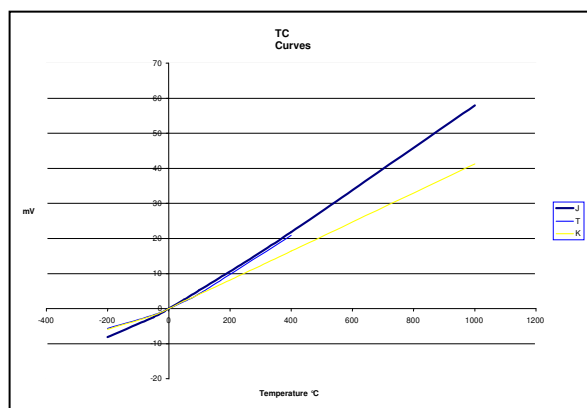
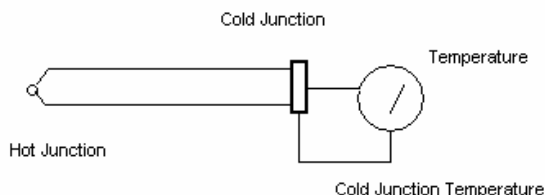


Q: What is a TC, and how does it work?

Answer: Sometimes I fall into my own trap. I hate going to meetings when someone stands up and uses abbreviations and phrases that I went there to learn about. In a previous applications note I used the term TC, so here in short form is a little about thermocouples and how they work.

The term TC stands for Thermocouple. A thermocouple is a temperature measuring element that measures the difference in temperature between two points. It uses a principle of physics called the Seebeck effect. In the 1820's the German physicist, Thomas J. Seebeck discovered if a closed loop is formed by joining the ends of two strips of dissimilar metals and the two junctions of the metals are at different temperatures, a current flows that is proportional to the difference in temperature between the "hot" junction and the "cold" junction. In addition he found that if he open-circuited one end ("cold" junction), a predictable millivolt signal was generated proportional to the difference in temperature between the junctions. The resulting millivoltage is described by the Seebeck coefficient. Over the years a set of standard thermocouples have evolved, and very well defined tables have been generated which characterize this effect.

Modern thermocouples (TC's) take advantage of the Seebeck effect to easily measure temperature in many industrial situations. Heating the "Hot" junction will produce a small voltage which is proportional to the difference in temperature between the "hot" junction and the "cold" junction. The meter measures this millivolt value. Another input to the meter tells the temperature of the "cold" junction. The meter "adds" these two values to indicate the temperature.



Actually, there is a little more involved than the above. Each type of TC has its own curve. Thus the meter needs to know what type of TC you have, the difference in temperature and the CJ ('cold" junction) temperature. It then computes the temperature.

TC curves are defined in the standard TC tables published by NIST. The most common types of TC are types J, K and T. You can view the tables at the link below. Thanks to Pyromation for supplying the tables.
www.pyromation.com/downloads/tables.html .

Thus a TC (thermocouple) is a two wire device that measures the difference between two temperatures. The

measuring instrument then adds the "cold" junction temperature, and applies the correct curve resulting in the display of the measured temperature.

Other Applications Notes: www.AdvIndSys.com/ApplicationsNotes.htm