Temperature is the physical magnitude that is most often measured. It is a very important part of measuring techniques, and is most often measured with an electronic temperature meter.

There are a wide range of sensor elements for converting temperature values to electrical signals. Every element has different specific properties, which determine their use and practical applications. The following sensors are most common.

● Thermocouple

Measuring temperature with thermocouples is based on the thermoelectric effect. A thermocouple consists of two wires welded together, and manufactured of different metals or alloys, e.g. type K (NiCR-Ni).

● Resistance sensors (Pt100)

Measuring temperature with resistance sensors (Pt100) utilises the temperature-related change in the resistance of the platina. A constant current is applied to the measuring resistance. The voltage drop is then measured, which changes with the resistance, which in turn changes with the temperature.

● Thermistor (NTC)

Selection of temperature sensor

The purpose of the measurement determines the choice of sensor. The most suitable temperature sensor should be selected according to the following criteria:

● Measuring range
● Precision
● Response time
● Design

Rule of thumb

Sensors with thermocouples are quick-acting and have a wide measuring range. Resistance and NTC sensors are slower, but more precise.

IR measuring

It is also possible to measure the surface temperature on an object via heat radiation. An IR meter measures the infrared radiation, which varies with the temperature. The main advantage of this method is that it is possible to measure at a distance.

Different surface materials have different capacities to emit radiation at the same temperature. The emission factor describes this property. The emission factor is specified from 1.00-0.01, where 1.00 is the optimum surface (black body). Bright surfaces have the lowest emission factors. To measure such surfaces an IR meter with an adjustable emission factor should be used.

Temperature measuring with thermistors is also based on a temperature-related change in the resistance of the sensor element. As opposed to resistance sensors, thermistors have a very negative temperature coefficient (the resistance reduces with an increase in temperature).