Impeller
Data Industrial®

T-Series Thermistors

2-Wire 10KΩ Thermistors

DESCRIPTION

The T-Series Thermistors are high-quality temperature sensors compatible with Impeller BTU transmitters and energy monitors. BTU monitors require two temperature sensors and a flow sensor to operate. When operating BTU monitors, temperature sensor selection and placement is extremely important. There are a number of options available to help maximize the efficiency of BTU monitoring. The T-Series Thermistors are a great temperature measurement solution.

The temperature sensor is based on a 10k Ω thermistor. A thermistor is a resistor made of specific semiconductor material whose resistance decreases as the temperature around it increases. Thermistors are different from thermo-couples, which are made when two dissimilar conductors joined at the ends, and when the junction is heated, the voltage across it becomes proportional to the rise in temperature.

The actual resistance values for Impeller thermistors are based on all temperature sensors having 10k Ω resistance at 77° F (25° C). Seventy-seven degrees Fahrenheit (Twenty-five degrees Celsius) is the industrial standard used as the main point of reference for most thermistor calibrations. The following chart shows the change in resistance values relative to changes in temperature. Note that at 77° F (25° C), the resistance value is 10,000 Ohms (10k Ω).

° F	° C	Resistance	° F	° C	Resistance
32	0	32,654 Ω	122	50	3602 Ω
50	10	19,903 Ω	140	60	2488 Ω
68	20	12,493 Ω	158	70	1753 Ω
77	25	10,000 Ω	176	80	1257 Ω
86	30	8056 Ω	194	90	917 Ω
104	40	5325 Ω	212	100	679 Ω

With an accuracy of ±0.2° C, Impeller thermistors can operate accurately at 32…158° F (0…70° C) with a maximum temperature of 230° F (110° C), and are designed for use with liquid heating and cooling media. The maximum distance between a temperature sensor and any Impeller BTU monitor is 500 feet.

The simplest temperature sensor option is a 1/4 in. (6.35 mm) tube, 3-1/2 in. (88.90 mm) long with 1/2 in. (12.70 mm) NPT pipe connections. The thermistor is potted solid inside the tube fixture. The potting eliminates any air pockets from forming around the temperature sensitive areas of the thermistor. If air is present, it acts as an insulation barrier to the thermistor, adversely affecting the heat transfer coefficients of the tubing wall, the potting material, and the semiconductor material itself. The quality built into the Badger Meter® temperature sensors allows minimum variation from sensor to sensor. Each temperature sensor can be replaced without affecting either the other temperature sensor or the accuracy of BTU calculations. Individual circuit adjustments are NOT required when changing temperature sensors.

PROTECTING TUBE CONFIGURATION

Impeller temperature sensors are available as a thermistor potted in a protecting tube for direct insertion or for use with a thermowell. The T106 has an adjustable length and a 1/4 in. (6.35 mm) process connection so it can be used in line sizes 1/2 in. (12.70 mm) and larger. The sensing portion of the probe is at the tip and must be mounted so that the tip is completely immersed in the direct flow stream. All sensors measure not only the fluid they are in, but also the mass and effect of their own body on the fluid stream.

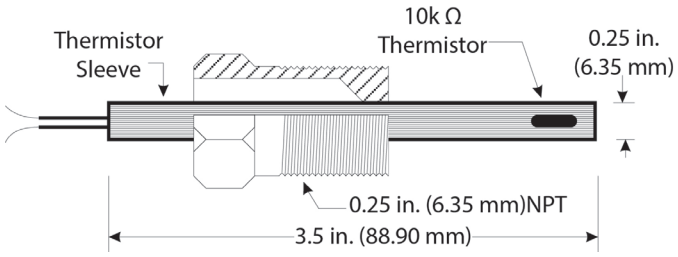

Figure 1: Thermistor diagram

Badger Meter

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Product Data Sheet

THERMOWELL STYLE

For higher velocity or pressure systems or for industrial applications in larger pipe sizes, use thermowells. A thermowell is a sleeve assembly that protects the temperature sensing device from direct damage by higher velocities, and also allows ease in service or replacement of the thermistor elements without draining or shutting down the fluid system.

Thermowells also allow deeper sensor penetration into larger piping systems. A general rule is to allow the sensing area of the thermowell to be as close to the actual center of the pipe I.D. as practical. This helps make the response time of the thermistor faster and more representative of the actual fluid temperature. Badger Meter offers a number of optional thermowells. When the actual thermistor sleeve is mounted at the bottom of the thermowell, make sure to use some type of heat transfer material (for example, silicone grease) to fill the area between the I.D. of the thermowell and the O.D. of the thermistor tubes. This material serves the same purpose as potting the actual thermistor element in the tube assembly previously discussed. A threaded retainer holds the thermistor sleeve in the thermowell.

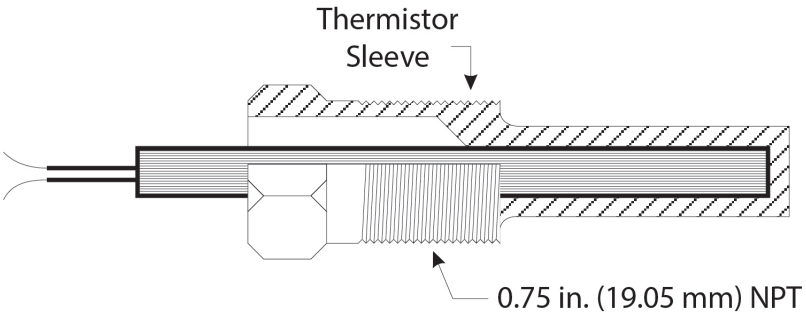

Figure 2: Thermowell diagram

LIST OF MODELS

T-Model Number	NPT	Element	Depth	Conduit Connection	Leads
T106B	1/4 in. (6.35 mm)	Brass Thermistor	Adjustable	—	6 in. (152.40 mm) leads
T106S	1/4 in. (6.35 mm)	340SS Thermistor	Adjustable	—	6 in. (152.40 mm) leads
T116B	3/4 in. (19.05 mm)	Brass Thermowell	1-5/8 in. (41.28 mm)	1/2 in. (12.70 mm)	Thermistor/Retainer
T116S	3/4 in. (19.05 mm)	304SS Thermowell	1-5/8in. (41.28 mm)	1/2 in. (12.70 mm)	Thermistor/Retainer
T125	3/4 in. (19.05 mm)	304SS Thermowell	2-1/2 in. (63.50 mm)	1/2 in. (12.70 mm)	Thermistor/Retainer
T140	3/4 in. (19.05 mm)	304SS Thermowell	4 in. (101.60 mm)	1/2 in. (12.70 mm)	Thermistor/Retainer
T160	3/4 in. (19.05 mm)	304SS Thermowell	6 in. (152.40 mm)	1/2 in. (12.70 mm)	Thermistor/Retainer
T180	3/4 in. (19.05 mm)	304SS Thermowell	8 in. (203.20 mm)	1/2 in. (12.70 mm)	Thermistor/Retainer
67002	Replacement Thermistor Element in protecting tube				6 in. (152.40 mm) leads

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