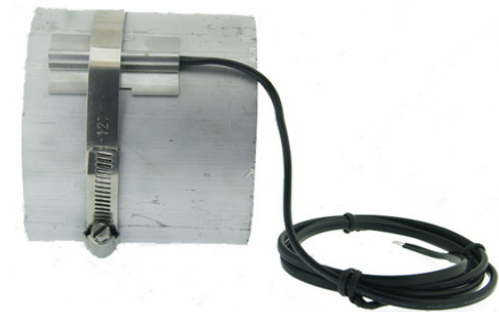
Strap On Temperature Sensor

Features

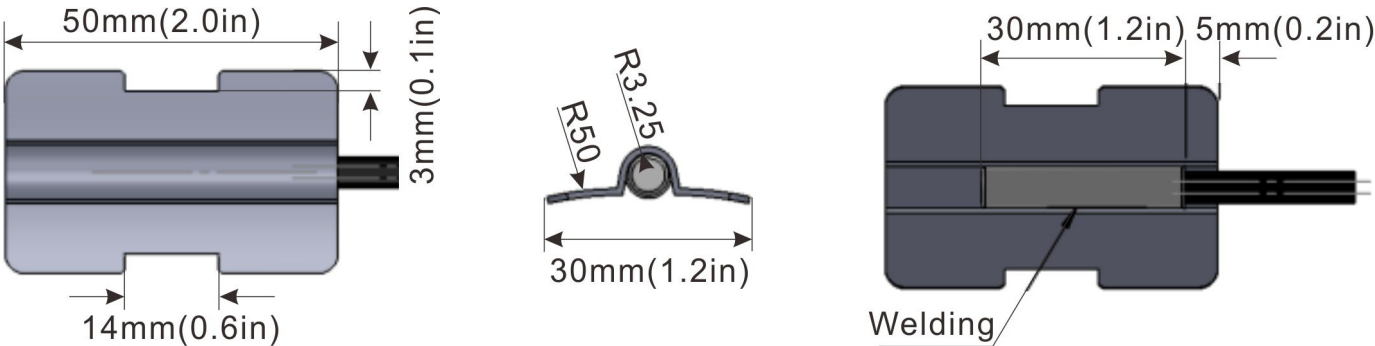
- Sensing elements
- Thermistors and RTDs in all industry standard ranges.
- Included 300 mm adjustable strap-on band,for pipe diameter 13 to 92 mm (1/4" to 3")
- IP 54 protection
- Simple two wire connection
- Economical way to measure temperature
- Metal Wing: Stainless steel 304

Application/Description

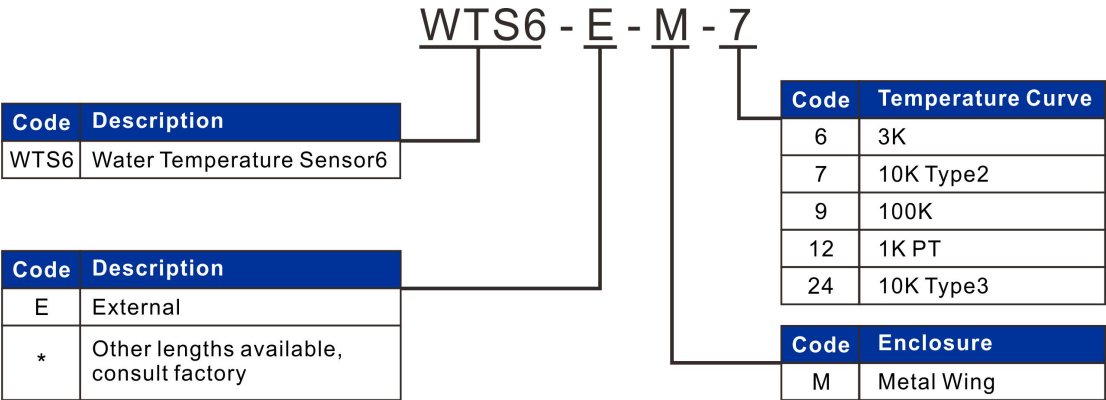
The strap-on temperature sensor is used for sensing the temperature of pipework in heating, ventilation and air conditioning systems. The strap on sensor is available with RTD and PT type passive sensor elements. Passive sensing elements is a low cost alternative to measure temperature with simple two wire connection. The sensing element is housed in a 50 mm long metal wing. The probe will be fixed to the pipe with an adjustable 300 mm, strap-on band, other strap-on lengths on request.



Dimension:



Part Number Scheme:



\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

### Strap On Insert Temperature Sensor:



#### Strap-on Insert Sensor

The strap-on Insert sensor consists of a stainless steel sheath temperature sensor, thermal conducting compound, and an adjustable pipe bracket accessory. The stainless steel sheath temperature sensor is suitable for direct application to pipe surfaces for chilled or hot water measurement. It is also used for freezer cases, where moisture protection is important.

#### Strap-on Applications

Where it is not practical to install immersion wells, the stainless sheath sensor may be strapped to the pipe. A pipe strap accessory provides a bracket to hold a thermally conductive compound and clamps the sensor securely in place.

Make electrical connections to the sensor in accordance with the installation wiring diagram for the job and in accordance with national and local electrical codes. Use the one big-foot lead furnished with the sensor. **Do not use wire nuts.**

Though the sensor itself does not require shielded cable, some controllers and microprocessors do; check with the controller supplier.

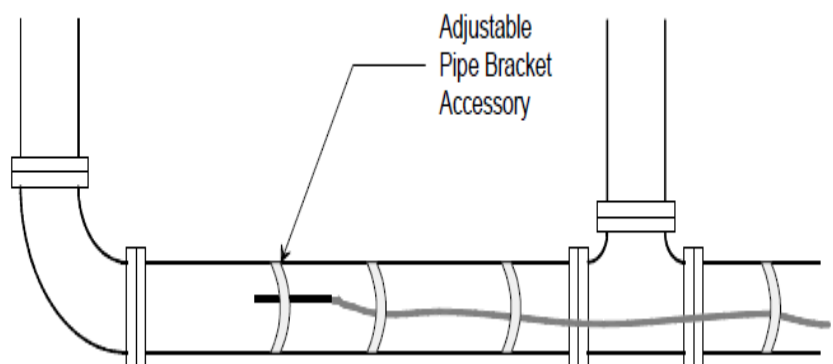
Accuracy  $\pm 36^{\circ}\text{F}$  from  $32^{\circ}\text{F}$  to  $158^{\circ}\text{F}$  ( $\pm 2^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ )

Stability  $24^{\circ}\text{F}$  ( $-4.4^{\circ}\text{C}$ ) over 5 years

Basic Model Basic model comes with one foot lead and a 0.24-inch stainless steel tube.

#### Typical Mounting

When used as a strap-on Insert sensor, best results are obtained when conductive compound is applied between the sensor and the pipe. In addition, the sensor should be inserted under insulation with at least 4mm of the sensor lead covered. A pipe clamp accessory is available for use with this sensor.



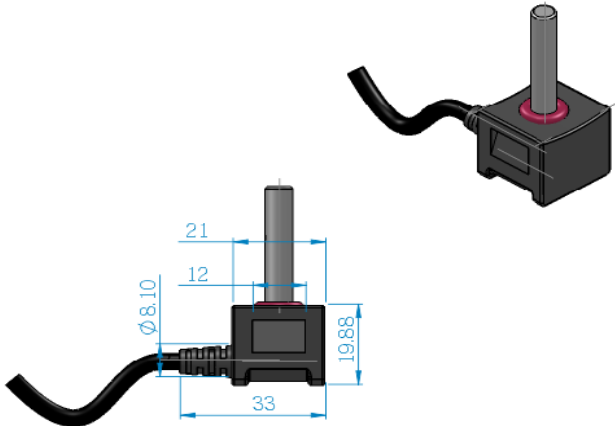
Strap On Insert Temperature Sensor:

Adjustable Pipe Bracket Accessory  
The pipe bracket is designed for use with the stainless sheath sensor. The bracket can be used on pipe sizes from 2" (50.8mm) to 8" (203mm) outside diameter. Thermal conducting compound should be used with the bracket to improve heat transfer between the pipe and the temperature sensor.

130~152mm adjustable 304 stainless steel strap as a standard accessory with larger size available on request.

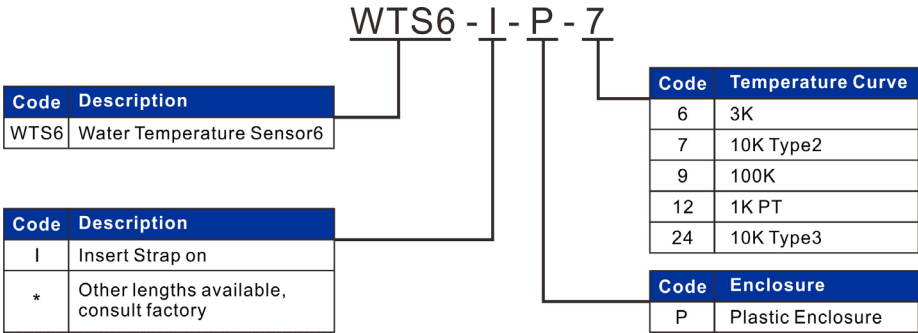


Dimensions



Unit: mm

Part Number Scheme:



\*Thermistors, pt elements and probe sizes for all popular control systems are available, send us an email if you don't see what you need online.

## Installation

1. Drill a hole which diameter is 8mm in the pipe



2. Put sensor into the hole



3. Attach with a stainless steel strap

