Type E

Type E (chromel–constantan) has a high output (68 µV/°C), which makes it well suited to cryogenic use. Additionally, it is non-magnetic. Wide range is −270 °C to +740 °C and narrow range is −110 °C to +140 °C.

Type J

Type J (iron–constantan) has a more restricted range (−40 °C to +750 °C) than type K but higher sensitivity of about 50 µV/°C.[2] The Curie point of the iron (770 °C)[9] causes a smooth change in the characteristic, which determines the upper temperature limit. Note, the European/German Type L is a variant of the type J, with a different specification for the EMF output.

Type K

Type K (chromel–alumel) is the most common thermocouple with a sensitivity of approximately 41 µV/°C.It is inexpensive, and a wide variety of probes are available in its −200 °C to +1350 °C (−330 °F to +2460 °F) range. Type K was specified at a time when metallurgy was less advanced than it is today, and consequently characteristics may vary considerably between samples. One of the constituent metals, nickel, is magnetic; a characteristic of thermocouples made with magnetic material is that they undergo a deviation in output when the material reaches its Curie point, which occurs for type K thermocouples at around 185 °C.

Type M

Type M (82%Ni/18%Mo–99.2%Ni/0.8%Co, by weight) are used in vacuum furnaces for the same reasons as with type C (described below). Upper temperature is limited to 1400 °C. It is less commonly used than other types.

Type N

Type N (Nicrosil–Nisil) thermocouples are suitable for use between −270 °C and +1300 °C, owing to its stability and oxidation resistance. Sensitivity is about 39 µV/°C at 900 °C, slightly lower compared to type K.

Type T

Type T (copper–constantan) thermocouples are suited for measurements in the −200 to 350 °C range. Often used as a differential measurement, since only copper wire touches the probes. Since both conductors are non-magnetic, there is no Curie point and thus no abrupt change in characteristics. Type-T thermocouples have a sensitivity of about 43 µV/°C. Note that copper has a much higher thermal conductivity than the alloys generally used in thermocouple constructions, and so it is necessary to exercise extra care with thermally anchoring type-T thermocouples. A similar composition is found in the obsolete Type U in the German specification DIN 43712:1985-01.

2. Platinum/rhodium-alloy thermocouples

Type B

Edit

Type B (70%Pt/30%Rh–94%Pt/6%Rh, by weight) thermocouples are suited for use at up to 1800 °C. Type-B thermocouples produce the same output at 0 °C and 42 °C, limiting their usebelow about 50 °C. The emf function has a minimum around 21 °C, meaning that cold-junction compensation is easily performed, since the compensation voltage is essentially a constant for a reference at typical room temperatures.

Type R

Type R (87%Pt/13%Rh–Pt, by weight) thermocouples are used 0 to 1600 °C. Type R Thermocouples are quite stable and capable of long operating life when used in clean, favorable conditions. When used above 1100 °C ( 2000 °F), these thermocouples must be protected from exposure to metallic and non-metallic vapors. Type R is not suitable for direct insertion into metallic protecting tubes. Long term high temperature exposure causes grain growth which can lead to mechanical failure and a negative calibration drift caused by Rhodium diffusion to pure platinum leg as well as from Rhodium volatilization. This type has the same uses as type S, but is not interchangeable with it.

Type S

Type S (90%Pt/10%Rh–Pt, by weight) thermocouples, similar to type R, are used up to 1600 °C. Before the introduction of the International Temperature Scale of 1990 (ITS-90), precision type-S thermocouples were used as the practical standard thermometers for the range of 630 °C to 1064 °C, based on an interpolation between the freezing points of antimony, silver, and gold. Starting with ITS-90, platinum resistance thermometers have taken over this range as standard thermometers.

3. Tungsten/rhenium-alloy thermocouples

Type C

(95%W/5%Re–74%W/26%Re, by weight) maximum temperature will be measured by type-c thermocouple is 2329 ℃.

Type D

(97%W/3%Re–75%W/25%Re, by weight)

Type G

(W–74%W/26%Re, by weight)

4. Others

Chromel–gold/iron-alloy thermocouples

In these thermocouples (chromel–gold/iron alloy), the negative wire is gold with a small fraction (0.03–0.15 atom percent) of iron. The impure gold wire gives the thermocouple a high sensitivity at low temperatures (compared to other thermocouples at that temperature), whereas the chromel wire maintains the sensitivity near room temperature. It can be used for cryogenic applications (1.2–300 K and even up to 600 K). Both the sensitivity and the temperature range depend on the iron concentration. The sensitivity is typically around 15 µV/K at low temperatures, and the lowest usable temperature varies between 1.2 and 4.2 K and so on.