

Thermal resistor & Thermocouple

Brief Introduction:

Thermal resistor is a common temperature detector in low and medium temperature. The basic theory is resistance value of metal conductor increased with temperature increase. Its main feature is high accuracy, stable performance. Pt thermal resistor own highest accuracy among them, it not only widely used in industry, but also be made into standard station meter. Most thermal resistor are made of pure metal material, currently most used is Pt and Cu, besides, thermal resistor either adopt Ni, Mn, Rh etc material. Many thermostatic bimetal are used in metal thermal resistor, common one is Pt wire, except it, there are Cu, Ni, Fe, Fe-Ni etc.

Main feature:

Pressure spring component to measure temperature, good vibration resistance
High accuracy in measuring temperature;
High mechanical strength and good performance in anti-high temperature and anti-pressure
Stable and high quality

Practical application:

Currently, widely used thermal resistor material is Pt and Cu: Pt resistor has high accuracy and good stability, be suitable for Neutral and oxidizing medium. Besides, Pt has certain nonlinearity, that is higher temperature, smaller change rate of resistor; At the same time, Cu resistor value has a linear relation with temperature. It is suitable for No corrosive medium, easily has oxidation in temperature which is above 150°C. Commonly used is $R_0=10\Omega$, $R_0=100\Omega$ and $R_0=1000\Omega$, they are Pt10, Pt100, and Pt1000; Cu resistor has two type, $R_0=50\Omega$ and $R_0=100\Omega$, they are Cu50 and Cu100, among them, Pt100 and Cu50 are more popular.

Main Structure:

Temperature-sensing element of metal thermal resistor has quartz socket tube Cross the skeleton structure, Twist the skeleton structure, etc. There are many temperature-sensing materials can be used in thermal resistor, the most commonly used are Pt wire. Industrial measuring metal resistor material also use Cu, Ni, Fe, Fe-Ni, W, Ag, etc.

Main type:

Common type thermal resistor resistor

It can be found from basic theory of thermal resistor that temperature change can be measure through resistor value change, therefore, resistor out going line and other wire resistance can affect measuring temperature, to avoid resistance influence, we commonly adopt 3-wire or 4-wire

sheathed thermoresistor

Resistor is combined with temperature-sensing element(resistor body), lead, insulating material, Stainless steel sleeve tube. Its external diameter is $\varnothing 2 \sim \varnothing 8 \text{mm}$, minimum is $\varnothing 1 \text{mm}$. Compared with common type thermal resistor, it has following advantages:

1. small volume, no air-gap in internal space
2. High mechanical strength and good performance in anti-high temperature and anti-pressure
3. be able to curve and easily to install

4. Long service life

WZPM

Its temperature-sensing element is enwinded by resistance wire which is special treat, and cling in thermometer end surface.

Compared with other thermal resistor, it can reflect end surface real temperature more accurate and more quickly, be suitable for measuring end surface temperature of shaft Tile and other parts

Ex-proof thermal resistor

Through special structure junction box, it locked possible explosion caused by Explosive mixture gas in box and avoid explosion which will happened in work site.

Thermocouple

Thermocouple is a common measurement element in temperature instrument, it can measure temperature directly and translate temperature signal to Thermoelectric emf signal, then translate to medium temperature through electric instrument (secondary instrument). Shape of each thermocouple are totally different by requirements, but their basic structure are similar, commonly combined by thermode, insulation sleeve tub and junction box, and compatible apply with display, recorder instrument and electronic regulator

Brief introduction:

Working principle of thermocouple is two different material conductor and form closed loop circuit, when two side has temperature gradient, current will go through the loop, then two side occur electromotive force(thermoelectromotive force), that is Seebeck effect. Both side conductor are thermode, higher temperature side are working side, and colder side is free side, free side commonly keep stable temperature. According to functional relationship of thermoelectromotive force and temperature, form a SEBK.

when connect third metal material in loop, if connect point temperature of this metal material is same, then thermoelectromotive force will keep unchanged. Therefore, connect measuring instrument to thermocouple and got thermoelectromotive force, then medium temperature can be got too. At the same time, thermocouple cold side need to keep its temperature stable, then thermoelectromotive force will has a proportional relation with measured temperature. If cold side temperature changed, it will seriously effect accuracy. So it need compecsation menthond in cold to avoid cold side temperature change.

Main feature

Easy installation and convenient replacement

Pressure spring temperature-sensing elements has good ability to anti-shock

High accuracy

Wide measuring range ($-200^{\circ}\text{C} \sim 1300^{\circ}\text{C}$, special situation: $-270^{\circ}\text{C} \sim 2800^{\circ}\text{C}$)

Quick thermal response

High mechanical strength and good anti-pressure

Thermostability is up to 2800 degree

Long service life

Main type

1.Classified by fixed device

As a tool to measuring temperature, thermocouple has wide use in industry, therefore, it has many requirements in its fixed device and technical functions. It can be classified into 6 types: no-fixed device type, thread type, fixed flange type, active flange type, active flange angle rule type and conical protiven tube

2.Classified by device and structure

According to thermocouple function and structure, it can be divided into 4 types: detachable type, Ex-proof type, sheathed type and pressure spring fixed type

Main advantage

1.High accuracy and no influence from middle medium necause it directly touch measured object

2.Wide measuring range. Common thermocouple can measure from -50 degree to 1600 degree, some special thermocouple can even measure from -269 degree (such as Au,Fe, Ni) to 2800 degree (W, Re)

3.Simple structure and easily to use. Thermocouple is combined with two type metal wire, and no limited from size, beaides, it also has protective tube.