

# SURFACE TEMPERATURE SENSORS



These sensors are thermocouples and resistance thermometers for measuring surface temperature of objects.

C400•R400 Magnet sensors



Surface temperature measurement and monitoring of objects such as refrigerators and motors which a magnet can be absorbed.

R420 Pipe Surface Temperature Sensors



For measurement of every kinds of pipes  
By mounting sensors at outlet and inlet of a pipe, heat loss can be measured by temperature difference.  
Mounting of sensors is by a magic tape.

R060 Surface Temperature Sensors



Surface temperature measurement and monitoring of stationary objects such as every kind of materials, machines, and equipment.  
Skin temperature measurement and monitoring of human bodies.  
Temperature measurement of trees and leaves.

C015 Simple Compensation Type Surface Temperature Sensors



Surface temperature measurement of press rollers, rolling rollers coating rollers, calendar rollers, and others.  
Surface temperature measurement of moving belts, sheets, and others.  
Non-contact surface temperature measurement of other moving objects.

C060 Sheet couples



Surface temperature measurement of stationary objects.  
Surface temperature measurement of small objects.  
Temperature distribution measurement of stationary objects.

## Magnet Sensors (Thermocouple)

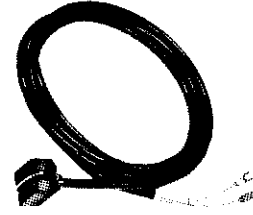
Model C400 - 01

This surface temperature sensor uses a 0.1 mm (thickness) K type ribbon thermocouple as a detecting element and is mounted by a built-in magnet to an object.

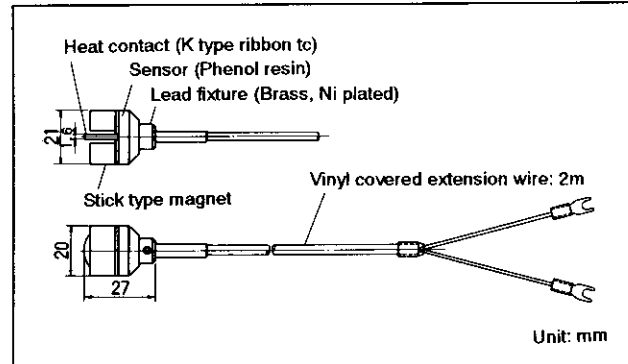
Temperature of a place, where a magnet is absorbed, of refrigerators and motors can be measured.

### General Specifications

Measuring range: 0 to 100°C  
 Class: JIS 2  
 Element: K (ribbon thermocouple)  
 Connecting lead wire: 2m of vinyl covered extension wire (maximum 60°C)  
 Response time: Room temp. . 100°C iron plate above boiling steam about 2 seconds (time to reach to 90% of equilibrium)



### External Dimensions



## Small Magnet Sensors (Thermocouple)

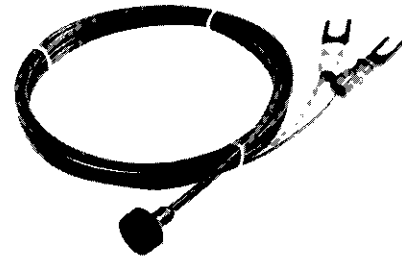
Model: C401 -

K: K type thermocouple  
 T: T type thermocouple

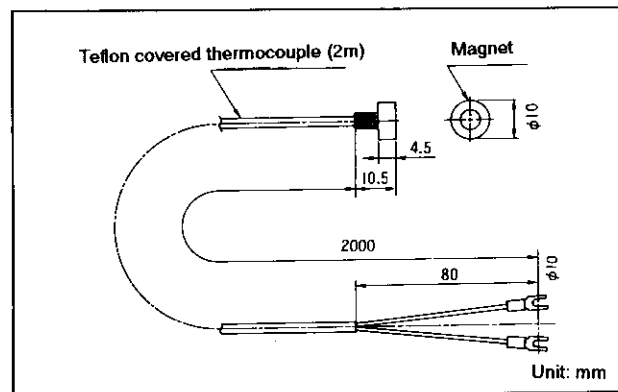
This surface temperature sensor uses a  $\varnothing 0.32$  mm thermocouple as a detecting element and is mounted by a built-in small magnet (outer diameter:  $\varnothing 10$ mm, thickness: 4.5mm) to an object. Temperature of a place, where a magnet is absorbed, of robots for research and experiment, machine tools, bearings, pipes, and furnace walls can be measured.

### General Specifications

Measuring range: 0 to 150 °C  
 Class: JIS 2  
 Element: K, T  
 Connecting lead wire: 2m of teflon covered thermocouple  
 Response time: Room temp. . 100°C nickel plated aluminum plate about 10 seconds



### External Dimensions



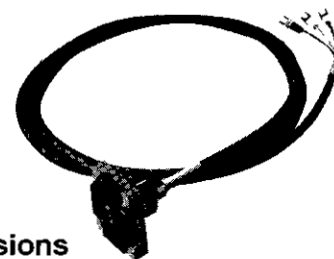
## Magnet Sensors (RTD)

Model: R400 -  1: JPt100, 3: Pt100

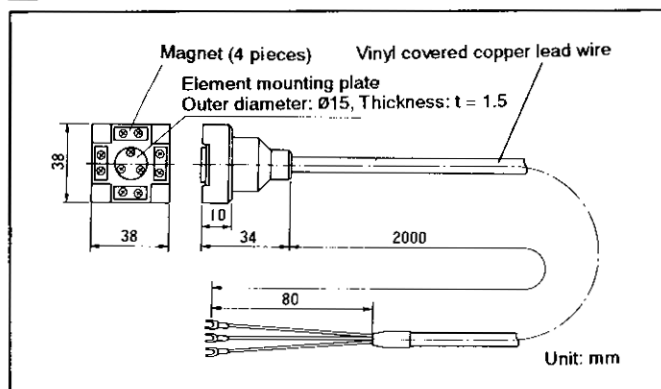
This surface temperature sensor uses a platinum resistance thermometer as a detecting element and is mounted by a built-in magnet to an object. Temperature of a place, where a magnet is absorbed, of refrigerators and motors can be measured.

### General Specifications

Measuring range: 0 to 60°C  
 Class: JIS B  
 Element: Pt100, JPt100 3-wire type  
 Nominal current: 2mA  
 Connecting lead wire: 2m of vinyl covered copper lead wire  
 Response time: Room temp. → 100°C iron plate above boiling steam about 97 seconds (time to reach to 90% of equilibrium)



### External Dimensions



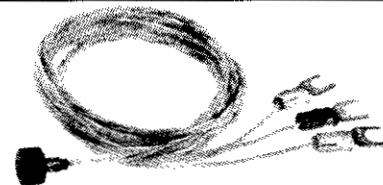
## Small magnet Sensors (RTD)

Model: R401 - 3

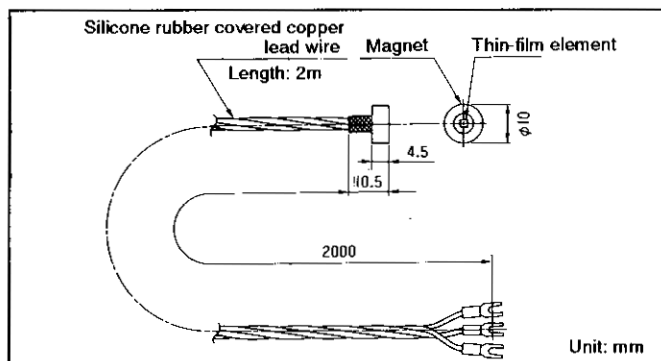
This surface temperature sensor uses a thin-film element as a detecting element and is mounted by a built-in small magnet (outer diameter: Ø10mm, thickness: 4.5mm) to an object.

### General Specifications


Measuring range: 0 to 100°C  
 Class: JIS B  
 Element: Pt100 3-wire type  
 Nominal current: 2mA  
 Connecting lead wire: 2m of silicone covered copper lead wire  
 Response time: Room temp. → 100°C nickel plated aluminum plate about 25 seconds



### External Dimensions



## Pipe Surface Temperature Sensors (RTD)

Model: R420 -  1: JPt100, 3: Pt100

This surface temperature sensor for pipes uses a platinum resistance thermometer with heat collection plate.

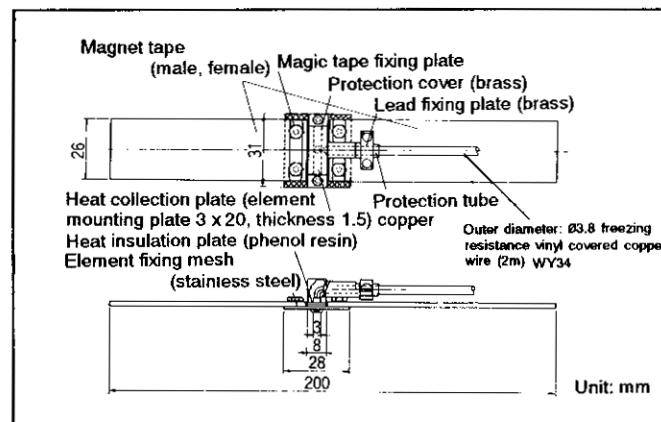
This sensor uses a magic tape and can be mounted to various sizes of pipe.

### General Specifications

Measuring range: 0 to 60°C  
 Class: JIS B  
 Element: Pt100, JPt100 3-wire type  
 Nominal current: 2mA  
 Connecting lead wire: 2m of vinyl covered copper lead wire  
 Response time: Room temp. → 60°C aluminum pipe surface (outer diameter: Ø60mm, wall thickness: 10mm) about 6 seconds



### External Dimensions



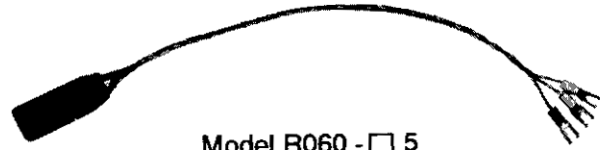
Note: The standard magic tape length (200mm) can be connected to pipes less than Ø50mm.

## R060 Series Surface Temperature Sensors (RTD)

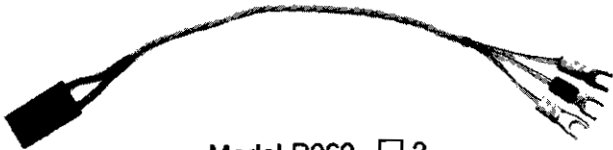
- Model: R060 - □ 1 (General purpose type)  
 R060 - □ 2 □ 5 □ 6 (Flexible type)  
 R060 - □ 3 □ 7 (Small type)  
 R060 - □ 4 (High temperature type)  
 R060 - □ 8 (Small reinforced type)  
 1: JPt100, 3: Pt100



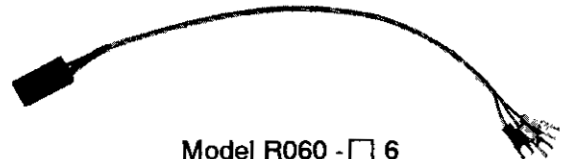
Model R060 - □ 1



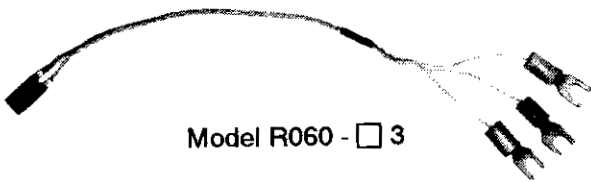
Model R060 - □ 5



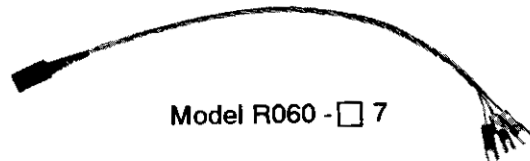
Model R060 - □ 2



Model R060 - □ 6



Model R060 - □ 3



Model R060 - □ 7



Model R060 - □ 4



Model R060 - □ 8

This sensor, having a platinum resistance thermometer as a detecting element, is intended for measurement of surface temperature of stationary objects, with a minimum heat disturbance. Five types for specific measuring conditions are available.

### General purpose type (R060 - □ 1)

A platinum resistance thermometer element is encapsulated with silicone rubber molding in a thin brass casing for moisture-proof and shock resistance.

### Flexible type (R060 - □ 2)

A platinum resistance thermometer element is encapsulated with silicone rubber molding as thin as 0.8mm, which is flexible enough to permit the element to be fitted to a curvature of 20mm radius at minimum.

### Small type (R060 - □ 3)

Being very small, 8 x 12.5 x 1mm in width, length, and thickness, respectively, this sensor enables stable measurement over a range of -50°C to 150°C.

### High temperature type (R060 - □ 4)

A platinum resistance thermometer wound on a ruby mica is housed in a brass casing, with the lead wire fixing material made of aluminum porcelain to permit stable measurement up to 500°C.

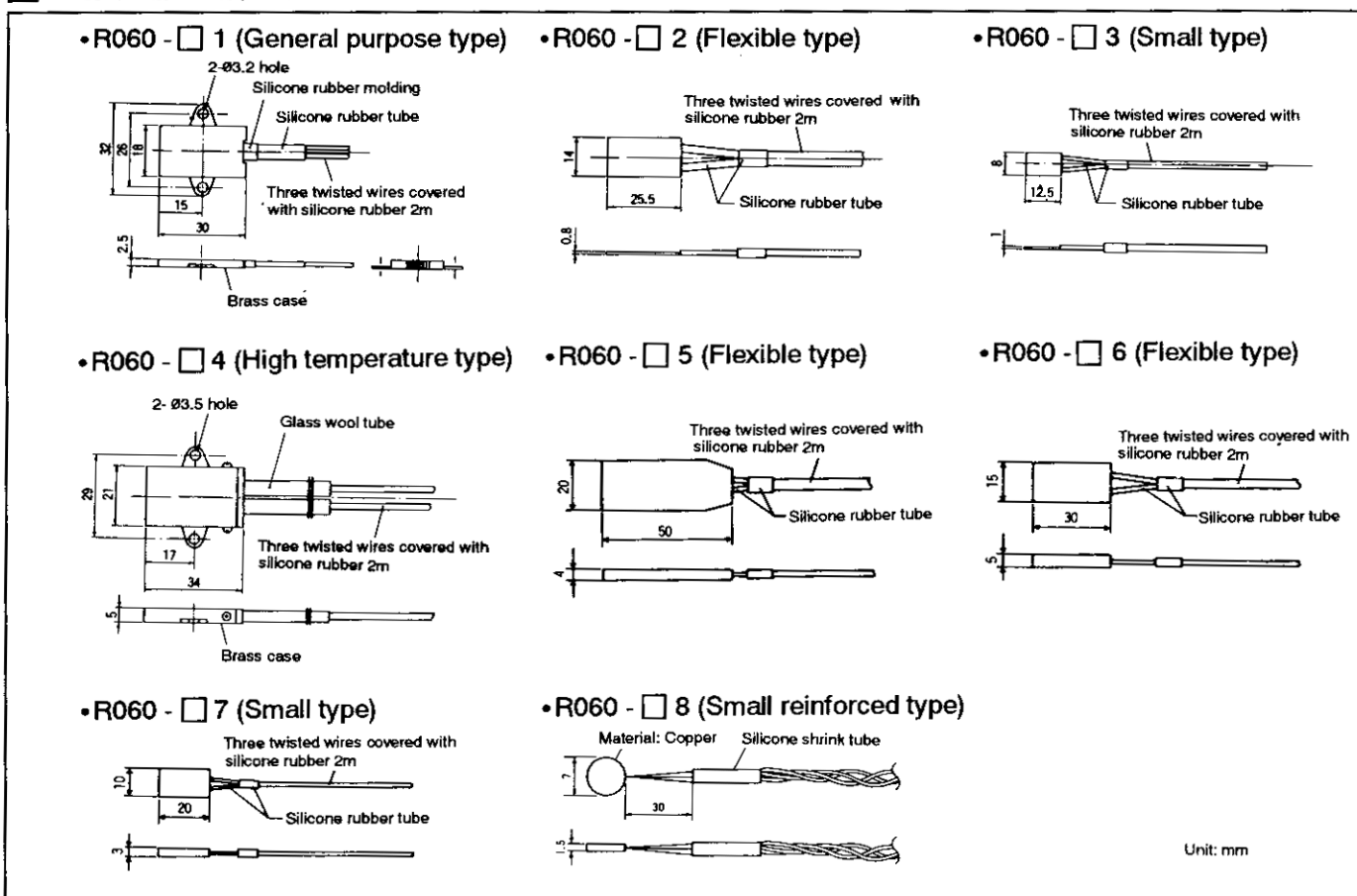
### Small reinforced type (R060 - □ 8)

A platinum resistance thermometer element is mounted in a copper circle plate with better heat-conductivity and has excellent mechanical strength. The lead wires are fixed by resin for high temperature and are strong to disconnection, etc. This sensor with the Ø7mm outer diameter is suitable to high accurate measurement of small area.

## General Specifications

Model Specs	R060 - □ 1 (General purpose type)	R060 - □ 2 R060 - □ 5, R060 □ 6 (Flexible type)	R060 - □ 3, R060 - □ 7 (Small type)	R060 - □ 4 (High temperature type)	R060 - □ 8 (Small reinforced type)
Measuring range	(-)100 to 250°C	(-)50 to 250°C	(-)50 to 150°C	(-)30 to 500°C	(-)100 to 250°C
Class	JIS B	JIS B	JIS B	JIS B	JIS B
Element	Pt100 at 0°C, 3-wire type JPt100 at 0°C, 3-wire type	Pt100 at 0°C, 3-wire type JPt100 at 0°C, 3-wire type	Pt100 at 0°C, 3-wire type JPt100 at 0°C, 3-wire type	Pt100 at 0°C, 3-wire type JPt100 at 0°C, 3-wire type	Pt100 at 0°C, 3-wire type JPt100 at 0°C, 3-wire type
Nominal current	2mA, JPt: 5mA	2mA, JPt: 5mA	2mA, JPt: 5mA	2mA, JPt: 5mA	2mA
Lead wire	2m, three twisted wires covered with silicone rubber	2m, three twisted wires covered with silicone rubber	2m, three twisted wires covered with silicone rubber	2m, three twisted wires with glass wool braided	2m, three twisted wires covered with silicone rubber
Mounting	Screw mounting	Bonding or inserting	Bonding or inserting	Screw mounting	Bonding or inserting
Response time (Time to reach 90% of equilibrium)	25 ~ 100°C (in water) about 10 seconds 100 ~ 25°C (in water) about 10 seconds	R060 - □ 2 25 ~ 100°C (in water) about 2 seconds 100 ~ 25°C (in water) about 1 second R060 - □ 5 25 ~ 100°C (in water) about 13 seconds 100 ~ 25°C (in water) about 10 seconds R060 - □ 6 25 ~ 100°C (in water) about 17 seconds 100 ~ 25°C (in water) about 12 seconds	R060 - □ 3 25 ~ 100°C (in water) about 2 seconds 100 ~ 25°C (in water) about 1.5 seconds R060 - □ 7 25 ~ 100°C (in water) about 8 seconds 100 ~ 25°C (in water) about 6 seconds		
Housing	Box type, brass, black nickel plating, silicone-rubber-molding	Sheet form of silicone rubber molding	Sheet form of silicone rubber molding	Box type, brass, chrome plating	Copper circle plate Resin molding
Mounting curvature	Impossible	Possible on curvature with minimum radius of 20mm	Impossible	Impossible	Impossible
Applications	Surface temperature measurement of stationary objects such as materials, machines and equipment.	Surface temperature measurement of stationary objects. Skin temperature measurement of human bodies for medical treatment. Surface temperature measurement of trees and leaves in greenhouses. Surface temperature measurement of small objects.		Surface temperature measurement of stationary objects such as materials, machines and equipment. (For relatively high temperature measurement)	Surface temperature measurement of stationary objects. Surface temperature measurement of small objects.

## External Dimensions



## C015 Series

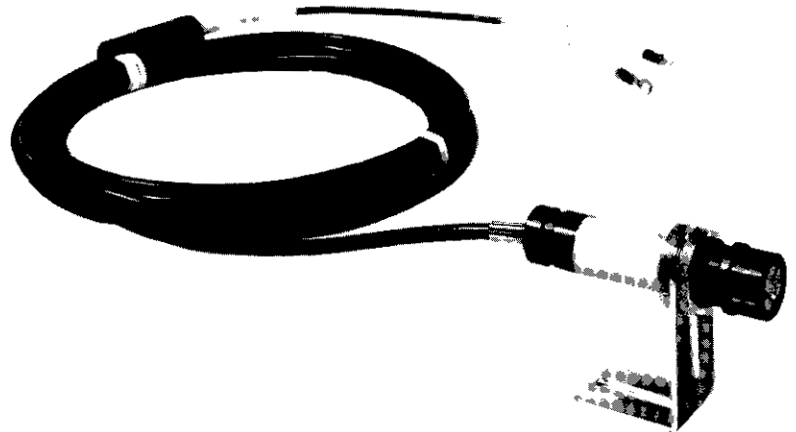
### Surface Temperature Sensor (Thermocouple)

This sensor is a non-contact type thermocouple for surface temperature measurement and has a built-in automatic compensation circuit for difference of close air temperature and true temperature.

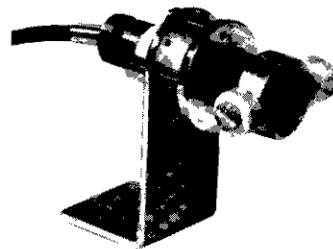
Its applications are temperature measurement of rollers, running belts, plastic sheets, etc.

#### ■ Features

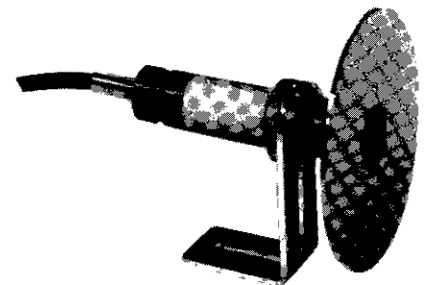
- Non-contact temperature measurement from room temperature to 250°C or to 500°C with a constant distance (1 to 2mm)
- Accurate temperature measurement by automatic compensation for variation of object temperature and environmental temperature
- Stable temperature measurement by a stabilizing filter
- No emissivity compensation for object material, surface, etc.
- A K type thermocouple is used for a detecting element.



Standard type



With distancer



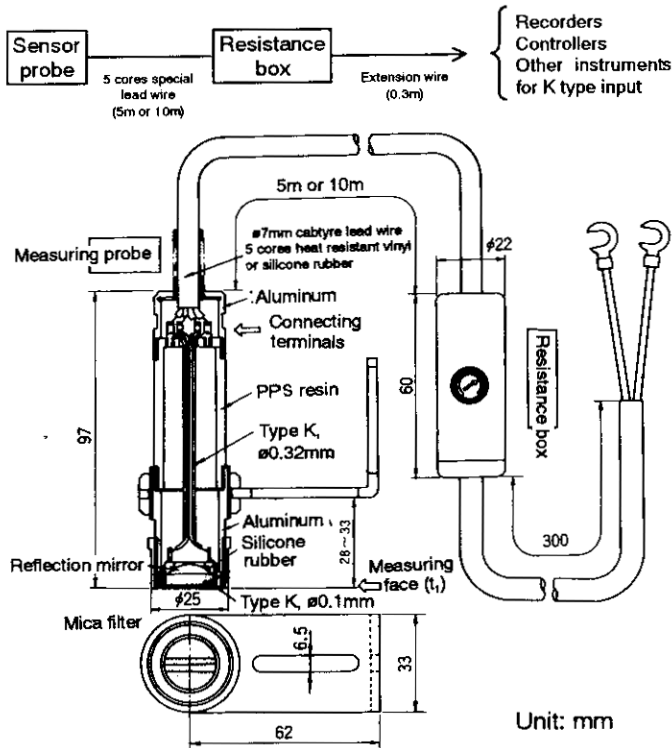
With reflector

#### ■ Models

	Shape			Measuring Range		Lead Wire		Description
	Standard	With reflector	With distancer	Room to 250°C	Room to 500°C	5m	10m	
C015-11	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>		This model is suitable for temperature measurement in case that measurement environment has relatively little disturbance and measuring distance is constant (1 to 2mm). It can be used for press rollers, rollers, heating rollers, running belts, sheets, etc. in various industries.
C015-21	<input type="radio"/>			<input type="radio"/>			<input type="radio"/>	
C015-31	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>		
C015-41	<input type="radio"/>				<input type="radio"/>		<input type="radio"/>	
C015-12		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		This model is with a reflector. It can be used in case that measurement environment has much disturbance and measuring distance is long as about 3mm..
C015-22		<input type="radio"/>		<input type="radio"/>			<input type="radio"/>	
C015-32		<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		
C015-42		<input type="radio"/>			<input type="radio"/>		<input type="radio"/>	
C015-13			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		This model is suitable for temperature measurement in case that measuring distance varies like as eccentric rollers, axis-variation belts, etc. Stable measurement is possible by teflon rollers that contact to objects up to ±5mm of measurement surface variation.
C015-23			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	

## Construction

This sensor is consisted of a sensor probe and a resistance box. The sensor probe consists of three sensing elements made up in coils and with a miller for effective heat receiving. A filter is inserted in front of the element for stabilization of output as well as for protection of the element. A trimmer resistor for compensation constant is built-in.



## General Specifications

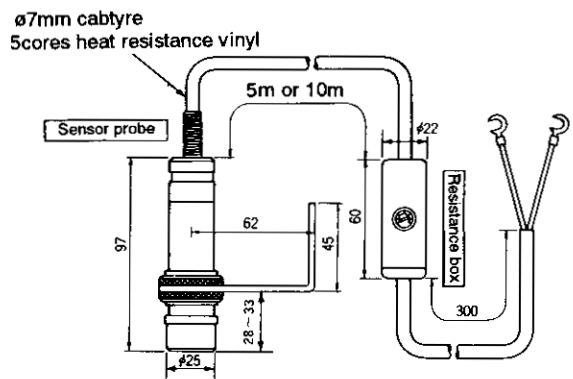
- Measuring element: K type thermocouple
- Element diameter:  $\varnothing 0.1\text{mm}$
- Measuring range: General -- Room temp to  $250^{\circ}\text{C}$   
High temp -- Room temp to  $500^{\circ}\text{C}$
- Ambient temperature: General -- up to  $100^{\circ}\text{C}$   
High temp -- up to  $230^{\circ}\text{C}$
- Measuring accuracy: Within  $\pm 5^{\circ}\text{C}$  in measuring range of  $200^{\circ}\text{C}$  span  
(When the compensation constant is given at halfway of the measuring range)
- Measuring distance: 1 to 2mm (fixed)
- Response time: About 6 seconds (time constant)
- Output signal: E.M.F. of L type thermocouple
- Output impedance: 15 to  $22\Omega$
- Output stabilizing filter: 0.07mm thick amber mica
- Lead wire:  $\varnothing 7\text{mm}$  heat resistant vinyl cord or silicone rubber covered lead wire 5m (10m)

## Measuring Method

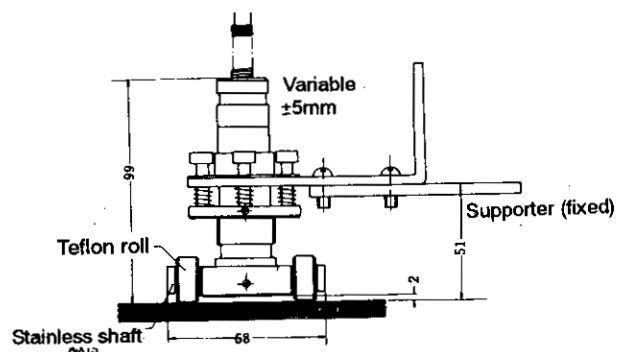
1. Measure temperature of an object by a contact type surface temperature sensor. For a running surface, stop it temporary and measure temperature
2. By adjusting a trimmer resistor in the resistance box by a minus driver, adjust an output of this sensor to the measured value by the contact type surface temperature sensor.

## External Dimensions

### Standard surface temperature sensor

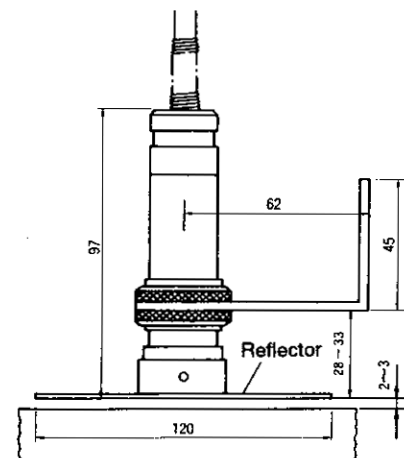


### Surface temperature sensor with a distancer



### Surface temperature sensor with a reflector

1. Reflector



Unit: mm

**C600 Series  
Sheet Couple (Thermocouple)**

Model C060-K  
C060-T

This sensor is a thermocouple (Type K, Type T) in sheet form with the measuring junction covered with an insulating paper.

The sensor is directly pasted to surface of objects to be measured.

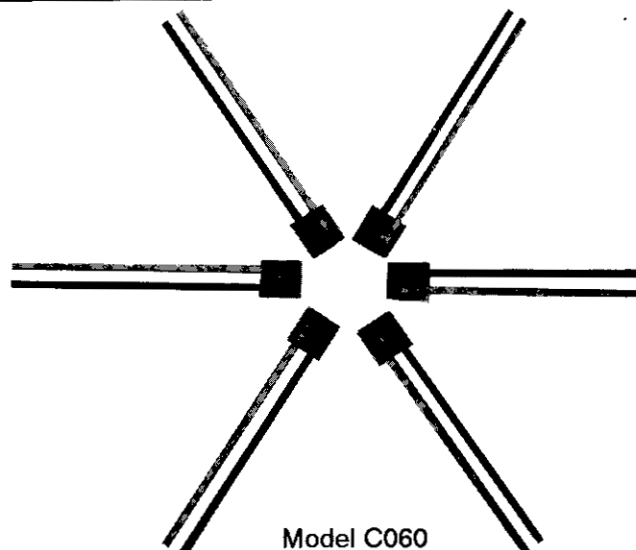
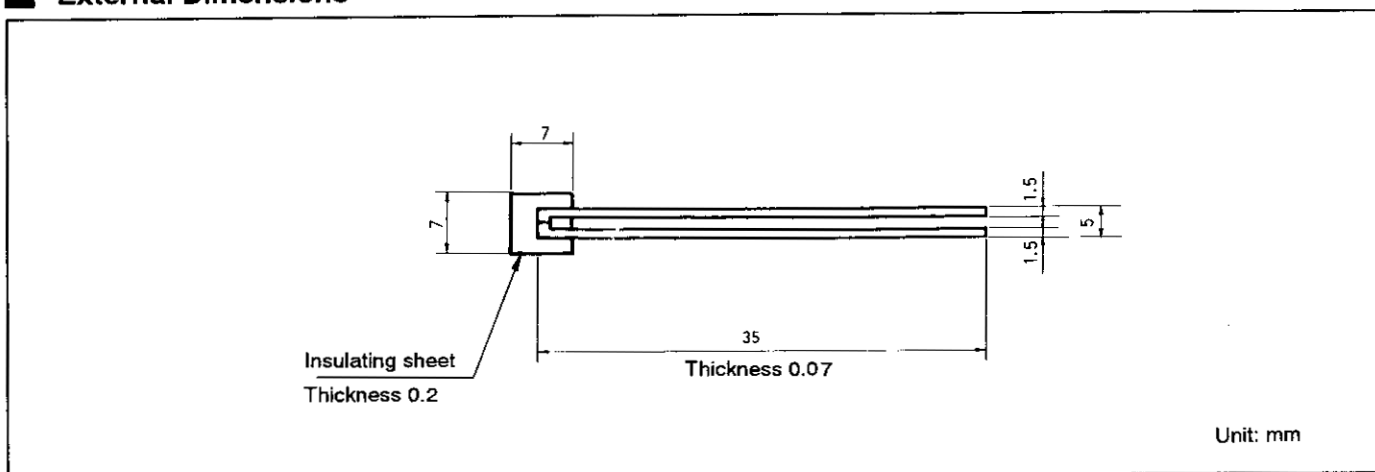
- Quick response  
Being as thin as 0.07mm, the sensor is very quick in response.

Condition	Sheet couple	Type K, ø1.0mm sheath
25 → 100°C in static water	Less than 0.1 second	0.13 second
25 → 100°C in static air	14 seconds	-----

- No thermal disturbance  
Being small in size and very low heat capacity, the sensor gives little thermal disturbance to a surface to be measured. This makes the sensor suitable for measuring temperature of small objects.

- Easy pasting or winding  
For measurement of relatively low temperature, the sensor can be conveniently pasted to objects. For measuring temperature of round surface such as pipes, the sensor can be wound around surface with a tape.

**External Dimensions**



**General Specifications**

- Measuring range: -200 to 300°C \*1
- Class: JIS 2
- Element: K, T
- Lead wire: Extension wire for type K or T, or ø3.2mm type K or T thermocouple wire
- Connection: Spot welding (or soldering for use at relatively low temperature)  
Sensors with a cord is available upon request.
- Mounting: Pasting or pressing
- Applications: Surface temperature measurement and monitoring of stationary objects  
Surface temperature measurement of small objects  
Measurement of temperature distribution of stationary surface

\*1 The insulating paper can be used up to 150°C.

Specifications subject to change without notice. Printed in Japan (I) 2017.8 Recycled Paper

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