Temperature °Controls Pty Ltd

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SPEED OF RESPONSE

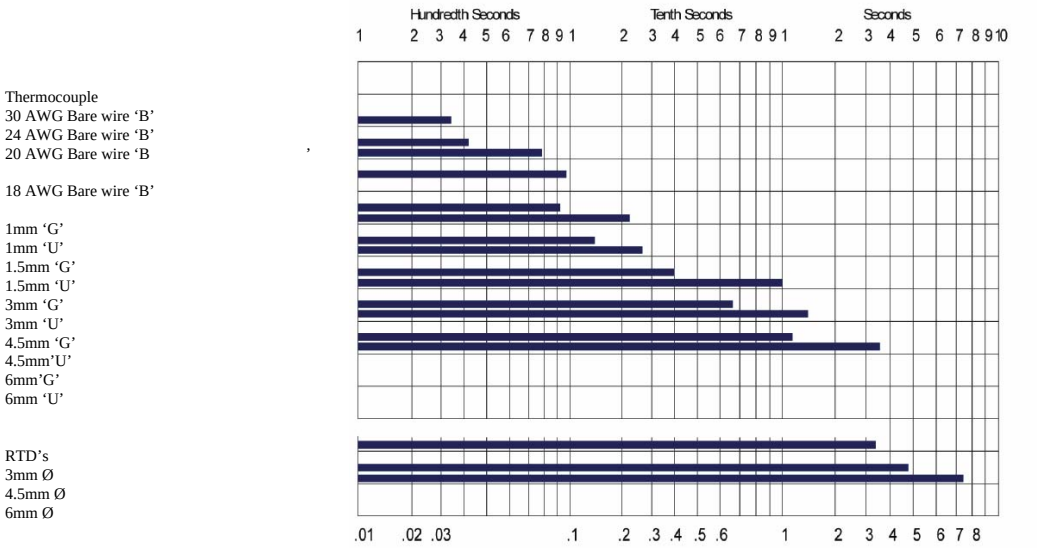
The purpose of the information on this page is to give you some general guidelines in estimating the speed of response you might expect from a thermocouple or an RTD.

In defining any transient condition such as a temperature change, it is important that a standard measuring point be established to provide a basis of comparison. In temperature transducers, the time constant is defined as the time required, in seconds, for the temperature sensor to respond through 63.2% of the total temperature change.

The factors affecting the response rate of a temperature probe in a fluid are:

a) The mass of the probe surrounding the active temperature sensitive point
b) The thermoconductivity of materials used in manufacturing the transducer
c) The mass and conductivity of the measured fluid
d) The velocity of the fluid over the probe

From the above, it is obvious that a probe of small diameter made of highly conductive materials will respond most rapidly to temperature change. Since thermocouple material will have shorter conductive paths, a thermocouple probe will respond more rapidly than an RTD probe of equal diameter. This is verified by the bar charts:



In determining time constants for the bar charts above, tests were performed in still water going through an instantaneous step change from 0°C to 100°C.

For guidelines for determining the time constant for specific probes under other conditions, multiply the time constant from the chart by the following factors:

Conditions	Still Air	Air @ 10 ft/Sec	Water@ 15ft/Sec
Factor	20X	4X	0.25X

Letters G, U and B correspond with various styles of tip configurations.
G = grounded (Bonded Junction) U = Ungrounded (Insulated Junction)
B = Bare wire (Beaded Junction)