Ultra-fast response Ultra-fine & Ultra-thin thermocouples

ANBE SMT Co.

1. Introduction

Traditionally, thermocouples have been widely used for temperature measurements for low cost and easy to use. This conventional thermocouples had usually ball-shaped tip of about φ0.5 mm.

We have developed thermocouples with faster response as below.

2. Development of ultra-fiine and ultra-thin thermocouples with ultra-fast response

①Smaller heat capacity is better for sensitive tip.

②Larger heat transfer area is better for sensitive tip.

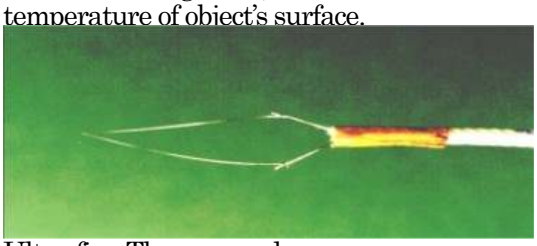
③Tip of thermocouple should be a fine wire of few millimeters length to prevent heat transfer.

(Heat tends to escape through the thermocouple wire itself)

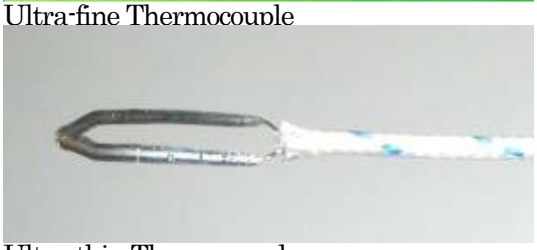
④ For better handling, at least 100μm diameter thermocouple wire is needed except the tip.

Ultra-fine thermocouple fits above①③④ conditions with fastest response.

Ultra-thin thermocouple fits above ①②④ conditions with some toughness, and suitable for measuring the temperature of object's surface.



Ultra-fine Thermocouple



Ultra-thin Thermocouple

3. Specifications and applications of the ultra-fast response thermocouples

Our ultra-fine thermocouple (mainly K-type) has its tip made of 13μm, 25μm, or 50μm chromel- alumel wire for tip only.

Our ultra-thin thermocouple has its tip thickness between about 10 and 80 μm and mainly suitable for measuring object's surface temperature.

These ultra-fine and ultra-thin thermocouples are possible to measure temperature regardless of the solids, liquids, gases at unprecedented ultra-fast response. For example,

Temperature of the gas in the automobile engine cylinder rotating with several 1000rpm

Temperature of air bags inflater gas in an instant when a car crash

Temperature change of a single living cell in a short time of 20msec called patch clamp

Temperature of IC junction to prevent destruction

Temperature of IC flip chip underfill

Temperature changes during the explosion of gunpowder

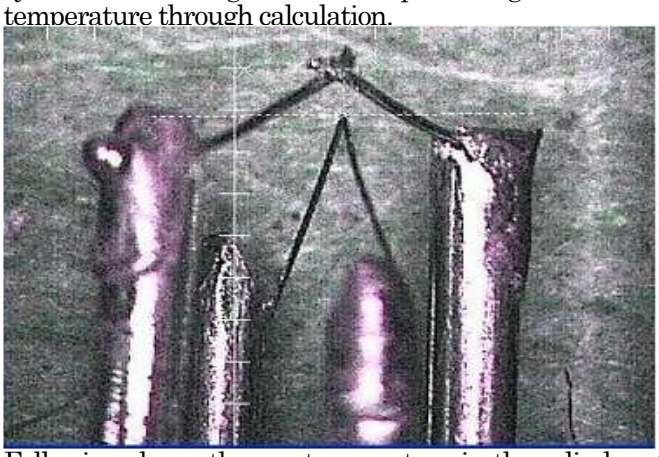
Temperature of tip end of bite or end-mill in a short time

Temperature of breathing

Our thermocouples were used extensively in the central fields of high technology, such as space, aviation, nuclear power, semiconductor, solar, medical, agricultural etc..

4. Example of measured temperature data

Picture shows 2- thermocouples (25 & 50μm) for engine cylinder measuring the same space to get the true temperature through calculation.



Following shows the gas temperature in the cylinder of a micro Sterling engine driven by candle as an example of fast response .

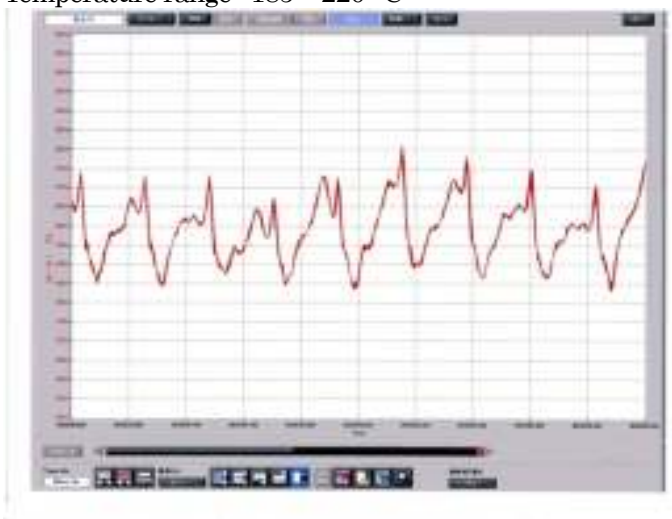
Sampling time : 1msec

Thermocouple type: 25μm ultra-fine thermocouple (installed in φ2mm SUS tube)

One division in the axis of abscissas : 50msec

Rotating speed about 1090 rpm (1cycles= 55msec)

Temperature range : 185 ~ 220 ℃



Moreover, recently we have succeeded in measuring the temperature of explosion of gunpowder of high speed change (μsec order, about 1/1000 time of the above example) using 25μm ultra-fine thermocouple. We would like to announce in the future.

5 Sales

Last year we shipped more than 12,500 thermocouples mainly in Japanese market. Basically all our thermocouple is made- to-order.

We are planning to sell our thermocouple world-widely