

# Temperature Sensors for Use in Aerospace and Automotive Industries!

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June 2014

## Abstract

Temperature sensors are used in all types of processes in aerospace and automotive industries. They have to be monitored, calibrated and chosen according to either AMS2750, for aerospace, or CQI-9 for automotive. Their characteristics, applications and wide range of options for temperature sensors are shown in this paper as well as the requirements for both scopes for either type of industry.!

## 1.-General Sensor Information & Requirements

### a) Thermocouple Definition

A thermocouple is a sensing device that consists of two conductors of dissimilar electro thermal characteristics. The conductors are joined together at one end (hot junction), where the junction is placed in contact with the item whose temperature is to be measured. At the other end (cold junction), a voltmeter is used to measure the electrical voltage that is produced by the difference in temperature between the two junctions as shown in figure 1.



Figure 1 Example of thermocouple hot junction and cold junction.

As shown in figure 2, there are different types of sensors for thermocouples, their classification is as follows.

**Base Metal Thermocouple:** Thermocouple whose thermo elements are composed primarily of base metals and their alloys. Examples include E, J, K, N and T.

**Noble Metal Thermocouple:** Thermocouple whose thermo elements are composed primarily of noble metals (example: platinum/platinum-rhodium) and their alloys. Examples include types R, S and B.

**Expendable Thermocouple:** Thermocouples made of fabric or plastic covered wire. The wire is provided in coils or on spools. Insulation usually consists of glass braid or ceramic fiber cloth on each conductor plus glass braid overall.

**Nonexpendable Thermocouple:** Thermocouples that are not covered with fabric or plastic insulations. One type consists of ceramic insulators over bare thermocouple wire, sometimes inserted in a tube for stability and protection. A second type consists of a combination of thermocouple wires, mineral insulation, and a protecting metal sheath compacted into a small diameter. The thermocouple thus constructed is protected, flexible and, within the temperature limits of