

# Temperature °Controls Pty Ltd

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## SPEED OF RESPONSE

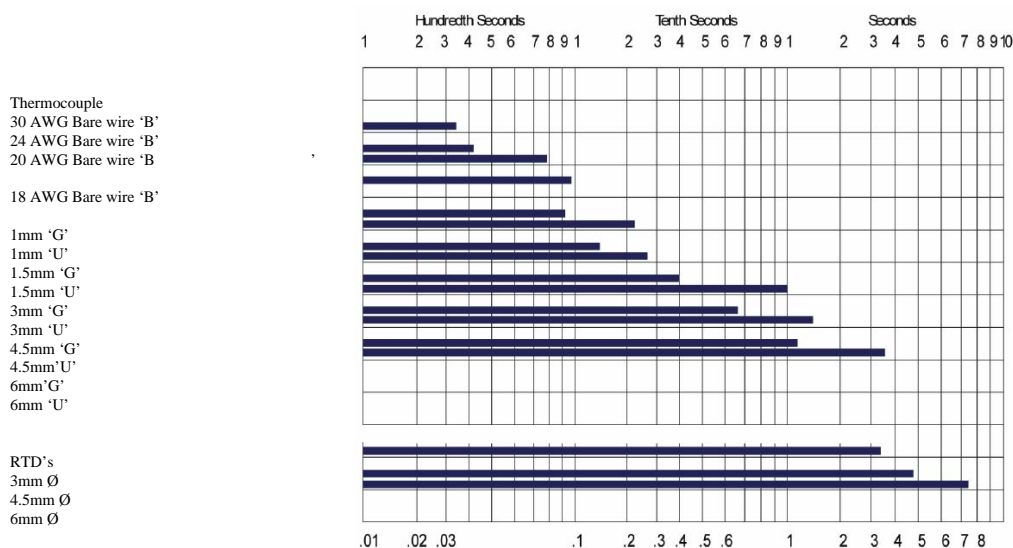
The purpose of the information on this page is to give you some general guidelines in estimating the speed of response you might expect from a thermocouple or an RTD.

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)