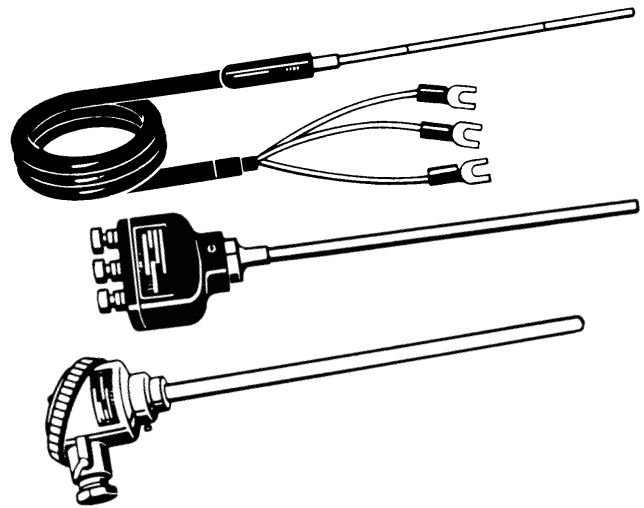


Selecting the Proper Sensor

Selecting the right sensor for your control application assures reliable input to your Omron temperature controller. The topics discussed below point out choices you will make in selecting the proper sensor.

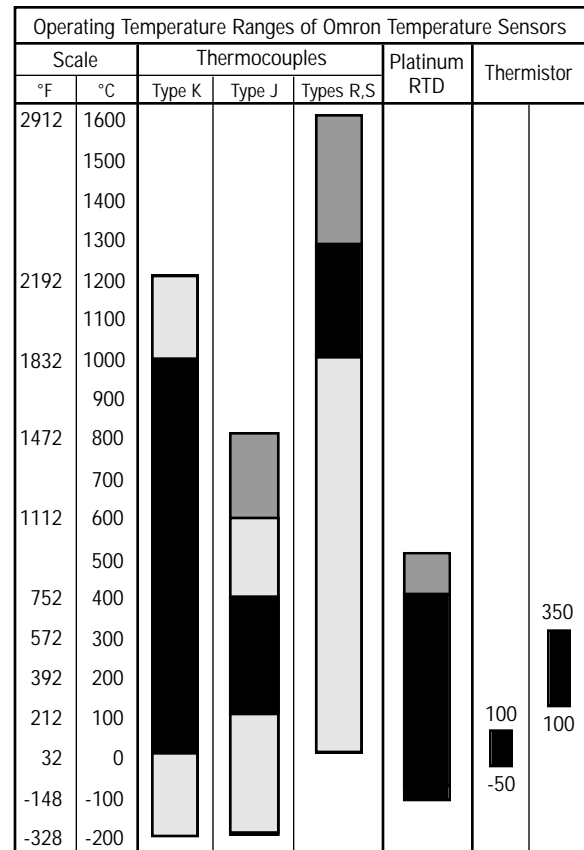


■ SENSOR TYPE

Choose thermocouple, platinum resistance temperature detector (RTD), or thermistor. The decision is made based on the optimum operating range of the sensor shown in the bar graph, the accuracy, and the response time.

■ COMPARISON OF TEMPERATURE SENSOR PERFORMANCE

Sensor Type	Thermocouple	Platinum RTD	Thermistor
Temperature range	0° to 1,600°C 32° to 2,912°F	-100° to 400°C -148° to 752°F	-50° to 350°C -58° to 662°F
Accuracy	Ordinary	Good	Slightly poor
Advantages	Good thermal response Self-powered Simple Rugged Inexpensive Wide variety Wide temperature range	Most accurate Most stable More linear than thermocouple	Fast thermal response Small error due to resistance of conductor
Disadvantages	Compensating conductor necessary Non-linear Low voltage Least stable Least sensitive	Likely to be affected by conductor resistance Slightly slow thermal response because the heat sensing element is long Expensive	Non-linear Limited temperature range Fragile



Legend: Optimum operating range (black), Normal range (grey), Overheat limit (light grey)

● PACKAGE TYPE

Your choice from the list below will influence the response time of the sensor.

- Sheathed or general-purpose types
- Grounded or ungrounded elements
- Protective tubing material

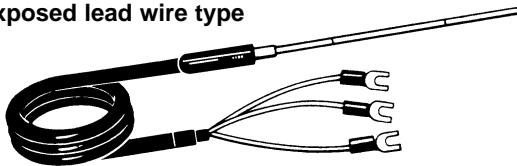
Each sensor has a time constant, the amount of time required to register 63.2% change in temperature. Sensors require between 5 and 10 time constants to stabilize at an accurate temperature reading.

Typical response times for Omron sensors are shown with each type of sensor. You will find the time constant as well as the value calculated for 90% of the final temperature.

● TERMINATION TYPE

Choose sensors with exposed lead wires, exposed terminal, or built-in terminal. The choice is based on environmental conditions and ease of long-term maintenance.

• Exposed lead wire type



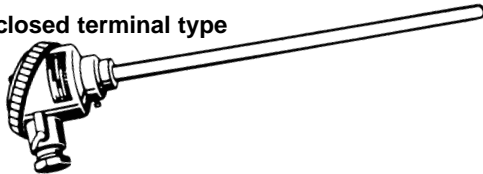
This is an inexpensive type of termination from which the compensating conductor and the lead wires are taken directly for external connection.

• Exposed terminal type



The exposed terminal type has the terminal screws exposed for easy access. It is simple to install and maintain. The temperature sensor can be replaced without changing the compensating conductor and lead wires. Install this type mainly indoors.

• Enclosed terminal type



Sealed terminals are accessible from the screw-on cover. It is moisture-proof for use outdoors as well as indoors. The sensor can be removed for replacement in the same manner as the exposed terminal type.

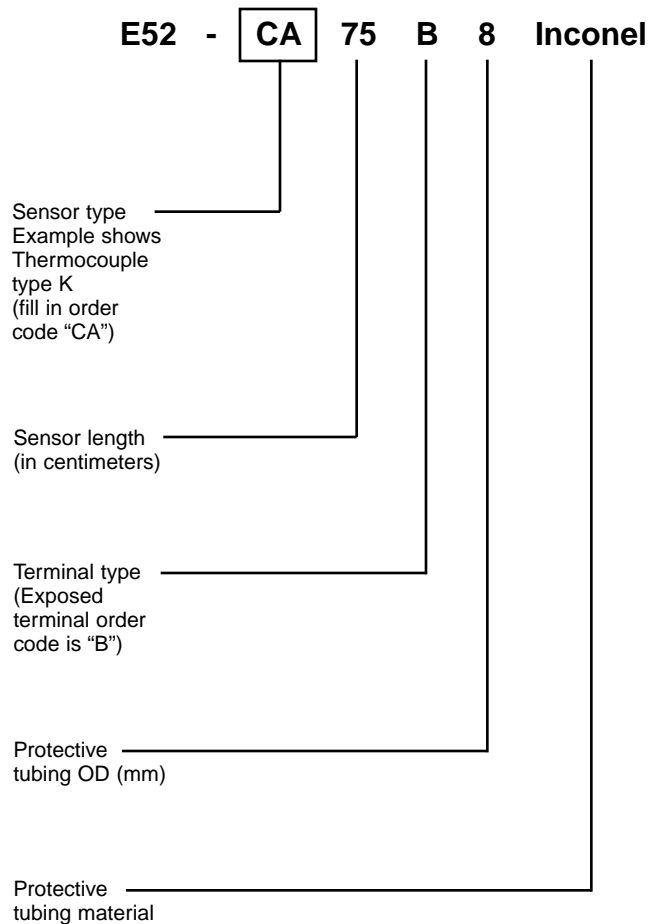
● LEAD LENGTH

To keep electrical noise interference to a minimum, the lead length should be as short as possible. Sensors with exposed leads come with one meter (3.28 feet) of appropriate cable. Longer lead lengths are available on special order.

Sensors with exposed or built-in terminals are not supplied with lead wire. For thermocouple sensors, order a compensating conductor (extension lead) that matches the thermocouple type. For platinum RTD and thermistor sensors, use copper standard wire of proper resistance. Consult Omron for details.

■ ORDERING EXAMPLE

When placing your order for a temperature sensor, be sure to specify sensor type using the order code where left blank, the diameter and material of protective tubing, and the length and insulation material of lead wire/compensating conductors where leads are supplied.



■ THERMOCOUPLE SENSORS

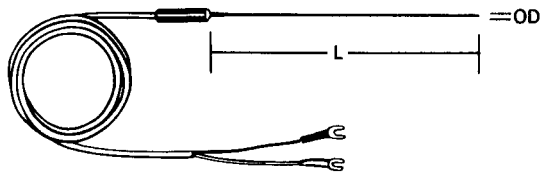
Thermocouples type K, R and S conform to BS 4937, ASTM E230/72, JIS C1602, DIN 43710, and NBS 561. Type J thermocouples that meet DIN standard are available on request.

● SHEATHED, UNGROUNDED THERMOCOUPLES

Construction: The element wire is externally shielded, insulated with tightly packed magnesium oxide, and sheathed in a thin stainless steel tube. The sheath is electrically insulated, offers high thermal conductivity and protects the thermocouple from outside air.

Capabilities: They can be bent to fit otherwise inaccessible areas. Minimum bend curvature is four times the outside diameter of the sheath. If the thermocouple is bent in more than one place, the curvature should be 10 times the sheath diameter.

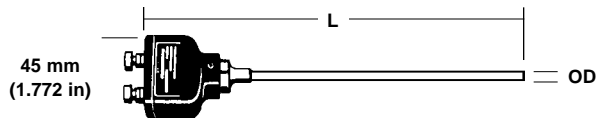
• Exposed lead wire type



Accuracy: ±0.75% or ±2.5°C, whichever is larger.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead [m (ft)]	Accuracy
Sheathed, ungrounded thermocouple (May be bent to shape; angle of bend can be 2 times the sheath diameter)	Specify: Type K (order code CA)	Exposed lead wire type	Specify: 316 stainless steel	E52- □ 15A	150 (5.906)	1.0 (0.039), 1.6 (0.063), 3.2 (0.126)	1 (3.28), 2 (6.56)	±0.75% or ±2.5°C, whichever is larger
				E52- □ 20A	200 (7.874)	1.0 (0.039), 1.6 (0.063), 3.2 (0.126), 4.8 (0.189), 6.4 (0.252), 8.0 (0.315)	4 (13.12), 8 (26.25)	
	Type J (order code IC)		Inconel for type K (CA) sensors only	E52- □ 35A	350 (13.779)	1.0 (0.039), 1.6 (0.063), 3.2 (0.126), 4.8 (0.189), 6.4 (0.252), 8.0 (0.315)		
			E52- □ 50A	500 (19.685)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252), 8.0 (0.315)			

• Exposed lead wire type



Thermal response: The sensor, sheathed in 316 stainless steel tubing, was tested in static water, from room temperature to 100°C (212°F).

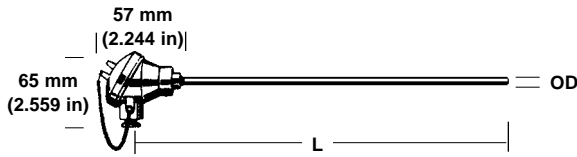
Protective tubing OD	3.2 mm dia. (0.126 in)	4.8 mm dia. (0.189 in)	6.4 mm dia. (0.252 in)
63.2% of indicated value	1 sec	1.8 sec	4 sec
90% of indicated value	1.8 sec	4.4 sec	8 sec

- Supplied with 1 meter (3.28 feet) of general-purpose vinyl covered compensating conductor for -20° to -90°C (-4° to 194°F) service.
- May be ordered with heat resistant, glass-wool covered compensating conductor for 0° to 150°C (32° to 302°F) service.
- Longer lengths may be special ordered: 2 m (6.56 ft), 4 m (13.12 ft) or 8 m (26.25 ft).
- Specify tubing material on type K sensors.
- A protective sleeve between the sheath and compensating conductor measures 40 x 7 mm dia. (1.575 x 0.275 in). On sensors 6.4 mm (0.252 in) diameter and larger, the sleeve measures 45 x 10 mm dia. (1.772 x 0.394 in).
- Order compression fittings and flanges separately from ACCESSORIES section.

- Order compensating conductor (lead extension) separately from ACCESSORIES section.
- Terminal has two M3 screws to fasten compensating conductor.
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy
Sheathed, ungrounded thermocouple (May be bent to shape; angle of bend can be 2 times the sheath diameter)	Specify: Type K (order code CA)	Exposed lead wire type	Specify: 316 stainless steel	E52- □ 20B	200 (7.874)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252)	Order compensating conductor for Type J or Type K from ACCESSORIES	±0.75% or ±2.5°C, whichever is larger
				E52- □ 35B	350 (13.780)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252), 8.0 (0.315)		
	Type J (order code IC)		Inconel for type K (CA) sensors only	E52- □ 50B	500 (19.685)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252), 8.0 (0.315)		
			E52- □ 75B	750 (29.528)	4.8 (0.189), 6.4 (0.252), 8.0 (0.315)			

• Exposed lead wire type



- Order compensating conductor (lead extension) separately from ACCESSORIES section.
- A rubber bushing inside the 3/8 inch pipe thread seals out moisture from the terminal
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy
Sheathed, ungrounded thermocouple (May be bent to shape; angle of bend can be 2 times the sheath diameter)	Specify: Type K (order code CA) Type J (order code IC)	Enclosed terminal type	Specify: 316 stainless steel	E52- □ 20C	200 (7.874)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252)	Order compensating conductor for Type J or Type K from ACCESSORIES	±0.75% or ±2.5°C, whichever is larger
				E52- □ 35C	350 (13.780)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252), 8.0 (0.315)		
			Inconel for type K (CA) sensors only	E52- □ 50C	500 (19.685)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252), 8.0 (0.315)		
				E52- □ 75C	750 (29.528)	4.8 (0.189), 6.4 (0.252), 8.0 (0.315)		

● SHEATHED, UNGROUNDED THERMOCOUPLES

Construction: The thermocouple element is a ceramic insulating pipe, enclosed in a protective tubing sheath. For Types J and K thermocouples, the sheath is steel. For Types R and S thermocouples, the sheath is made of porcelain to protect against reduction at high temperatures.

Accuracy: ±0.75% or ±2.5°C, whichever is larger, for Type J and K thermocouples. ±0.25% or ±1.5°C, whichever is larger, for Type R and S thermocouples in high-temperature service.

Thermal response: A general-purpose thermocouple sensor with 1.6 mm diameter element wire and 12 mm diameter, 316 stainless steel protective tubing was tested in both static water and air.

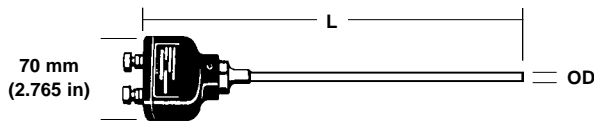
General-purpose thermocouple in static water

Test conditions	In static water	
	Room temp. to 100°C	100°C to Room temp.
63.2% of indicated value	55 sec	56 sec
90% of indicated value	2 min 4 sec	2 min 9 sec

General-purpose thermocouple in air

Test conditions	In air, room temp. to 100°C		
	Static air	Forced air 1.5 m (5ft)/sec.	Forced air 1.5 m (5ft)/sec.
63.2% of indicated value	6 min 50 sec	2 min 2 sec	1 min 43 sec
90% of indicated value	19 min 30 sec	4 min 45 sec	3 min 45 sec

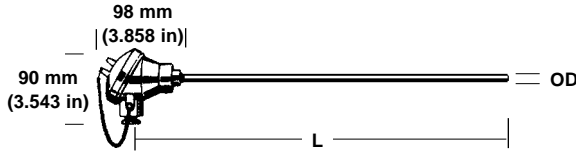
• Exposed terminal type



- Order compensating conductor (lead extension) separately from ACCESSORIES section.
- Terminal has two M3 screws to fasten compensating conductor.
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy
General-purpose ungrounded thermocouple	Specify: Type K (order code CA) Type J (order code IC)	Exposed terminal type	Specify: 304 stainless steel	E52- □ 35B	350 (13.780)	10 (0.394), 12 (0.472), 15 (0.591)	Order compensating conductor for Type J or Type K from ACCESSORIES	±0.75% or ±2.5°C, whichever is larger
				E52- □ 50B	500 (19.685)	10 (0.394), 12 (0.472), 15 (0.591), 22 (0.866)		
			316 stainless steel	E52- □ 75B	750 (29.528)	10 (0.394), 12 (0.472), 15 (0.591), 22 (0.866)		
				E52- □ 100B	1000 (39.370)	10 (0.394), 12 (0.472), 15 (0.591), 22 (0.866)		

• Exposed lead wire type



- Order compensating conductor (lead extension) separately from ACCESSORIES section.
- A rubber bushing inside the 3/8 inch pipe thread seals out moisture from the terminal
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy	
General-purpose ungrounded thermocouple	Specify: Type K (order code CA) Type J (order code IC)	Exposed terminal type	Specify: 304 stainless steel	E52- □ 35B	350 (13.780)	10 (0.394), 12 (0.472), 15 (0.591)	Order compensating conductor for Type J or Type K from ACCESSORIES	±0.75% or ±2.5°C, whichever is larger	
				E52- □ 50B	500 (19.685)	10 (0.394), 12 (0.472), 15 (0.591), 22 (0.866)			
			E52- □ 75B	750 (29.528)	10 (0.394), 12 (0.472), 15 (0.591), 22 (0.866)				
			E52- □ 100B	1000 (39.370)	10 (0.394), 12 (0.472), 15 (0.591), 22 (0.866)				
	Type R (order code PR)	Specify: JIS Class 1 porcelain Recrystallized alumina	E52-PR50C	500 (19.685)	17 (0.669)	Order compensating conductor for Type R from ACCESSORIES			±0.25% or ±1.5°C, whichever is larger
			E52-PR75C	750 (29.528)	17 (0.669)				
			E52-PR100C	1000 (39.37)	17 (0.669)				

● LOW-COST GROUNDED THERMOCOUPLES

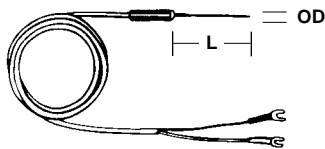
Construction: The thermocouple element is welded to the steel sheath.

Accuracy: ±0.75% or ±2.5°C, whichever is larger, for Type J and K thermocouples.

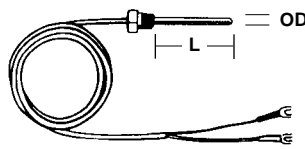
Thermal response: A grounded thermocouple sensor was tested in static water at 100°C (212°F).

Protective tubing OD	4 mm (0.157 in)	5 mm (0.197 in)
63.2% of indicated value	1.1 sec	2 sec
90% of indicated value	2.5 sec	4 sec

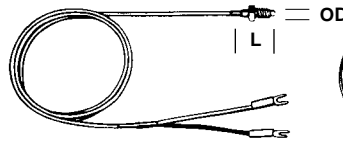
• Exposed terminal type



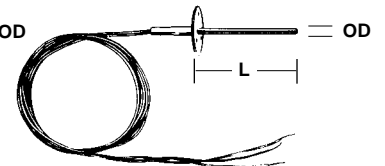
E52- □ □ AS



E52- □ 6D



E52- □ 1D



E52- □ 6F

- Supplied with 1 meter (3.28 feet) of heat resistant glass-wool covered compensating conductor for 0 to 150°C (32 to 302°F) service.
- Longer lengths may be special ordered: 2 m (6.56 ft) or 4 m (13.12 ft).
- Specify tubing material.

- Part numbers that end in "AS" have a 150 mm (6 in) strain relief spring.
- Part numbers that end in "1D" have the sensing element contained in a threaded bushing. Specify the screw thread.
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy
Low-cost grounded thermocouple	Type K (order code CA)	Exposed lead wire type	Nickel-plated brass	E52-CA6AS E52-IC6AS	65 (2.559)	5 (0.197)	1 (3.28), 2 (6.56), 4 (13.12)	±0.75% or ±3°C, whichever is larger
				E52-CA10AS E52-IC10AS	100 (3.937)	5 (0.197)		
				E52-CA15AS E52-IC15AS	150 (5.906)	5 (0.197)		
				E52-CA20AS E52-IC20AS	200 (7.874)	5 (0.197)		
	Type J (order code IC)	Exposed lead, with flange	304 stainless steel	E52-CA1D E52-IC1D	10 (0.394)	W1/4 pitch, M6 or M8		
				E52-CA6D E52-IC6D	65 (2.559)	4 (0.157)		
				E52-CA6F E52-IC6F	65 (2.559)	4 (0.157)		

■ PLATINUM RTD SENSORS

Platinum RTD sensors listed in this catalogue conform to JIS C1604-1981 tolerances. Several Omron temperature controllers require sensors that conform to DIN 43760-1980 tolerances. Consult Omron for availability of "PT-DIN" sensors.

● SHEATHED PLATINUM RTD SENSORS

Construction: The heat sensing element is a glass or ceramic rod having the same thermal expansion coefficient of platinum, and is wound with platinum wire. The wire-wound rod is then covered with glass or ceramic. This sensing element is inserted into a stainless steel sheath packed with magnesium oxide for electrical insulation. The sheath improves thermal conductivity and protects the sensing element from outside air.

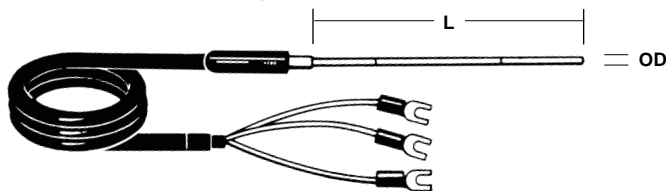
Capabilities: They can be bent to fit otherwise inaccessible areas. The front tip contains the rigid sensing element, so any bend should be made at a point 70 mm (2.756 in) behind the front tip of the sensor. Minimum bend curvature is four times the outside diameter of the sheath. If the sensor is bent in more than one place, the curvature should be 10 times the sheath diameter.

Accuracy: ±0.5% or ±2.5°C, whichever is larger.

Thermal response: Sheathed platinum RTD sensors in 316 stainless steel protective tubing were tested in static water from room temperature to 100°C (212°F).

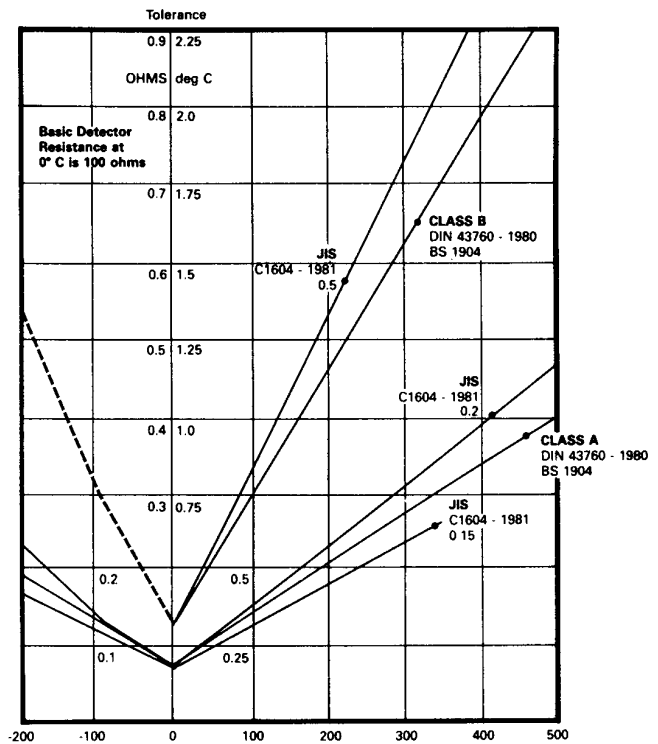
Protective tubing OD	3.2 mm dia. (0.126 in)	4.8 mm dia. (0.189 in)	6.4 mm dia. (0.252 in)
63.2% of indicated value	2.5 sec	4.2 sec	9.9 sec
90% of indicated value	5.6 sec	8.4 sec	19.5 sec

• Exposed lead wire type



- Supplied with 1 meter (3.28 feet) vinyl-covered wires with spade lug terminals, for -20 to 90°C (-4 to 194°F) service.

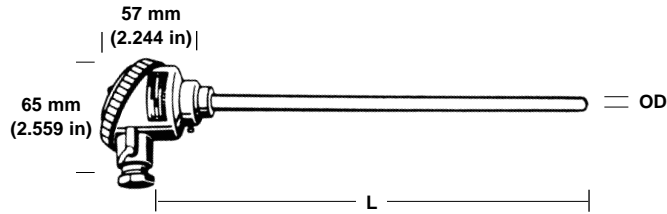
Interchangeability tolerances between platinum RTD sensors of JIS and DIN standards



- Heat-resistant glass-wool covered leads shielded with braided stainless steel wire may be ordered for 0 to 150°C (32 to 302°F) service.
- Longer lengths may be special ordered: 2 m (6.56 ft), 4 m (13.12 ft) or 8 m (26.25 ft).
- A protective sleeve between the sheath and lead wires measures 70 x 8 mm dia. (2.756 x 0.315 in). On the 6.4 mm (0.252 in) diameter sensor, the sleeve measures 70 x 10 mm dia. (2.756 x 0.394 in).
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead [m (ft)]	Accuracy
Sheathed, platinum resistance thermocouple	Platinum 100-ohm resistance, 3-conductor type	Exposed lead wire type	316 stainless steel	E52-P15A	150 (5.906)	3.2 (0.126)	1 (3.28)	±0.5% or ±2.5°C, whichever is larger
				E52-P20A	200 (7.874)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252)	2 (6.56), 4 (13.12), 8 (26.25)	
				E52-P35A	350 (13.779)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252)		
				E52-P50A	500 (19.685)	4.8 (0.189), 6.4 (0.252)		

• Exposed lead wire type



- A rubber bushing inside the 3/8 inch pipe thread seals out moisture from the terminal.
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy
Sheathed, platinum resistance thermocouple	Platinum 100-ohm resistance, 3-conductor type	Exposed terminal type	316 stainless steel	E52-P20C	200 (5.906)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252)	Customer supplies lead wire	±0.5% or ±2.5°C, whichever is larger
				E52-P35C	350 (13.779)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252)		
				E52-P50C	500 (19.685)	3.2 (0.126), 4.8 (0.189), 6.4 (0.252)		
				E52-P75C	750 (29.528)	4.8 (0.189), 6.4 (0.252)		

● GENERAL-PURPOSE PLATINUM RTD SENSORS

Construction: The sensing element is a mica plate wound with platinum wire. The outside of the plate is sandwiched with other mica plates and is attached with a stainless steel fin. The fin improves the thermal conductivity because it is connected to the protective tubing. It also acts as a spring to absorb mechanical shock. The protective tubing cannot be bent. Mount the sensor so that all parts of the protective tubing have a uniform temperature.

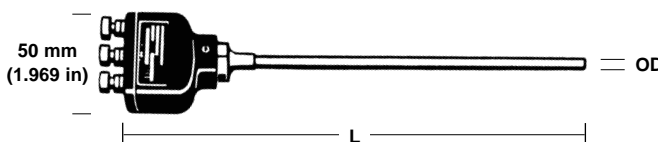
Accuracy: ±0.5% or ±2.5°C, whichever is larger.

Thermal response: A general use platinum RTD sensors in 316 stainless steel protective tubing was tested in static water, from room temperature to 100°C (212°F).

General-purpose platinum RTD sensor in static water

Protective tubing OD	8 mm (0.315 in)	10 mm (0.394 in)
63.2% of indicated value	21.9 sec	23.6 sec
90% of indicated value	43.2 sec	53.2 sec

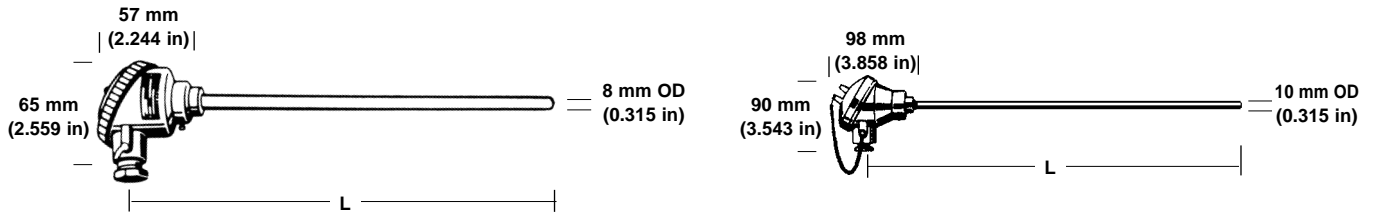
• Exposed terminal type



- Terminal has three M3 screws to fasten lead wires.
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy
Sheathed, platinum resistance thermocouple	Platinum 100-ohm resistance, 3-conductor type	Exposed terminal type	316 stainless steel	E52-P20B	200 (5.906)	8 (0.315)	Customer supplies lead wire	±0.5% or ±2.5°C, whichever is larger
				E52-P35B	350 (13.779)	8 (0.315), 10 (0.394)		
				E52-P50B	500 (19.685)	8 (0.315), 10 (0.394)		
				E52-P75B	750 (29.528)	10 (0.394)		
				E52-P100B	1000 (39.37)	10 (0.394)		

• Enclosed terminal type



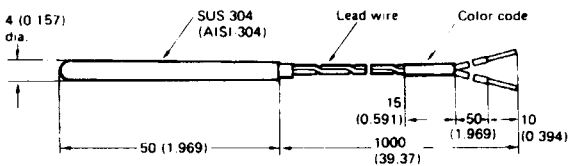
- Terminal has three M3 screws to fasten lead wires.
- Order compression fittings and mounting flanges separately from ACCESSORIES section.

Name	Element	Terminal	Tubing material	Part number	Length [mm (inch)]	Tubing OD [mm (inch)]	Lead	Accuracy
General-purpose type platinum thermocouple	Platinum 100-ohm resistance, 3-conductor type	Exposed terminal type	316 stainless steel	E52-P20C	200 (5.906)	8 (0.315)	Customer supplies lead wire	±0.5% or ±2.5°C, whichever is larger
				E52-P35C	350 (13.779)	8 (0.315), 10 (0.394)		
				E52-P50C	500 (19.685)	8 (0.315), 10 (0.394)		
				E52-P75C	750 (29.528)	10 (0.394)		
				E52-P100C	1000 (39.37)	10 (0.394)		

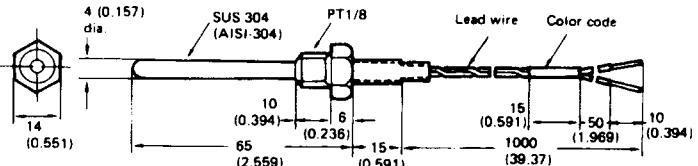
Thermistor Sensor Specifications

The following thermistor sensors are the only ones that can be used with E5C2 and E5CS controllers.

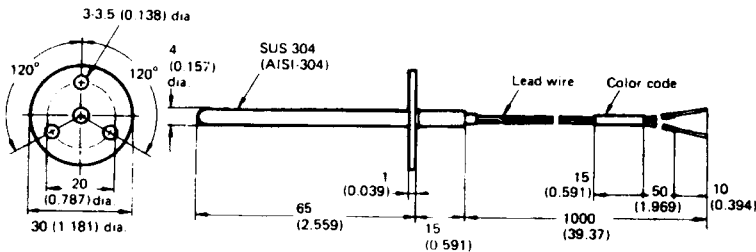
E52-THE5A Probe



E52-THE6D Probe with Compression Fitting



E52-THE6F Probe with Flange



Note:

1. Any type of lead wire may be used to extend the thermistor leads.
2. Add the temperature range to the thermistor sensor part number.

Temperature range	Color code	Nominal resistance value	Constant	Lead wire
-58° to 122°F/-50° to 50°C	Blue	6 kΩ (0°C/32°F)	3390K	Composite stranded wire with two Teflon covered conductors of 7 - 0.12 mm dia. (0.276 - 0.005 in dia.)
32° to 212°F/0° to 100°C	Black			
122° to 302°F/50° to 150°C	Red	30 kΩ (0°C/32°F)	3450K	
212° to 392°F/100° to 200°C	Yellow	0.55 kΩ (200°C/392°F)	4300K	
302° to 572°F/150° to 300°C	Green	4 KΩ (200°C/392°F)	5133K	Parallel glass-wool covered wire 2.28 x 1.44 mm (0.090 x 0.057 in)

Temperature range	Accuracy
-50° to 100°C (-58° to 212°F)	±2°C (±3.6°F) maximum
100° to 350°C (212° to 572°F)	±2% max. of measured temperature

■ ACCESSORIES

● COMPENSATING CONDUCTORS FOR THERMOCOUPLES

These extension leads are made of the same material as the thermocouple, or materials that offer similar thermoelectric characteristics. Three insulation types are available to match the application. Compensating conductors are supplied in spools of 100-meter (328-foot) length.

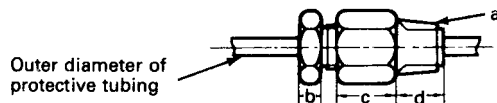
Part number	Thermocouple type	Application (service range)	Sheath material	Sheath colour
WICG-100M	Type J	General purpose -20° to 90°C (-4° to 194°F)	Fully vinyl covered	Yellow
WICH-100M			Glass wool covered	
WICH6-100M			Glass wool covered shielded in braided stainless steel	
WCAG-100M	Type K	General purpose -20° to 90°C (-4° to 194°F)	Fully vinyl covered	Blue
WCAH-100M			Glass wool covered	
WCAH6-100M			Glass wool covered shielded in braided stainless steel	
WPRG-100M	Type R	General purpose -20° to 90°C (-4° to 194°F)	Fully vinyl covered	Black
WPRH-100M			Glass wool covered	
WPRH6-100M			Glass wool covered shielded in braided stainless steel	

● MOUNTING ACCESSORIES

Plan to order a compression fitting or flange to position and mount the sensor in the process unless your insulation already has these pieces in place.

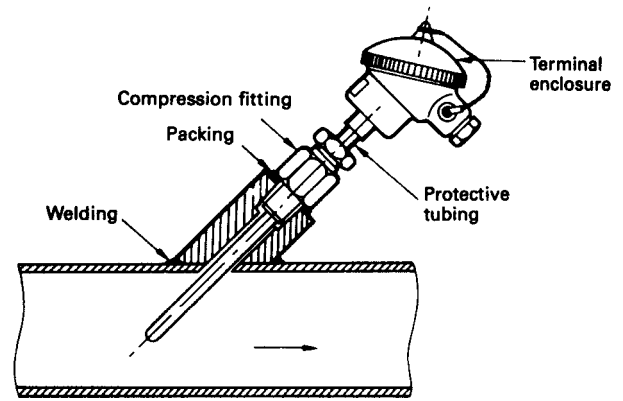
• Compression fittings

Omron's 304 stainless steel compression fittings seal temperature sensors against high-pressure gas or steam. They can withstand pressures up to 20 kg/cm² (284.5 lbs/in²). Compression fittings are used for temperature sensors having a protective tubing outside diameter od 1 to 10 mm (0.039 to 0.394 in). They allow the insertion length of the temperature sensor to be adjusted as necessary.



Part number	Fits sensor tubing OD	Pipe thread (a)	Retaining nut (b)	Fitting body (c)	Ferrule (d)
PT 1/8	1, 1.6, 3.2 and 4.8 mm	PT 1/8	5 mm (0.197 in)	13 mm (0.512 in)	10 mm (0.394 in)
PT 1/4	3.2, 4.8 and 6.4 mm	PT 1/4	5 mm (0.197 in)	15 mm (0.591 in)	12 mm (0.472 in)
PT 3/8	8 mm dia.	PT 3/8	5 mm (0.197 in)	19 mm (0.748 in)	15 mm (0.591 in)
PT 1/2	10 mm dia.	PT 1/2	8 mm (0.315 in)	23.5 mm (0.925 in)	19.5 mm (0.768 in)
PT 12	4.8 mm dia.	PT 12	5 mm (0.197 in)	15 mm (0.591 in)	12 mm (0.472 in)

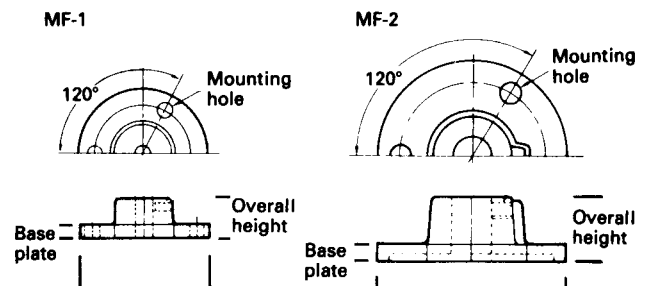
Order as: PT-1/2 D = Xmm, where "X" is OD of protective tubing



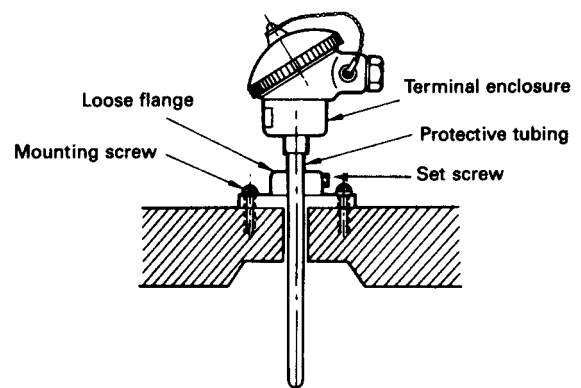
Example of mounting a temperature sensor using a compression fitting

• Loose flanges

An aluminum flange is used to mount temperature sensors in systems where pressure is normal or slightly negative. A flange does not provide sealing. The insertion length of the sensor can be adjusted as necessary then fastened by tightening a set screw. Two flange sizes are available to fit sensors with protective tubing outside diameters of 3.2 to 22 mm (0.126 to 0.866 in). Mounting holes are located 120° apart.



Part number	Fits sensor tubing OD	Base plate		Overall height	Mounting hole dia.
		Diameter	Height		
MF-1	3.2 to 8 mm (0.126 to 0.314 in)	45 mm (1.772 in)	5 mm (0.197 in)	14 mm (0.551 in)	5 mm (0.197 in)
MF-2	10 to 22 mm (0.394 to 0.866 in)	70 mm (2.756 in)	6.6 mm (0.260 in)	24 mm (0.945 in)	6.5 mm (0.256 in)



Example of mounting a temperature sensor using a loose flange

■ HINTS ON CORRECT USE

● OVERHEAT SERVICE LIMITS

Refer to the sensor overheat service limits before choosing a temperature sensor. Plan for an adequate allowance above the normal service range of the sensor.

If the sensor will be used at temperatures lower than the normal temperature range, choose a sheathed temperature sensor with moisture-proof construction.

● Sheathed thermocouple sensor

Element type	Type K		Type J
Protective tubing material	316 stainless steel	Inconel	316 stainless steel
Tubing OD	Overheat service limit		
1.0 mm (0.039 in)	500°C (932°F)	500°C (932°F)	400°C (752°F)
1.6 mm (0.063 in)	800°C (1472°F)	800°C (1472°F)	400°C (752°F)
3.2 mm (0.126 in)	800°C (1472°F)	900°C (1652°F)	450°C (842°F)
4.8 mm (0.189 in)	800°C (1472°F)	1000°C (1832°F)	500°C (932°F)
6.4 mm (0.252 in)	900°C (1652°F)	1100°C (2012°F)	600°C (1112°F)
8.0 mm (0.252 in)	900°C (1652°F)	1150°C (2102°F)	600°C (1112°F)

● Platinum RTD sensor

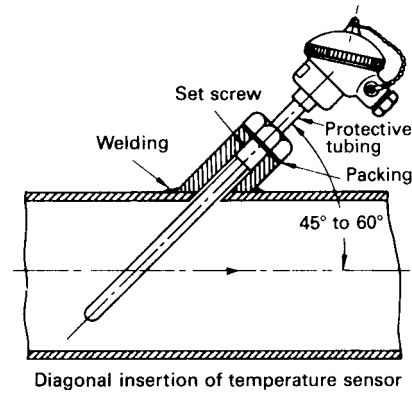
Sensor enclosure type	Overheat service limit
Sheathed platinum RTD	400°C (752°F)
General-purpose platinum RTD	

● Platinum RTD sensor

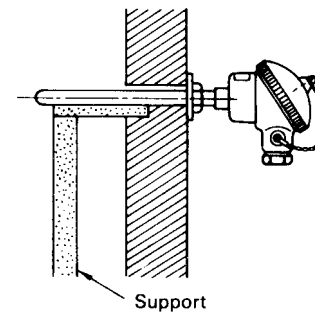
Transmistor temperature range	Overheat service limit
-50° to 50°C (-58° to 122°F)	100°C (212°F)
0° to 100°C (32° to 212°F)	150°C (302°F)
50° to 150°C (122° to 302°F)	200°C (392°F)
100° to 200°C (212° to 392°F)	250°C (482°F)
150° to 300°C (302° to 572°F)	350°C (662°F)

● INSTALLATION OF TEMPERATURE SENSORS

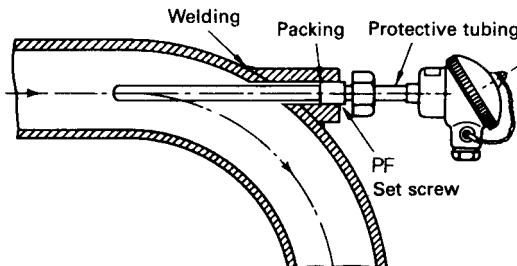
- Select a location where the temperature distribution of the measured substances will not be affected by the installation of a temperature sensor.
- Error in the measured temperature can be reduced if the temperature sensor is inserted in the controlled system as deep as possible. A long insertion length is particularly necessary for resistance thermometers since they measure the average temperature over the whole surface of the protective tubing. Normally, an insertion length about 10 to 20 times the diameter is necessary for accurate measurement.



- When measuring the temperature of flowing liquids such as water, error will be reduced by inserting the temperature sensor against the flow. It is therefore recommended that the temperature sensor be inserted into a pipe bend or diagonally into a straight pipe. Be sure to choose a sensor that can adequately withstand the bending forces and vibration caused by the flow.
- The lead wires of the temperature sensor should be wired so that they are as far away from the power circuit and load circuit as possible. This way, electrical noise interference and induction do not influence the temperature sensor.
- For exposed lead wire terminals, install the sensor so that the junction (sleeve) between the protective tubing and the lead wires does not reach a temperature of more than 90°C (122°F) for vinyl covered leads, 150°C (302°F) for leads in heat resistant insulation.
- The protective tubing of the temperature sensor placed on a wall may droop if the measured temperature rises to the overheat service limit, so provide suitable support for the protective tubing for high temperature measurement.



- Avoid using the adapter of thermistor sensor in a high humidity atmosphere.



Inserting temperature sensor in a pipe bend

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