

## Series 1550 Energy Monitor & Series 2300 Btu Monitor Temperature Sensors

Data Industrial's Series 1550 Energy Monitor and Series 2300 Btu Monitor both require two temperature sensors, as well as a flow sensor, to operate. The proper selection and placement of the temperature sensors is extremely important to the operation of these Btu monitors. There are a number of options available to help maximize the efficiency of Btu monitoring. The following are a few hints to help fully take advantage of the Data Industrial monitoring capabilities.

The temperature sensor is based on a 10k $\Omega$  thermistor. A thermistor is actually a resistor made of specific semiconductor material whose resistance decreases as the temperature around it increases. Thermistors should NOT be confused with thermo-couples, which are fabricated from two dissimilar conductors joined at the ends; when the junction is heated, the voltage across it becomes proportional to the rise in temperature.

The actual resistance values for Data Industrial thermistors are based on all temperature sensors being 10k $\Omega$  resistance @ 25°C. 25°C is the industrial standard used as the main point of reference for most thermistor calibration. The following chart references the change in resistance values relative to changes in temperature. Note that at 25°C (77°F) the resistance value is 10,000 ohms.

°C	°F	Resistance
0	32	32,654 $\Omega$
10	50	19,903 $\Omega$
20	68	12,493 $\Omega$
25	77	10,000 $\Omega$
30	86	8,056 $\Omega$
40	104	5,325 $\Omega$
50	122	3,602 $\Omega$
60	140	2,488 $\Omega$
70	158	1,753 $\Omega$
80	176	1,257 $\Omega$
90	194	917 $\Omega$
100	212	679 $\Omega$

Data Industrial thermistors' accuracy is  $\pm 0.2^\circ\text{C}$ . They can operate accurately from 0°C (32°F) to 70°C (158°F) with maximum temperature of 110°C (230°F), and are designed for use with liquid heating and cooling media. The maximum distance between a temperature sensor and any Data Industrial Btu monitor is 500 feet.

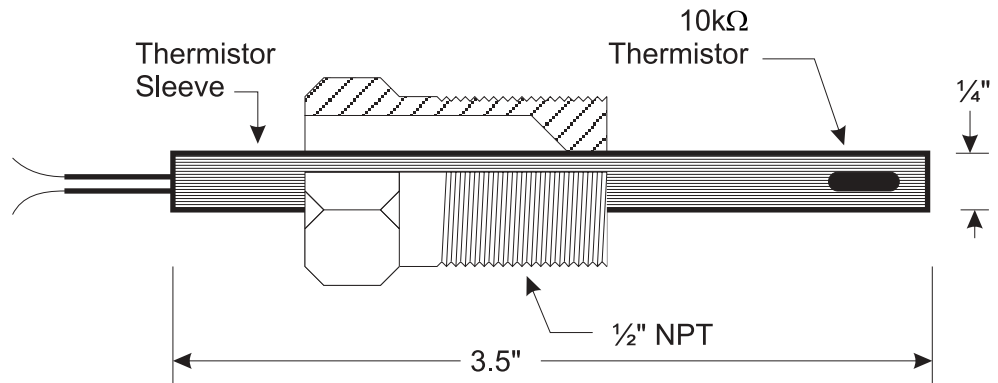
### PRODUCTS

200  
4000  
310  
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1500 ✓  
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HTT  
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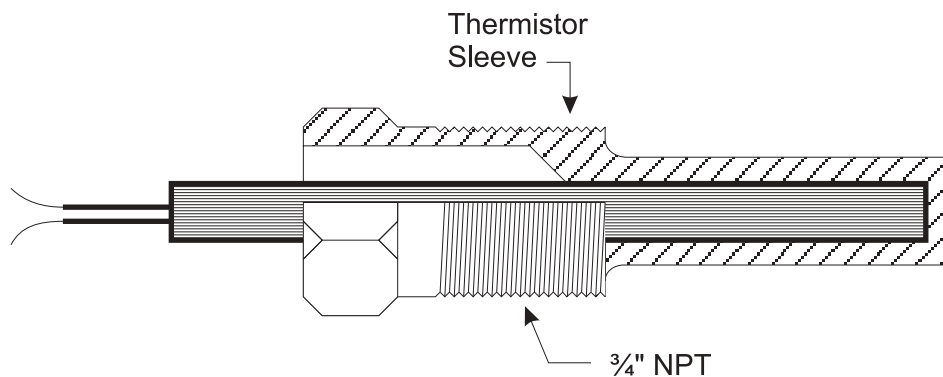
The simplest temperature sensor option is a ¼" tube, 3 ½" long with ½ NPT pipe connections. The thermistor is potted solid inside the tube fixture. The potting is used to eliminate any air pockets from forming around the temperature sensitive areas of the 10kΩ thermistor. If air is present, it will act 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 Data Industrial 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 the Btu calculations. Individual circuit adjustments are NOT required when changing temperature sensors.

### Protecting Tube Configuration

Data Industrial temperature sensors are available as a thermistor potted in protecting tube for direct insertion or for use with a thermowell. The T-105 has an adjustable length and a ½" process connection so it can be used in line sizes from ½" and up. 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 to the fluid stream.



For higher velocity or pressure systems or for industrial applications in larger pipe sizes, we suggest that thermowells be used. 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 of the fluid system.



### Thermowell Style

Thermowells also allow deeper sensor penetration into larger piping systems. A general rule is to allow the sensing area of the thermal well 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. Data Industrial offers a number of optional thermowells.

When the actual thermistor sleeve is mounted at the bottom of the thermowell, make sure some type of heat transfer material (silicone grease) is used 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. The thermistor sleeve is held in the thermowell by a threaded retainer.