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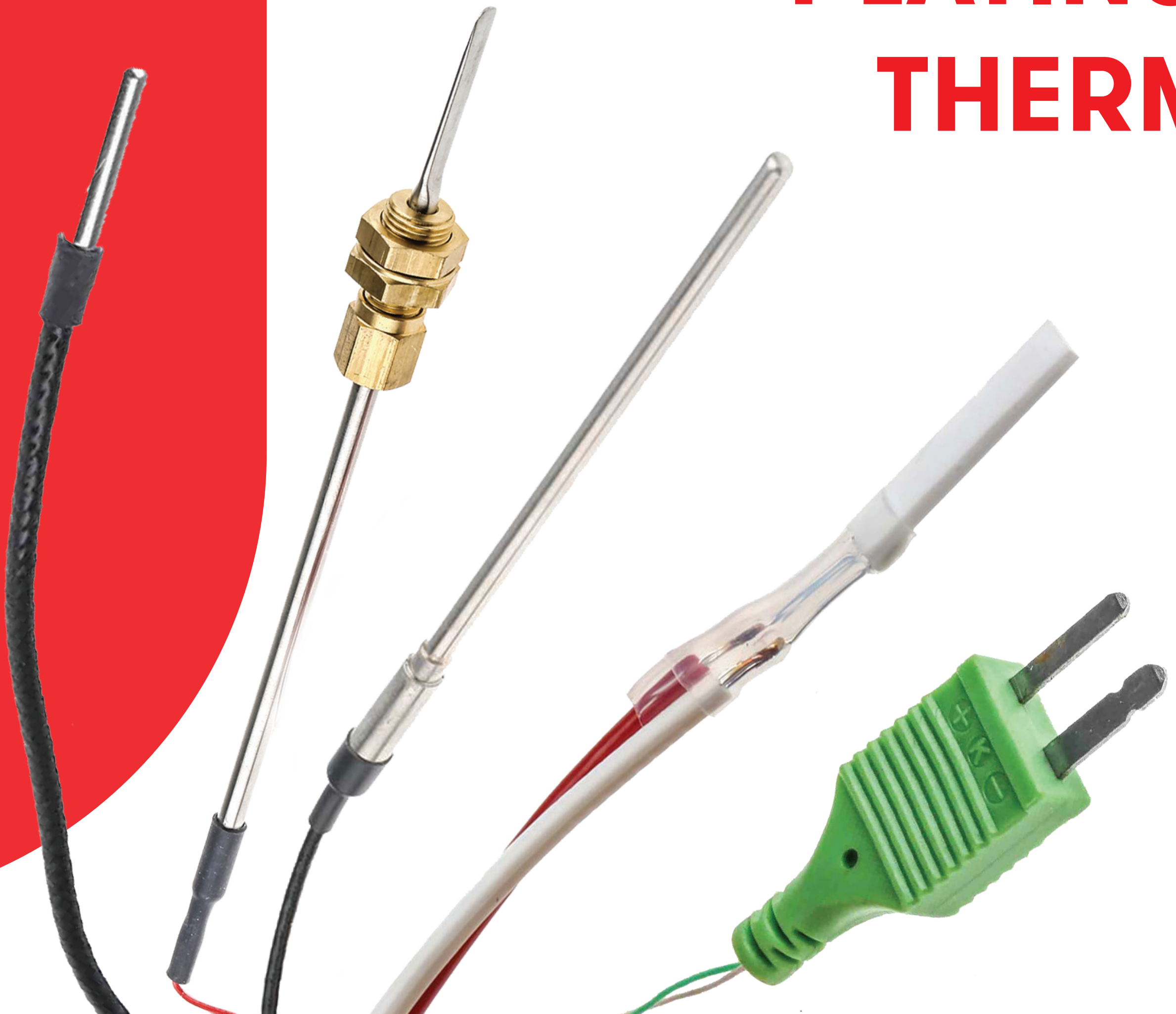
PLATINUM RESISTANCE THERMOMETER (PRT)

SELECTION GUIDE

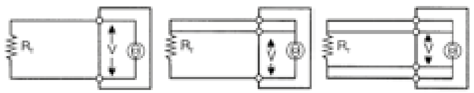


Practical Bridge Circuits For 2, 3 And 4 Wire Thermometers

The connection between the thermometer assembly and the instrumentation. The cabling introduces electrical resistance which is placed in series with the resistance thermometer. The two resistances are therefore cumulative and could be interpreted as an increased temperature if the lead resistance is not allowed for. The longer and/or the smaller the diameter of the cable, the greater the lead resistance will be and the measurement errors could be appreciable. In the case of a 2 wire connection, little can be done about this problem and some measurement error will result according to the cabling and input circuit arrangement.

For this reason, a 2 wire arrangement is only suitable for short cable lengths. If it is essential to use only 2 wires, ensure that the largest possible diameter of conductors is specified and that the length of cable is minimised to keep cable resistance to as low a value as possible.

The use of 3 wires, when dictated either by probe construction or by the input termination of the measuring instrument, will allow for a good level of lead resistance compensation. However the compensation technique is based on the assumption that the resistance of all three leads is identical and that they all reside at the same ambient temperature; this is not always the case. Optimum accuracy is therefore achieved with a 4 wire configuration.



2 Wire Connections   3 Wire Connections   4 Wire Connections

Stem Conduction

This is the mechanism by which heat is conducted from or to the process medium by the probe itself; an apparent reduction or increase respectively in measured temperature results. The immersion depth (the length of that part of the probe which is directly in contact with the medium) must be such as to ensure that the "sensing" length is exceeded (double the sensing length is recommended). Small immersion depths result in a large temperature gradient between the sensor and the surroundings which results in a large heat flow.

The ideal immersion depth can be achieved in practice by moving the probe into or out of the process medium incrementally; with each adjustment, note any apparent change in indicated temperature. The correct depth will result in no change in indicated temperature. For calibration purposes 150 to 300mm immersion is required depending on the probe construction.

Self-heating

In order to measure the voltage dropped across the Pt sensing resistor, a current must be passed through it. The measuring current produces heat dissipation in the sensor. This results in an increased temperature indication. It is necessary to minimise the current flow as much as possible; 1mA or less is usually acceptable.

If the sensor is immersed in flowing liquid or gas, the effect is reduced because of more rapid heat removal. Conversely, in still gas for example, the effect may be significant. The self-heating coefficient E is expressed as:

E = Δt / (R - I2)

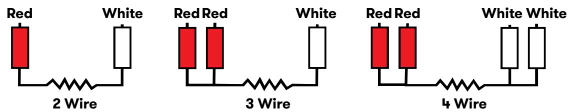
Where Δt = (indicated temperature) - (temperature of the medium)

R = Pt resistance

I = measurement current

Recommended Termination Colour Codes IEC 751(1995)

For dual sensors, IEC 60751(2008) specifies yellow & black(or grey) (instead of red & white as shown) to be introduced for the additional sensing resistor.



Resistance V Temperature and Tolerances for Platinum Resistors to IEC 751(1995)/BS EN60751(1996)

Temp	Resistance	Tolerance			
		Class A		Class B	
(°C)	(Ω)	(±°C)	(±Ω)	(±°C)	(±Ω)
-200	18.52	0.55	0.24	1.3	0.56
-100	60.26	0.35	0.14	0.8	0.32
0	100.00	0.15	0.06	0.3	0.12
100	138.51	0.35	0.13	0.8	0.30
200	175.86	0.55	0.20	1.3	0.48
300	212.05	0.75	0.27	1.8	0.64
400	247.09	0.95	0.33	2.3	0.79
500	280.98	1.15	0.38	2.8	0.93
600	313.71	1.35	0.43	3.3	1.06
650	329.64	1.45	0.46	3.6	1.13
700	345.28	-	-	3.8	1.17
800	375.70	-	-	4.3	1.28
850	390.48	-	-	4.6	1.34

New Tolerance Classes for Resistors to IEC 60751(2008)

For wire wound resistors		For film resistors		
Tolerance class	Temperature range of validity °C	Tolerance class	Temperature range of validity °C	Tolerance value° °C
W 0.1	-100 to +350	F 0.1	0 - +150	± (0.1 + 0.0017 | t |)
W 0.15	-100 to +450	F 0.15	-30 - +300	± (0.15 + 0.002 | t |)
W 0.3	-196 to +660	F 0.3	-50 - +500	± (0.3 + 0.005 | t |)
W 0.6	-196 to +660	F 0.6	-50 - +600	± (0.6 + 0.01 | t |)

° | t | = modulus of temperature in °C without regard to sign. For any value of R°

New Tolerance Classes for Thermometers to IEC 60751(2008)

Tolerance class	Temperature range of validity °C		Tolerance values° °C
	Wire wound resistors	Film resistors	
AA	-50 to +250	0 to +150	± (0.1 + 0.0017 | t |)
A	-100 to +450	-30 to +300	± (0.15 + 0.002 | t |)
B	-196 to +600	-50 to +500	± (0.3 + 0.005 | t |)
C	-196 to +600	- 50 to +600	± (0.6 + 0.01 | t |)

° | t | = modulus of temperature in °C without regard to sign. For any value of R°

COMPARISON OF SENSOR TYPES

	PLATINUM RESISTANCE THERMOMETER	THERMOCOUPLE	THERMISTOR
Sensor	Platinum-wire wound or flatfilm resistor	Thermoelement, two dissimilar metals/alloys	Ceramic (metal oxides)
Accuracy (typical values)	0.1 to 1.0°C	0.5 to 5.0°C	0.1 to 1.5°C
Long term Stability	Excellent	Variable, Prone to ageing	Good
Temperature range	-200 to 650°C	-200 to1750°C	-100 to 300°C
Thermal response	Wirewound – slow Film – faster 1-50 secs typical	Sheathed – slow Exposed tip – fast 0.1 to 10 secs typical	generally fast 0.05 to 2.5 secs typical
Excitation	Constant current required	None	None
Characteristic	PTC resistance	Thermovoltage	NTC resistance (some are PTC)
Linearity	Fairly linear	Most types non-linear	Exponential
Lead resistance effect	3 & 4 wire – low. 2 wire – high	Short cable runs satisfactory	Low
Electrical pick-up	Rarely susceptible	Susceptible	Not susceptible
Interface	Bridge 2,3 or 4 wire	Potentiometric input. Cold junction compensation required	2 wire resistance
Vibration effects/ shock	wirewound – not suitable. Film – good	Mineral insulated types suitable	Suitable
Output/ characteristic	approx. 0.4 W/°C	From 10µV/°C to to 40µV/°C depending on type	-4% / °C
Extension Leads	Copper	Compensating cable	Copper
Cost	Wirewound – more expensive Film – cheaper	Relatively low cost	Inexpensive to moderate

Comments and values shown in this chart are generalised and nominal. They are not intended to be definitive but are stated for general guidance.

RTD SENSOR OR THERMOCOUPLE?

RTD

Resistance Thermometers utilise a high precision sensing resistor, usually platinum, the resistance value of which increases with temperature. The dominant standard adopted internationally is the Pt100 which has a resistance value of 100.0 Ohms at 0°C and a change of 38.50 Ohms between 0 and 100°C (the fundamental interval).

The platinum sensing resistor is highly stable and allows high accuracy temperature sensing. Resistance thermometer sensing resistors are 2 wire devices but the 2 wires will usually be extended in a 3 or 4 wire configuration according to the application, the associated instrumentation and accuracy requirements.

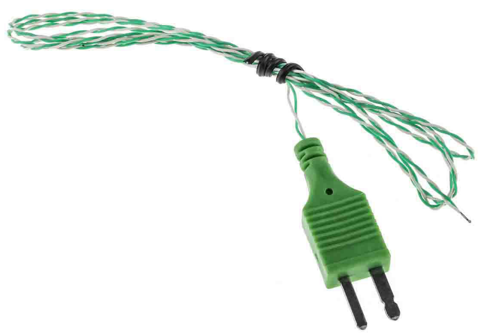
RTD's are, generally:

- More expensive
- More accurate
- Highly stable (if used carefully)
- Capable of better resolution
- Restricted in their range of temperature
- Stem, not tip sensitive
- Rarely available in small diameters (below 3mm)

Thermocouple

Thermocouples comprise a thermoelement which is a junction of two specifield, dissimilar alloys and a suitable two wire extension lead. The junction is a short circuit only, the EMF is generated in the temperature gradient between the hot junction and the 'cold' or reference junction. This characteristic is reasonably stable and repeatable and allows for a family of alternative thermocouple types (e.g. J,K,T,N) to be used.

The alternative types are defined by the nature of the alloys used in the thermoelements and each type displays a different thermal EMF characteristic.



Thermocouples are, generally:

- Relatively inexpensive
- More rugged
- Less accurate
- More prone to drift
- More sensitive
- Tip sensing
- Available in smaller diameters
- Available with a wider temperature range
- More versatile

In both cases, the choice of thermocouple or RTD must be made to match the instrumentation and to suit the application.

COMPARISON OF SHEATH MATERIALS

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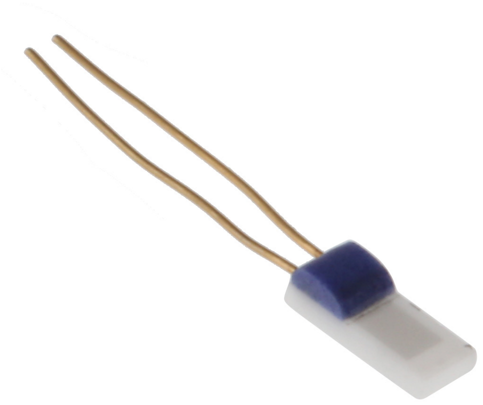
SHEATH MATERIAL	MAX CONTINUOUS TEMPERATURE	NOTES	APPLICATIONS
Refractory Oxide recrystallised, e.g. Alumina Impervious	1750°C	Good choice for rare metal thermocouples. Good resistance to chemical attack. Mechanically strong but severe thermal shock should be avoided.	Forging iron & steel, incinerators, carburizing and hardening in heat treatment, continuous furnaces and glass lehrs.
Silicon Carbide (Porous)	1500°C	Good level of protection even in severe conditions. Good resistance to reasonable levels of thermal shock. Mechanically strong when thick wall is specified but becomes brittle when aged. Unsuitable for oxidising atmospheres but resists fluxes.	Forging iron & steel, incinerator, billet heating, slab heating, butt welding, soaking pits and ceramic dryers.
Impervious Mullite	1600°C	Good choice for rare metal thermocouples under severe conditions. Resists Sulphurous and carbonaceous atmospheres. Good resistance to thermal shock should be avoided.	Forging iron & steel, incinerators, heat treatment, glass flues and continuous furnaces.
Mild Steel (cold drawn seamless)	600°C	Good physical protection but prone to rapid corrosion.	Annealing up to 500°C, hardening pre-heaters and baking ovens.
Stainless steel 25/20	1150°C	Resists corrosion even at elevated temperature. Can be used in Sulphurous atmospheres.	Heat treatment annealing, flues, many chemical processes, vitreous enamelling and corrosion resistant alternative to mild steel.
Inconel 600/800*	1200°C	Nickel-Chromium-Iron alloy which extends the properties of stainless steel 25/20 to higher operating temperatures. Excellent in Sulphur free atmospheres; superior corrosion resistance at higher temperatures. Good mechanical strength.	Annealing, carburizing, hardening, iron and steel hot blast, open hearth flue & stack, waste heat boilers, billet heating, slab heating, continuous furnaces, soaking pits, cement exit flues & kilns, vitreous enamelling, glass flues and checkers, gas superheaters and incinerators up to 1000°C. Highly sulphurous atmospheres should be avoided above 800°C.
Chrome Iron	1100°C	Suitable for very adverse environments. Good mechanical strength. Resists severely corrosive and sulphurous atmospheres.	Annealing, carburizing, hardening, iron & steel hot blast, open hearth flue and stack, waste heat boilers, billet heating, slab heating, continuous furnaces, soaking pits, cement exit flues & kilns, vitreous enamelling, glass flues and checkers, gas superheaters and incinerators up to 1000°C.
Nicrobell*	1300°C	Highly stable in vacuum and oxidising atmospheres. Corrosion resistance generally superior to stainless steels. Can be used in Sulphurous atmospheres at reduced temperatures. High operating temperature.	As Inconel plus excellent choice for vacuum furnaces and flues.

*** Tradenames**

Sheath materials range from mild and stainless steels to refractory oxides (ceramics, so called) and a variety of exotic materials including rare metals. The choice of sheath must take account of operating temperature, media characteristics, durability and other considerations including the material relationship to the type of sensor.

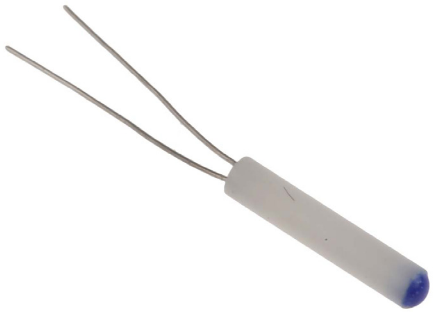
THIN FILM DETECTORS & WIRE-WOUND DETECTOR ELEMENTS

Thin Film Detectors



RESISTANCE	DIMENSIONS (WIDTH X LENGTH)	TOLERANCE CLASS A	TOLERANCE CLASS B	TOLERANCE CLASS 1/3 DIN
Pt100	2 × 5mm	611-7788	611-7801	-
Pt100	2 × 10mm	362-9799	237-1607	362-9812
Pt100	2 × 2.3mm	362-9834	362-9840	362-9856
Pt1000	2 × 10mm	362-9907	362-9913	814-0178
Pt1000	1 × 3mm	-	814-0171	-
Pt1000	1.25 × 1.7mm	-	814-0175	-

Wire-Wound Detector Elements

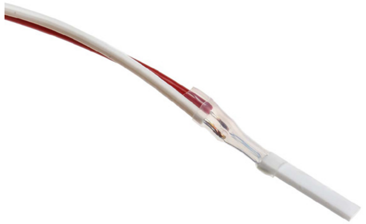


RESISTANCE	DIMENSIONS (DIA X LENGTH)	TOLERANCE CLASS A	TOLERANCE CLASS B	DUEL ELEMENT (PT100 X2) TOLERANCE CLASS A
Pt100	1.5 × 8mm	611-7873	611-7851	-
Pt100	1.5 × 15mm	611-7839	611-7867	397-1595
Pt100	2.8 × 15mm	611-7845	611-7823	-
Pt100	2.8 × 25mm	611-7817	611-7794	-

 This is just a small selection of Detectors offered by RS PRO

PLATINUM RESISTANCE THERMOMETER WITH EXTENDED LEADS

Platinum Resistance Pt100 & Pt1000 Detectors with Extended Leads



TYPE	CLASS	DETECTOR (W X L)	CABLE LENGTH	AWG	CABLE TYPE	TERMINATION	STOCK NO
Pt100	B	2 × 10mm	300mm	24 AWG	Teflon® insulated	2 Wire	891-9132
Pt100	A	2 × 10mm	1000mm	26 AWG	Teflon® insulated	4 Wire	891-9145
Pt1000	B	2 × 10mm	500mm	24 AWG	Teflon® insulated	2 Wire	891-9157

Pt100 Ceramic Wire-Wound

TYPE	CLASS	DETECTOR (W X L)	CABLE LENGTH	AWG	CABLE TYPE	TERMINATION	STOCK NO
Pt100	B	2.8 × 15mm	300mm	26 AWG	Teflon® insulated	2 Wire	110-4460
Pt100	B	2.8 × 15mm	500mm	26 AWG	Teflon® insulated	4 Wire	891-9160
Pt100	B	2.8 × 15mm	1000mm	26 AWG	Teflon® insulated	4 Wire	891-9163

Pt100 Tubular Ceramic Insert Elements with tail wires

TYPE	CERAMIC DIAMETER	CERAMIC LENGTH	LEAD LENGTH	CABLE TYPE	CABLE TYPE	TERMINATION	STOCK NO
Pt100	5mm	35mm	50mm	7/0.2mm SPC Teflon	Teflon® insulated	2 Wire	237-1641
Pt100	5mm	35mm	450mm	7/0.2mm SPC Teflon	Teflon® insulated	4 Wire	237-1657
Pt100	5mm	35mm	10mm	1/0.4mm Nickel	Teflon® insulated	4 Wire	237-1629

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Pt100 Heavy Duty Sensor Probe, Class B

TYPE	CLASS	PROBE DIAMETER	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	STOCK NO
Pt100	B	6mm	50mm	2m	Flexible silicone rubber insulated, 7/0.2mm	455-3968
Pt100	B	6mm	100mm	2m	Flexible silicone rubber insulated, 7/0.2mm	611-8264

Pt100 Sheathed Thin Film Strip Sensor

TYPE	CLASS	STRIP DIMENSIONS (L X W X H)	CABLE LENGTH	CABLE TYPE	STOCK NO
Pt100	B	35mm x 6mm x 2mm	1m	7/.02mm Teflon® insulated twin twisted lead	237-1613

PT100 'Flat Tip' Probe

TYPE	CLASS	PROBE DIAMETER	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	STOCK NO
Pt100	B	4mm	150mm	1m	7/0.2mm Teflon® insulated 2 twisted leads	237-1663

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PLATINUM RESISTANCE THERMOMETER PT100 PRECISION PROBES

Platinum Resistance Thermometer Pt100 Precision Probe

TYPE	CLASS	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	TERMINATION	PROBE TEMPERATURE RANGE	STOCK NO
Pt100	1/5th Din	250mm	2m	7/0.2mm PTFE insulated with silver plated copper screen	4 Wire	-50°C to +250°C	236-4299

Platinum Resistance Pt100 Dual Element Mineral Insulated Sensor Probe

TYPE	CLASS	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	TERMINATION	PROBE TEMPERATURE RANGE	STOCK NO
Mineral Insulated Duplex PRT	B	150mm	1m	7/0.2mm flexible 6 core Teflon® insulated & screened	2 × 3 wire	-50°C to +500°C	397-1416

Platinum Resistance Pt100 Dual Element Industrial Sensor Probe

TYPE	CLASS	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	TERMINATION	PROBE TEMPERATURE RANGE	STOCK NO
Pt100	B	150mm	1m	7/0.2mm flexible 6 core Teflon® insulated & screened	2 × 3 wire	-50°C to +250°C	397-1393

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PLATINUM RESISTANCE THERMOMETER PT100 WITH STAINLESS STEEL SHEATH

Platinum Resistance Pt100 Class B Sensors with Teflon Insulated lead in a Stainless-Steel Tube

CLASS	PROBE DIAMETER	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	TERMINATION	STOCK NO
B	3mm	25mm	1m	Teflon® insulated	4 Wire	762-1134
B	3mm	100mm	1m	Teflon® insulated	4 Wire	158-985
B	4mm	90mm	1m	Teflon® insulated	4 Wire	123-5610

Platinum Resistance Pt1000 Class B Sensor with Teflon insulated lead in a Stainless-Steel Tube

CLASS	PROBE DIAMETER	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	TERMINATION	STOCK NO
B	4mm	40mm	1m	Teflon® insulated	2 Wire	123-5612

Platinum Resistance Thermometer Pt100 Industrial Sensor Probe, Class B, in a Stainless-Steel Tube

TYPE	CLASS	PROBE DIAMETER	PROBE LENGTH	CABLE LENGTH	CABLE TYPE	TERMINATION	STOCK NO
Pt100	B	3mm	150mm	1m	Teflon® insulated, Screened	4 Wire	362-9935
Pt100	B	4mm	25mm	2m	Teflon® insulated, Screened	4 Wire	123-5588
Pt100	B	4.5mm	125mm	2m	Teflon® insulated, Screened	4 Wire	123-5597
Pt100	B	6mm	300mm	2m	Teflon® insulated, Screened	4 Wire	123-5606

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PLATINUM RESISTANCE PT100 & PT1000 SILICONE PATCH SENSORS

Pt100 Silicone Patch Sensor

TYPE	CLASS	PATCH LENGTH	PATCH WIDTH	PATCH HEIGHT	CABLE LENGTH	CABLE TYPE	TERMINATION	STOCK NO
Pt100	B	40mm	13mm	5mm	2m	Teflon Insulated, 7/0.2mm	4 Wire	285-661
Pt100	B	40mm	13mm	5mm	5m	Teflon Insulated, 7/0.2mm	4 Wire	762-1137

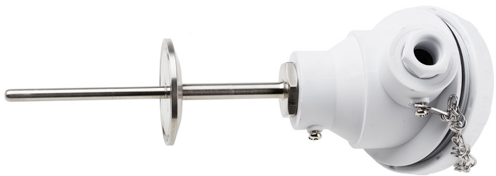
Pt1000 Silicone Patch Sensor

TYPE	CLASS	PATCH LENGTH	PATCH WIDTH	PATCH HEIGHT	CABLE LENGTH	CABLE TYPE	TERMINATION	STOCK NO
Pt1000	B	30mm	15mm	4mm	1m	Teflon Insulated, 7/0.2mm	2 Wire	762-1130

Platinum Resistance Pt100 Hygienic Thermometer, 1.5" RJT style fitting

SENSOR TYPE	SHEATH DIAMETER	SHEATH LENGTH	SUPPORT DIAMETER	SUPPORT LENGTH	TRANSMITTER FITTED (3 WIRE CONFIGURATION)	NO TRANSMITTER FITTED (4 WIRE CONFIGURATION)
Pt100	6mm	75mm	8mm	50mm	872-2761	872-2764
Pt100	6mm	125mm	8mm	50mm	872-2770	872-2767

Platinum Resistance Pt100 Hygienic Thermometer, 1.5" Tri-Clamp fitting



SENSOR TYPE	SHEATH DIAMETER	SHEATH LENGTH	SUPPORT DIAMETER	SUPPORT LENGTH	TRANSMITTER FITTED (3 WIRE CONFIGURATION)	NO TRANSMITTER FITTED (4 WIRE CONFIGURATION)
Pt100	6mm	75mm	8mm	50mm	-	872-2773
Pt100	5.7mm	120mm	8mm	50mm	896-8415	-

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Platinum Resistance Pt100 Indoor Air Temperature Sensor

CLASS	LENGTH	WIDTH	HEIGHT	INDOOR/ OUTDOOR USE?	STOCK NO
B	85mm	85mm	30mm	Indoor Only	338-9491

Platinum Resistance Thermometer Pt100 Outdoor/Cold Store Temperature Sensors

CLASS	LENGTH	WIDTH	HEIGHT	ELEMENTS TYPE	PT100 CONNECTION	4-20MA OUTPUT	INDOOR/ OUTDOOR USE?	STOCK NO
B	80mm	74mm	54mm	Single	4 Wire	No	Indoor or Outdoor use	236-4283
B	80mm	74mm	54mm	Duplex	2 × 4 Wire	No	Indoor or Outdoor use	455-4208
B	80mm	74mm	54mm	Single	3 Wire	Yes (2 Wire)	Indoor or Outdoor use	455-4214

4-20mA remote wall mounted housing, Platinum Resistance Pt100 input with 1 metre lead

CABLE GLANDS	CABLE LENGTH	CABLE INSULATION	TRANSMITTER FITTED?	TRANSMITTER RANGE	INDOOR/ OUTDOOR USE?	STOCK NO
M16	1000mm	PFA Teflon	Yes	-50°C to +150°C	Indoor Only	872-2758
M16	1000mm	F/G + SSOB	Yes	0°C to + 400°C	Indoor Only	872-2751

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PLATINUM RESISTANCE PT100 WITH TERMINAL HEADS

Platinum Resistance Pt100 4 wire class B Resistance Thermometer with DIN B Head

SENSOR TYPE	PROBE DIAMETER	PROBE LENGTH	HEAD TERMINATION	STOCK NO
Pt100	6mm	100	IP67 Din B Head	872-2736
Pt100	6mm	200	IP67 Din B Head	872-2733
Pt100	6mm	500	IP67 Din B Head	872-2749

Platinum Resistance Pt100 4 wire class B Resistance Thermometer with Compact KNS Head

SENSOR TYPE	PROBE DIAMETER	PROBE LENGTH	HEAD TERMINATION	STOCK NO
Pt100	6mm	150	IP67 KNS Head	872-2711
Pt100	6mm	250	IP67 KNS Head	872-2720
Pt100	6mm	300	IP67 KNS Head	872-2727

Platinum Resistance Pt100 3 wire class B Resistance Thermometer with KNE Head and Fitted Transmitter

SENSOR TYPE	PROBE DIAMETER	PROBE LENGTH	HEAD TERMINATION	TRANSMITTER FITTED?	TRANSMITTER RANGE	STOCK NO
Pt100	6mm	150	IP67 KNS Head	Yes	-50°C to +150°C	872-2708
Pt100	6mm	150	IP67 KNS Head	Yes	0°C to 100°C	872-2701
Pt100	6mm	150	IP67 KNS Head	Yes	0°C to 200°C	872-2705
Pt100	6mm	150	IP67 KNS Head	Yes	0°C to 400°C	872-2714

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PLATINUM RESISTANCE PT100 INDUSTRIAL PROBE WITH LAGGING EXTENSION

4 wire sensor with 1/2"BSPP process connection

TYPE	CLASS	PROBE DIAMETER	PROBE LENGTH BELOW ½" BSPP PROCESS CONNECTION	LAGGING LENGTH	TERMINATION	STOCK NO
Pt100	B	8mm	250mm	75mm	KNE Head	455-3980

L200 Digital Thermometer & Data Logger

The L200 Pt100 thermometer can be used in conjunction with a PC to provide accurate, Pt100 temperature measurement, scanning and logging of measured values. It can also be used as a “stand alone” indicator/logger and incorporates a digital display of measured temperature.

Self-calibration of Pt100 ranges is simple and uses plug-in precision resistors.

The L200 is designed to provide exceptional stability with high measurement resolution and represents an ideal crossover between plant practicality and laboratory performance at a very competitive price.

STOCK NO
910-6826

L300 USB TC & PT Digital Thermometer/Alarm/Logger Controller

The L300 Pt100 thermocouple temperature alarm on/off controller can be used in conjunction with a PC providing accurate monitoring. The alarm on/off control covers up to 8 zones simultaneously. The temperature monitor can also be used as a stand-alone indicator and logger incorporating a digital display of the measured temperature. The system has a self-calibration facility which is built in for the thermocouple version and is a rapid and extremely convenient method for on-site calibration.

The L300 does not need any additional equipment other than a special external link. The self- calibration of this series of digital temperature thermometers is just as simple and uses plug in precision resistors. The L300 series is designed to provide you with exceptional stability, high measurement resolution and is the perfect crossover between plant practicality and laboratory performance.

The PC software supplied with the thermometer allows control, configuration, logging, measurement, charting, alarm, relay configuration and calibration functions via a PC.

STOCK NO
910-6829

FREQUENTLY ASKED QUESTIONS

Information given here is for general guidance only and is not definitive – it is not intended to be the basis for product installation or decision making.

Q. How accurately can I measure temperature using a standard sensor?

A. To published internationally specified tolerances as standard, typically ± 2.5°C for popular thermocouples, ±0.5°C for PRT. Higher accuracy sensors can be supplied to order, e.g. ±0.5°C for type T thermocouple, ±0.2°C for PRT. All of these values are temperature dependent. A close tolerance, 4-wire PRT will give best absolute accuracy and stability.

Q. How do I choose between a thermocouple and a PRT?

A. Mainly on the basis of required accuracy, probe dimensions, speed of response and the process temperature.

Q. What is the difference between a RTD and PRT sensor?

A. Nothing. RTD means resistance thermometer detector (the sensing element) and PRT means Platinum resistance thermometer (the whole assembly) i.e. a PRT uses a RTD!

Q. What is a Pt100?

A. An industry standard Platinum RTD with a value of 100 Ohms @0°C to IEC751; this is used in the vast majority of PRT assemblies in most countries.

Q. Are there other types of temperature sensor apart from thermocouple and PRT Types?

A. Several, but these two groups are the most common. Alternatives include thermistors, infra-red (non-contact), conventional thermometers (stem & dial types) and many others.

Q. Why offer 2,3 or 4 wire PRT probes?

A. Because all 3 are encountered. Two-wire should be avoided, three-wire is widely used and four-wire gives optimum accuracy. Your instrument will be configured for 2,3 or 4 wire.

Q. What is the minimum immersion depth for a PRT probe?

A. Usually 150mm or more; increase the immersion until the reading is unchanged.

Q. What is the practical difference between wire-wound and film RTDs?

A. Wire-wound type provides greater accuracy and stability but is vulnerable to shock; film type is resistant to shock and has quicker thermal response.

Q. Is a sensor with a calibration certificate more accurate than an uncalibrated one?

A. No. However, the errors and uncertainties compared with a reference sensor are published and corrected values can be used to obtain better measurement accuracy.

Q. How long will my sensor last in the process?

A. Not known but predictable in some cases; this will be a function of sensor type, construction, operating conditions and handling.

Q. What is the longest thermocouple I can have without losing accuracy?

A. Try to ensure a maximum sensor loop resistance of 100 Ohms for thermocouples and 4 wire PRTs. Exceeding 100 Ohms could result in a measurement error. Note By using a 4-20mA transmitter near the sensor, cable runs can be much longer and need only cheaper copper wire. The instrument must be suitable for a 4-20mA input though.

Q. Do I need a power supply when using a transmitter, and what length of extension lead can I run with a transmitter fitted?

A. A 24Vdc, 20mA supply will be needed if this is not incorporated in the measuring instrument. Long runs of copper cable can be used.

FREQUENTLY ASKED QUESTIONS

Information given here is for general guidance only and is not definitive – it is not intended to be the basis for product installation or decision making.

Q. What accuracy will I get at a certain temperature using a Pt100 detector; if a better grade detector is used what effect will this have to the accuracy?

A. Refer to this Labfacility Temperature Handbook for Pt100 tolerance information.

Q. What accuracy loss will I get using a transmitter in line?

A. This depends on the accuracy of the specified transmitter; there will always be some degradation.

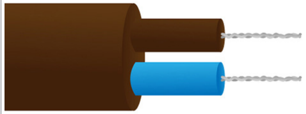
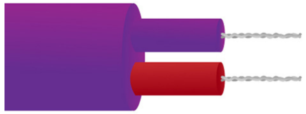
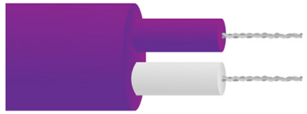
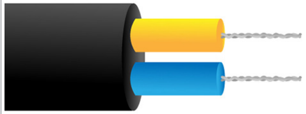
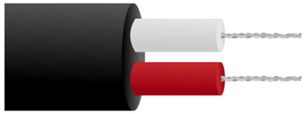
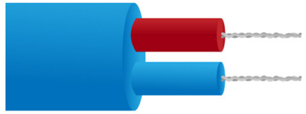
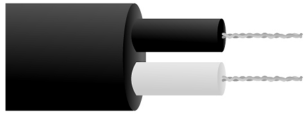
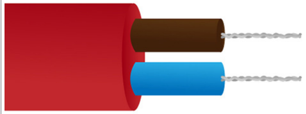
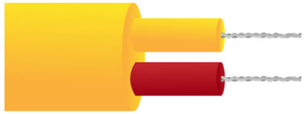
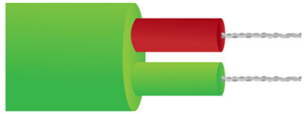
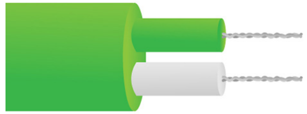
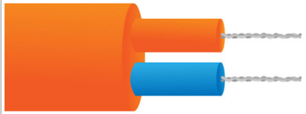
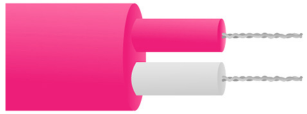
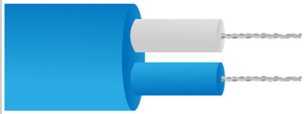
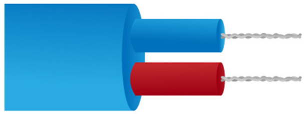
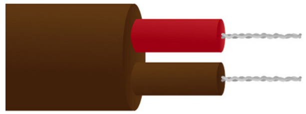
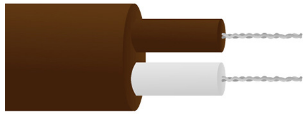
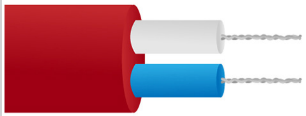
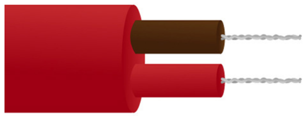
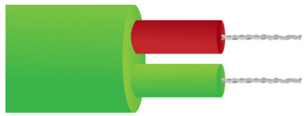
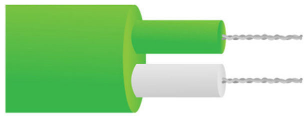
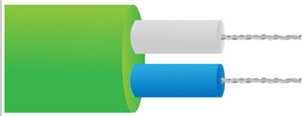
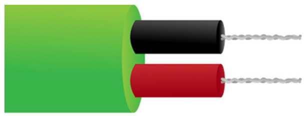
Q. As most instrumentation only takes 2 or 3 wire Pt100s, if I took the correction made on the 3 wire system and incorporated that on to the single leg could I achieve a 4 wire system?

A. No; cable length and ambient temperature variations come into play.

Q. What is the difference between a flat film and wire wound Pt100 element?

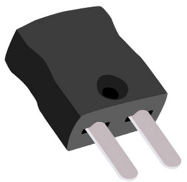
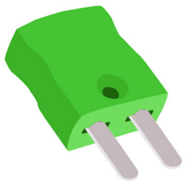
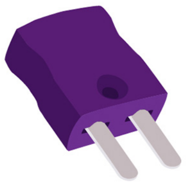
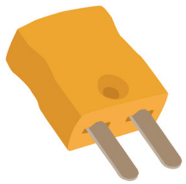
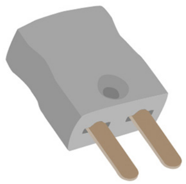
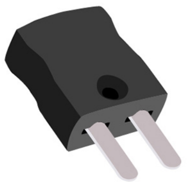
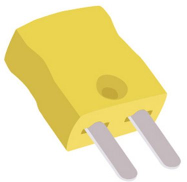
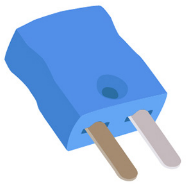
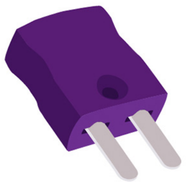
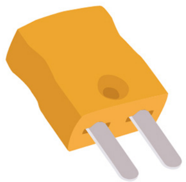
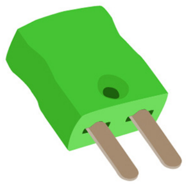
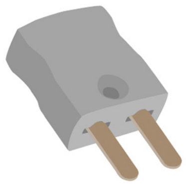
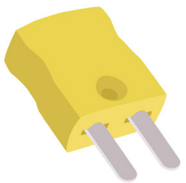
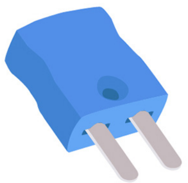
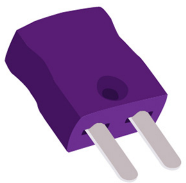
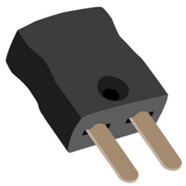
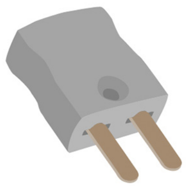
A. Film uses platinum deposition on a substrate; wire wound uses a helically wound Pt wire in ceramic. Wire-wound type provides greater accuracy and stability but is vulnerable to shock; film type is resistant to shock and has quicker thermal response.

COLOUR CODES FOR THERMOCOUPLE EXTENSION & COMPENSATING WIRES/CABLES

Type	CONDUCTORS +/-	FORMER STANDARD BRITISH BS1843:1952	FORMER STANDARD AMERICAN ANSI/MC 96.1	FORMER STANDARD GERMAN DIN 43713/43714	IEC 60584-3(2007) BS ENG60584-3(2008)	CABLE CODE
EX	Nickel chromium/Constantan (Nickel, Chromium/Copper Nickel, Chromel/ Constantan, T1/Advance, NiCr/ Constantan)					**EX**
J	Iron*/Contantan (Iron/Copper Nickel, Fe/Konst Iron/ Advance, Fe/Constantan I/C)					**JX**
K	Nickel Chromium/Nickel Aluminium* (NC/NA, Chromel/Alumel, C/A, T1/T2, NiCr/Ni, NiCr/NiAL)					**KX**
N	Nicrosil/Nisil					**NX** **NC**
T	Copper/Constantan (Copper/Copper Nickel, Cu/Con, Copper/Advance)					**TX**
Vx	Copper/Constantan (Low nickel) (Cu/Constantan) Compensating for K (Cu/Constantan)					**KCB**
U	Copper/Copper Nickel Compensating for Platinum 10% or 13% Rhodium/Platinum (Codes S & R respectively) Copper/ Cupronic Cu/CuNi, Copper/No. 11 alloy)					**RCA** **SCA**

***Magnetic** For Thermocouple connectors body colours are similar to outer sheath colours

THERMOCOUPLE COLOUR CODES FOR CONNECTOR BODIES

Type	J	K	T	E	N	R/S	B	Cu (Copper)
IEC								
ANSI								
JIS								

All connectors use true thermocouple alloys for optimum accuracy, except for types R, S & B which use compensating alloys.