

Platinum Resistance Thermometers (PRT) Product Guide



THERMOCOUPLE & PLATINUM RESISTANCE THERMOMETRY – AT A GLANCE

PLATINUM RESISTANCE THERMOMETER

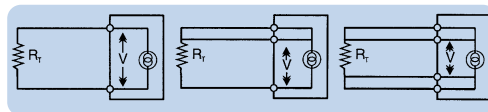
PRACTICAL BRIDGE CIRCUITS FOR 2, 3 AND 4 WIRE THERMOMETERS

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 Connection



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:

$$E = \Delta t / (R - I^2)$$

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

$$R = \text{Pt resistance}$$

$$I = \text{measurement current}$$

RESISTANCE V TEMPERATURE AND TOLERANCES FOR PLATINUM RESISTORS TO IEC 751(1995)/BS EN60751(1996)

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

NEW TOLERANCE CLASSES FOR RESISTORS to IEC 60751(2008)

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

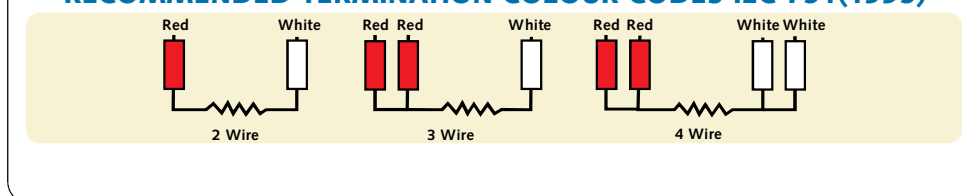
^a |t| = modulus of temperature in °C without regard to sign. For any value of R.

NEW TOLERANCE CLASSES FOR THERMOMETERS to IEC 60751(2008)

Tolerance class	Temperature range of validity °C		Tolerance values ^a °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)

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

RECOMMENDED TERMINATION COLOUR CODES IEC 751(1995)



	Platinum Resistance Thermometer	Thermocouple	Thermistor
Sensor	Platinum-wire wound or flat-film 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 to 1750°C	-100 to 300°C
Thermal response	Wirewound – slow Film – faster 1-50 secs typical	Sheathed – slow Exposed tip – fast 0.1 to 10 sec 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 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.

Choosing between a RTD Sensor and a Thermocouple

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.

Thermocouples comprise a thermoelement which is a junction of two specified, 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.

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)

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.

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. 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. Incinerators Billet heating, slab heating, butt welding. Soaking pits 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. 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. 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. 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. 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. 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.

Industrial Temperature Head Sensors

A selection of Head Mounted Industrial Temperature Sensors for many applications with RTD / PRT varieties, Hygienic and Heavy Duty probes.





A RTD Temperature Sensor with Hirschmann Connector

B RTD Temperature Sensor with Integral Transmitter & Hirschmann Connector

Type	Probe Diameter	Length of Probe	Process Connection	Sensor Type	A	B
					No Transmitter	With Transmitter
					Order Code	Order Code
PRT	6.0mm	50mm	1/2" BSP	PT100 Class A	XE-5681-001	XE-5675-001
PRT	6.0mm	75mm	1/2" BSP	PT100 Class A	XE-5682-001	XE-5676-001
PRT	6.0mm	100mm	1/2" BSP	PT100 Class A	XE-5683-001	XE-5677-001
PRT	6.0mm	150mm	1/2" BSP	PT100 Class A	XE-5684-001	XE-5678-001
PRT	6.0mm	200mm	1/2" BSP	PT100 Class A	XE-5685-001	XE-5679-001
PRT	6.0mm	300mm	1/2" BSP	PT100 Class A	XE-5686-001	XE-5680-001

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A Hygienic Pt100 Resistance Thermometer, 1.5" RJT Style

Type	Wire	Diameter / Length of Probe	Head Type	Sensor Type	No Transmitter	With Transmitter
					Order Code	Order Code
PRT	4 Wire	6.0mm x 75mm	KNEF	PT100 Class A	XE-5523-001	-
PRT	4 Wire	6.0mm x 125mm	KNEF	PT100 Class A	XE-5524-001	-
PRT	3 Wire	6.0mm x 75mm	KNEF	PT100 Class A	-	XE-5525-001
PRT	3 Wire	6.0mm x 125mm	KNEF	PT100 Class A	-	XE-5526-001



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

Type	Wire	Diameter / Length of Probe	Head Type	Sensor Type	No Transmitter	With Transmitter
					Order Code	Order Code
PRT	4 Wire	6.0mm x 75mm	KNEF	PT100 Class A	XE-5527-001	-
PRT	4 Wire	6.0mm x 125mm	KNEF	PT100 Class A	XE-5528-001	-
PRT	3 Wire	6.0mm x 75mm	KNEF	PT100 Class A	-	XE-5529-001
PRT	3 Wire	6.0mm x 125mm	KNEF	PT100 Class A	-	XE-5530-001



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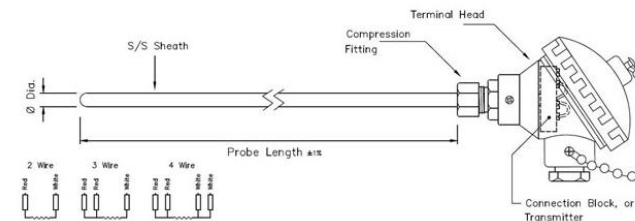


	<p>KNE Head</p>	<p>Pt100 Duplex 2 x 3 wire class A Resistance Thermometer, KNE Head</p>
	<p>KNE Head</p>	<p>Pt100 3 wire class B Resistance Thermometer, KNE Head with Transmitter</p>
	<p>KNE Head</p>	<p>Pt100 4 wire class B Resistance Thermometer, KNE Head</p>
	<p>DIN B Head</p>	<p>Pt100 4 wire class B Resistance Thermometer, DIN B Head</p>
	<p>Compact KNS Head</p>	<p>Pt100 4 wire class B Resistance Thermometer, Compact KNS Head</p>

Build Your Own Custom PRT Sensor

Click the link below to complete our custom configurator form and send us your specific requirements.

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A

Platinum Resistance Pt100 Industrial Probe with Lagging Extension

Type	Probe Diameter	Length of Probe	Insert	Terminal Head / Termination	Tolerance	A
						Order Code
Probe + Insert	8.0mm	150mm	6.0mm x 275mm	KNE	Class B	XE-3640-001
Probe + Insert	8.0mm	250mm	6.0mm x 375mm	KNE	Class B	XE-3641-001
Replacement Insert	-	-	6.0mm x 275mm	spring loaded ceramic connection block	Class B	XE-3643-001
Replacement Insert	-	-	6.0mm x 375mm	spring loaded ceramic connection block	Class B	XE-3644-001

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A Fibreglass + SSOB Option

B PFA Teflon Option

Image	Type	Cable Type	Cable length	Transmitter Range	With Transmitter
					Order Code
A	PRT	Fibreglass + SSOB	1m	0°C to +400°C	XE-5521-001
B	PRT	PFA Teflon	1m	-50°C to +150°C	XE-5520-001



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A Fibreglass + SSOB Option

B PFA Screened Option

Image	Type	Cable Type	Cable length	Probe Diameter x Length	Transmitter Range	With Transmitter
						Order Code
A	PRT	Fibreglass + SSOB	1m	6 x 300mm	0°C to +400°C	XE-5662-001
A	PRT	Fibreglass + SSOB	2m	6 x 300mm	0°C to +400°C	XE-5663-001
B	PRT	PFA Screened	1m	6 x 250mm	-50°C to +150°C	XE-5660-001
B	PRT	PFA Screened	2m	6 x 250mm	-50°C to +150°C	XE-5661-001

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Fabricated RTD / PRT Sensors

A Range of Fabricated RTD / PRT Platinum Resistance Thermometers.



**A****Adjustable Bayonet Pt100, Glassfibre Stainless Steel Overbraided Cable**

Type	Bayonet cap	Spring	Cable Type	Cable Length	Sensor Type	A
						Order Code
PRT	11.5mm I.D. single slot	6.0mm diameter x 200mm long	Glassfibre insulated lead with stainless steel Overbraid	1m	PT100 4 Wire	XE-5654-001
PRT	11.5mm I.D. single slot	6.0mm diameter x 200mm long	Glassfibre insulated lead with stainless steel Overbraid	2m	PT100 4 Wire	XE-5655-001

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A

General Purpose Pt100 Probe with PFA lead

Type	Sensor Type	Sheath Material	Probe Diameter & Length*	Cable Length	A
					Order Code
PRT	Class B, 4 wire	316 stainless steel	3mm x 25mm	2m	XE-3605-001
PRT	Class B, 4 wire	316 stainless steel	3mm x 100mm	2m	XE-3607-001
PRT	Class B, 4 wire	316 stainless steel	3mm x 250mm	1m	XE-3604-001
PRT	Class B, 4 wire	316 stainless steel	4mm x 25mm	2m	XE-3610-001
PRT	Class B, 4 wire	316 stainless steel	4mm x 100mm	2m	XE-3612-001
PRT	Class B, 4 wire	316 stainless steel	4mm x 200mm	2m	XE-3614-001
PRT	Class B, 4 wire	316 stainless steel	4.5mm x 25mm	2m	XE-3615-001
PRT	Class B, 4 wire	316 stainless steel	4.5mm x 125mm	2m	XE-3619-001
PRT	Class B, 4 wire	316 stainless steel	4.5mm x 200mm	2m	XE-3621-001
PRT	Class B, 4 wire	316 stainless steel	6mm x 50mm	2m	XE-3623-001
PRT	Class B, 4 wire	316 stainless steel	6mm x 150mm	1m	XE-3622-001
PRT	Class B, 4 wire	316 stainless steel	6mm x 300mm	2m	XE-3632-001

**More Probe Diameter & Lengths are available, click here to view the page for more information*



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A Platinum Resistance Pt100 Autoclave Drain Probe 4 Wire RTD / PRT

Type	Sensor Type	Diameter / Length of Probe	Cable Length / Type	Accuracy	A
					Order Code
PRT	Pt100 (100 Ohms @ 0°C) to IEC 751: 2008, Class B, 4 wire connection	6.0mm x 150mm	1m of Teflon® insulated with braided screen 7/0.2mm	Class B to IEC 751: 2008	XE-9512-001

Traceable to ISO17025 (UKAS) calibration standards, Labfacility offer a choice of a 3 or 5 point traceable calibration for this probe using our in-house calibration facility, you can select any temperature points between -10°C & +200°C.

You can select your specific temperature points on the product page.

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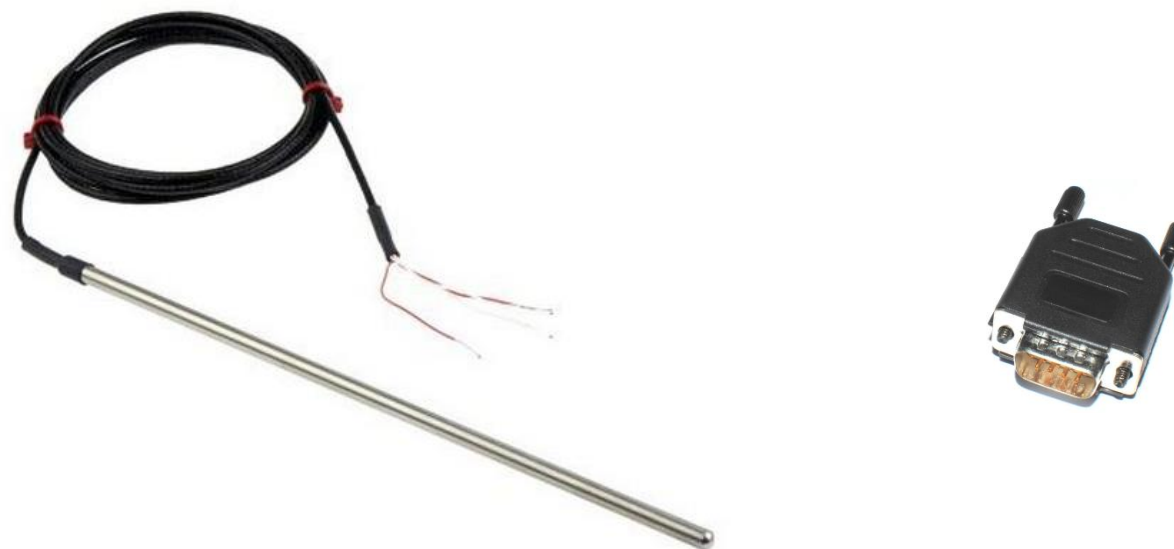
General Purpose Pt100 Silicone Rubber Lead - Type RTD / PRT

Type	Probe Diameter	Length of Probe	Number of Wires	Cable Length / Type	Accuracy	A
						Order Code
PRT	6.0mm	50mm	4 Wire	2m of flexible silicone rubber insulated	Class B	XE-3630-001
PRT	6.0mm	1000mm	4 Wire	2m of flexible silicone rubber insulated	Class B	XE-3631-001

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A Pt100 Precision Probe with 2 metre lead - Type RTD / PRT

Type	Accuracy	Probe Diameter & Length	Termination	Cable length	Temp Range	A
						Order Code
PRT	±0.06°C @ 0°C	6.0mm x 250mm	Bare Tails	1m of PTFE insulated screened lead	-50°C to 250°C	XE-3690-001
PRT	±0.06°C @ 0°C	6.0mm x 350mm	Bare Tails	1m of PTFE insulated screened lead	0°C to 450°C	XE-3689-001
PRT	±0.06°C @ 0°C	6.0mm x 250mm	'D' Connector	1m of PTFE insulated screened lead	-50°C to 250°C	XE-3692-001
PRT	±0.06°C @ 0°C	6.0mm x 350mm	'D' Connector	1m of PTFE insulated screened lead	0°C to 450°C	XE-3691-001

PRT sensor assemblies are constructed using sensing resistors (detectors) of the specified tolerance (i.e. Class A, 1/5DIN, 1/10DIN etc.). This tolerance refers to the detector only, not the complete, fabricated probe. Detector tolerance is rarely achieved via the probe terminations due to lead resistance effects, welding of extension leads to the detector and general manipulation during construction. The true measurement uncertainties are available via optional UKAS traceable Probe Calibration.



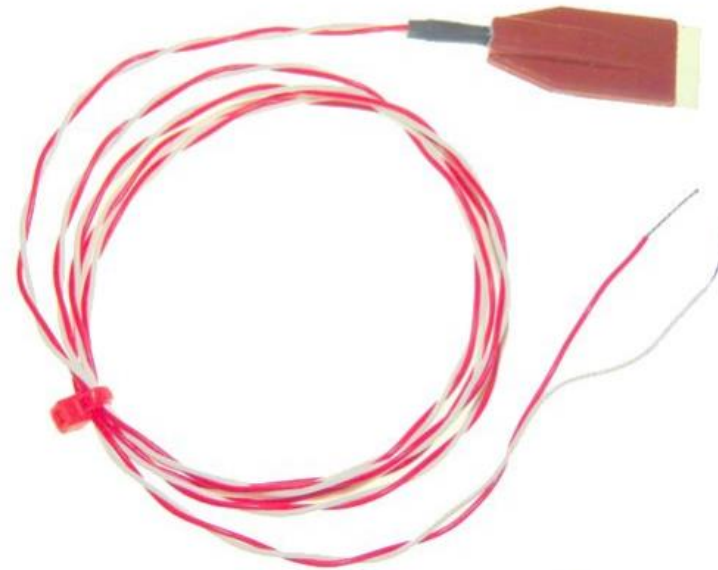
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Specialist RTD / PRT Sensors

A Range of Specialist RTD / PRT Platinum Resistance Thermometers.





A Self Adhesive Patch PT1000 Sensor

Type	Patch dimensions	Sensor Type	Cable Type	Cable Length	Cable Termination	A
						Order Code
PRT	Length 30mm x Width 15mm x Height 4mm	Pt1000 (1000Ω @ 0°C), thin film Class B to IEC751	Teflon® insulated twin twisted 7/0.2mm	1m	Bare Tails	XE-3662-001

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A Stainless Steel Sheathed Pt100 Sensor

Type	Accuracy	Sensor Type	Cable Type	Cable Length	Cable Termination	A
						Order Code
PRT	Class B	Sheathed Pt100 element in a thin, flat stainless steel body	Teflon® insulated twin twisted 7/0.2mm	1m	Bare Tails	XE-3665-001

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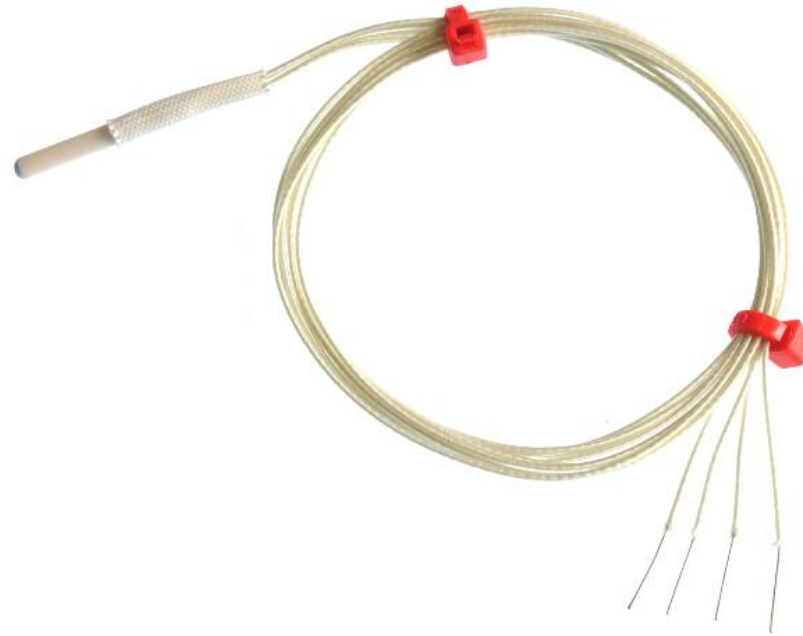
A Pt100 Class B Sensors with Teflon insulated lead

Type	Probe Diameter	Length of Probe	Sheath Material	Cable Length / Type	Accuracy	A
						Order Code
PRT	3.0mm	25mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3663-001
PRT	3.0mm	50mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3664-001
PRT	3.0mm	100mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3681-001
PRT	4.0mm	25mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3676-001
PRT	4.0mm	40mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3677-001
PRT	4.0mm	65mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3678-001
PRT	4.0mm	90mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3679-001
PRT	4.0mm	125mm	316 stainless steel Sheath	1m of Teflon® insulated twisted lead	Class B	XE-3680-001

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A Platinum Resistance Detectors with extended leads, Wire-Wound Ceramic

Type	Number of Wires	Detector Dimensions	Cable Type	Cable length	Accuracy	A
						Order Code
PRT	2 Wire	2.8mm x 15mm	Glass-fibre insulated nickel	300mm	Class B	XE-5595-001
PRT	2 Wire	2.8mm x 15mm	Glass-fibre insulated nickel	500mm	Class B	XE-5596-001
PRT	2 Wire	2.8mm x 15mm	Glass-fibre insulated nickel	1000mm	Class B	XE-5597-001
PRT	4 Wire	2.8mm x 15mm	Glass-fibre insulated nickel	500mm	Class B	XE-5593-001
PRT	4 Wire	2.8mm x 15mm	Glass-fibre insulated nickel	1000mm	Class B	XE-5594-001



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A Platinum Resistance Detectors with extended leads, Thin Film

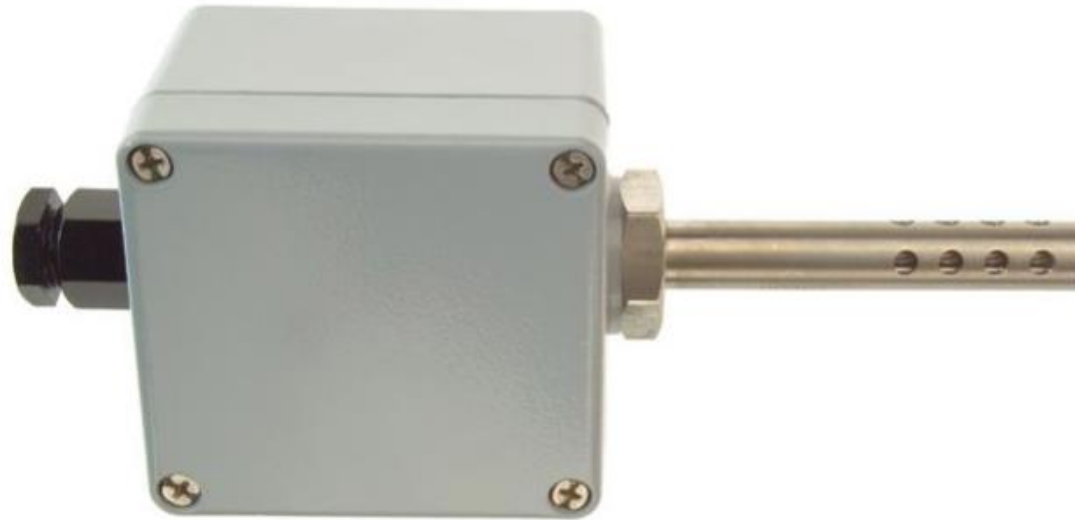
Type	Class	Wire	Extended Leads Length / Size	Cable Type	A
					Order Code
Pt100	B	2 Wire	300mm / 7/0.2mm	Teflon® insulated, stranded conductors	XE-5584-001
Pt100	B	2 Wire	500mm / 7/0.2mm	Teflon® insulated, stranded conductors	XE-5585-001
Pt100	B	2 Wire	1000mm / 7/0.2mm	Teflon® insulated, stranded conductors	XE-5586-001
Pt100	A	4 Wire	300mm / 7/0.15mm	Teflon® insulated, stranded conductors	XE-5587-001
Pt100	A	4 Wire	500mm / 7/0.15mm	Teflon® insulated, stranded conductors	XE-5588-001
Pt100	A	4 Wire	1000mm / 7/0.15mm	Teflon® insulated, stranded conductors	XE-5589-001
Pt1000	B	2 Wire	300mm / 7/0.2mm	Teflon® insulated, stranded conductors	XE-5590-001
Pt1000	B	2 Wire	500mm / 7/0.2mm	Teflon® insulated, stranded conductors	XE-5591-001
Pt1000	B	2 Wire	1000mm / 7/0.2mm	Teflon® insulated, stranded conductors	XE-5592-001



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A Pt100 Outdoor / Cold Store Temperature Sensors

Type	Type	A
		Order Code
Single element	Single 4 wire element, allowing connection to any Pt100 2, 3 or 4 wire instruments.	XE-3673-001
Dual element	Duplex 2 x 4 wire with two independent sensing elements, allowing connection to two measurement or control devices; alternatively one sensor may be used as a primary and the other as a back-up, eliminating the need to remove and replace the probe if one of the sensors should fail – can be connected to any Pt100 2, 3 or 4 wire instrument.	XE-3674-001
Single element with 4-20mA output	Includes integral transmitter which converts the Pt100 sensor output to a standard industrial 4 to 20mA output signal over pre-configured range of -50 to +150°C. It is also configurable by the user allowing range and burnout direction to be changed. It also allows the user to trim output current at either 4 or 20mA.	XE-3675-001



Click here to view our range of PRT sensor cable / wire to suit various applications.

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A

Self Adhesive Patch PT100 Sensor

Type	Accuracy	Sensor Type	Cable Type	Cable Length	Cable Termination	A
						Order Code
PRT	Class B	Silicone rubber patch with self adhesive foil backing	PTFE insulated twisted leads	2m	Bare Tails	XE-3660-001
PRT	Class B	Silicone rubber patch with self adhesive foil backing	PTFE insulated twisted leads	5m	Bare Tails	XE-3661-001



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A

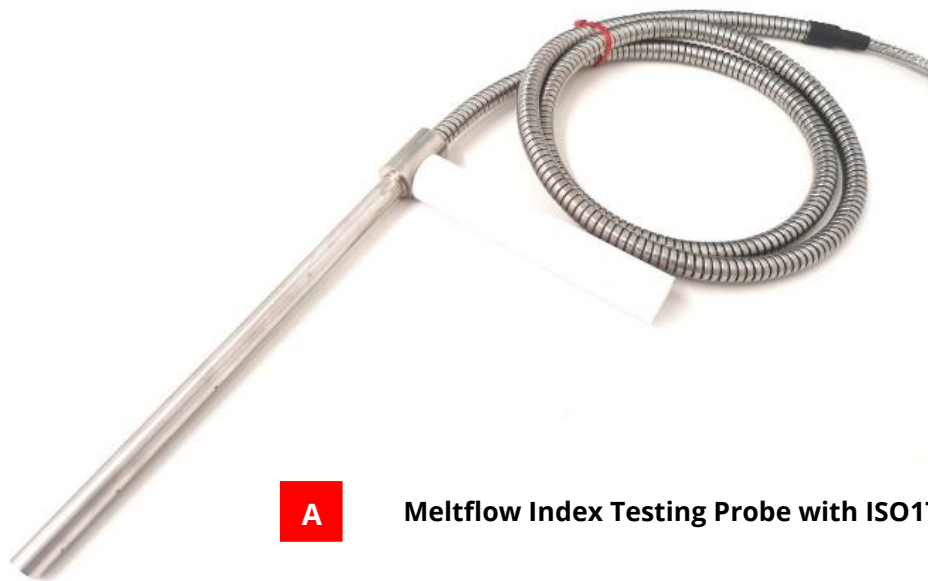
Air Temperature / Indoor PT100 Sensor

Type	Housing	Number of Wires	Accuracy	General Description	A
					Order Code
PRT	Moulded case L85 x W85 x H30mm	Can be connected to any 2, 3 or 4 wire instruments	Class B to IEC 751	PT100 wall mounting indoor temperature sensor for environmental temperature measurement	XE-3670-001

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A

Meltflow Index Testing Probe with ISO17025 System Calibration Certificate

Type	Accuracy	Sensor Type	Probe Diameter / Diameter	Cable Length / Type	Termination Type	General Description	A
							Order Code
PRT	±0.06°C @ 0°C	1/3 Din (100 Ohms @ 0°C)	9.4mm / 170mm	1.3m of Stainless Fixable Armour and PTFE insulated screened lead	Bare tails	Meltflow Index Machines (MFI). Sensors with 4 point measuring points.	XE-5670-CAL

Calibration Details

- ISO17025 (UKAS) System Calibration Certificate
 - Testing points are 10, 30, 50 and 70mm from tip of temperature probe.
- System Calibration temperature points at 220, 230, 240°C on all four sensing points.

Click here to view our Meltflow Index Testing Kit.

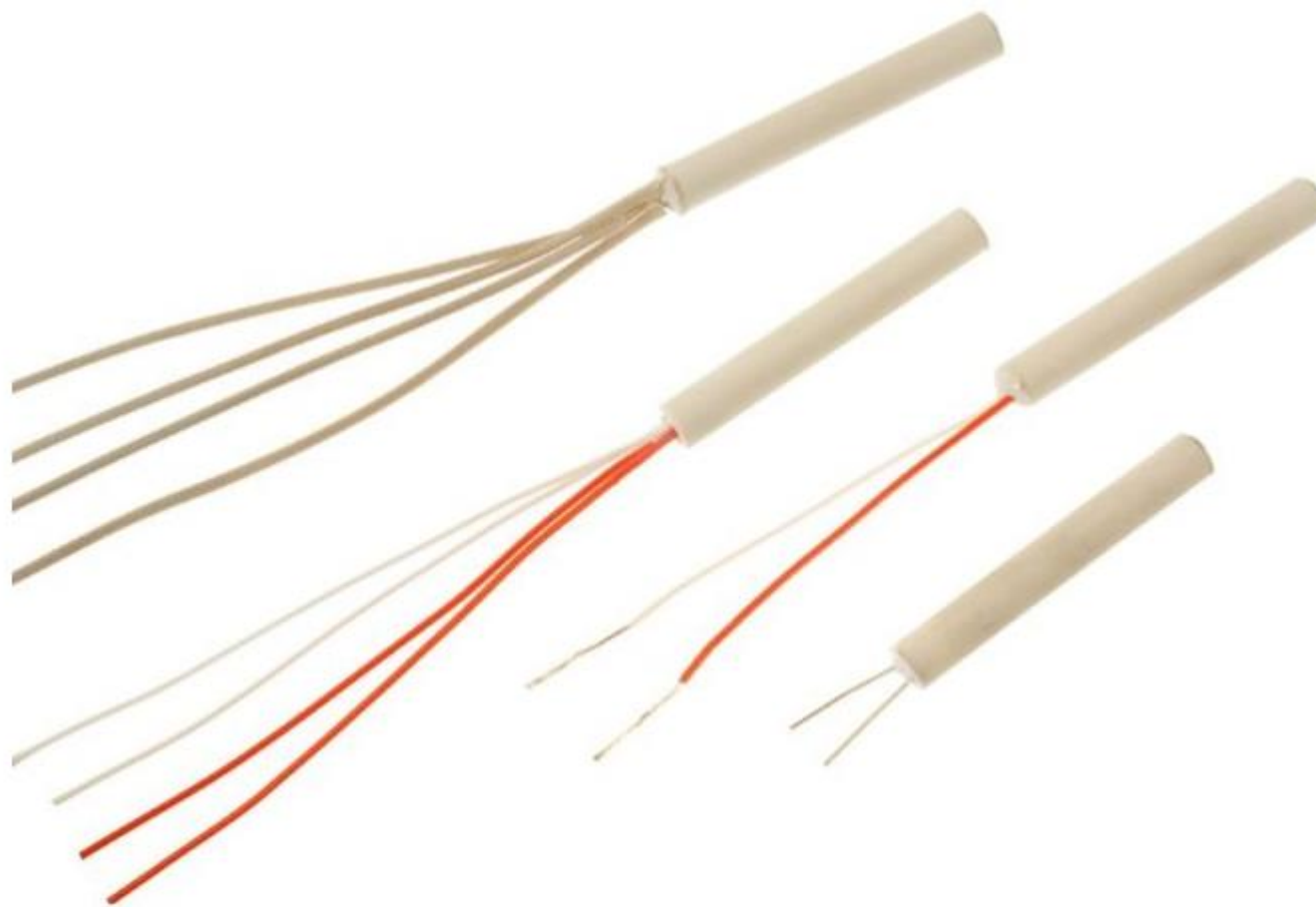
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MFI Handheld Probe + L200 PT Datalogger + ISO17025 (UKAS) System Calibration Certificate

RTD / PRT Platinum Sensing Resistor Inserts

RTD / PRT Platinum Sensing Resistor Inserts - Ceramic Sheathed, Pt100 & Pt1000 Inserts





A Ceramic Sheathed Pt1000 Grade A Inserts

Type	Grade	Detector Dimensions	Cable Type / Wire	Cable Length	Cable Termination	A
						Order Code
Pt1000	Grade A	Ceramic 5mm dia x 50mm long	PTFE insulated wires 7/0.2mm, 2 Wire	50mm	Bare Tails	XE-3668-001



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A

Ceramic Sheathed Pt100 Inserts

Type	Class	Detector Dimensions	Cable Type / Wire	Cable Length	Cable Termination	A
						Order Code
Pt100	Class B	Ceramic 5mm dia x 35mm long	PTFE insulated wires 7/0.15mm, 2 Wire	50mm	Bare Tails	XE-3666-001
Pt100	Class B	Ceramic 5mm dia x 35mm long	PTFE insulated wires 7/0.15mm, 4 Wire	450mm	Bare Tails	XE-3667-001



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Mineral Insulated RTD / RTD Probe with Extension Lead

Mineral Insulated RTD / PRT Resistance Thermometers are for use up to 500°C depending on the configuration.





A Mineral Insulated Pt100 Probe with Extension Lead

Type	Accuracy	Diameter / Length of Probe	Cable Length / Type	Wire	A
					Order Code
Flexible Pt100 Probe	Class B	3mm x 150mm	Teflon® insulated, screened lead 7/0.2mm	4 Wire	XE-3480-001
Flexible Pt100 Probe	Class B	3mm x 250mm	Teflon® insulated, screened lead 7/0.2mm	4 Wire	XE-3481-001
Flexible Pt100 Probe	Class B	6mm x 150mm	Teflon® insulated, screened lead 7/0.2mm	4 Wire	XE-3482-001
Flexible Pt100 Probe	Class B	6mm x 250mm	Teflon® insulated, screened lead 7/0.2mm	4 Wire	XE-3483-001

Traceable to ISO17025 (UKAS) calibration standards, Labfacility offer a choice of a 3 or 5 point traceable calibration for this probe using our in-house calibration facility, you can select any temperature points between -10°C & +200°C.

You can select your specific temperature points on the product page.

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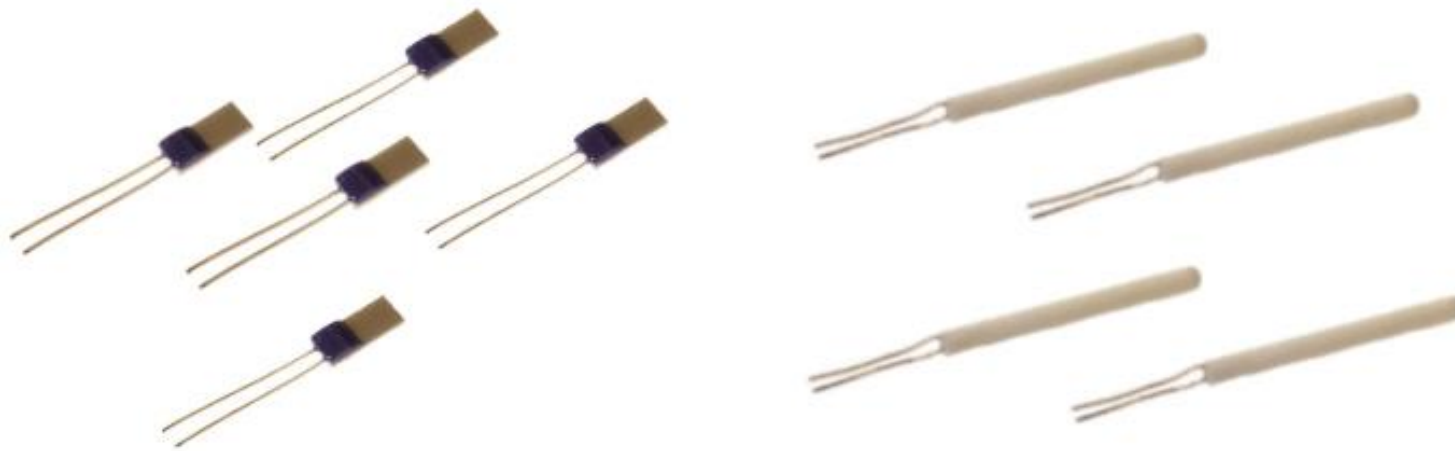
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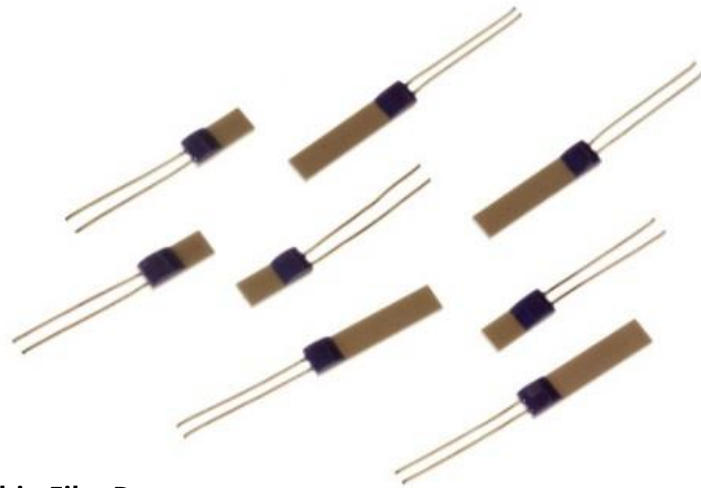
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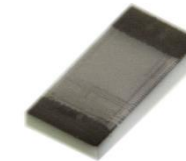
RTD Detectors

A selection of Flat Film RTD Detectors; 100, 500 & 1000 Ohm in class A, B or 1/3 DIN A selection of 100 Ohm RTD Wire Wound Detectors, single and dual element types available in class A, B or 1/10 DIN





A Thin Film Detectors



B PCB Flat Film Detector

Image	Resistance	Dimensions (width x length)	Tolerance Class A	Tolerance Class B	Tolerance Class 1/3 Din	PCB
			Order code	Order code	Order code	Order code
A	Pt100	1 x 3mm	XE-4446-001	XE-4416-001	-	-
A	Pt100	1.2 x 1.6mm	XE-4440-001	XE-4410-001	-	-
A	Pt100	1.2 x 4mm	XE-4439-001	XE-4409-001	-	-
A	Pt100	2 x 2.3mm	XE-4436-001	XE-4406-001	XE-4466-001	-
A	Pt100	2 x 5mm	XE-4430-001	XE-4400-001	XE-4460-001	-
A	Pt100	2 x 10mm	XE-4433-001	XE-4403-001	XE-4463-001	-
A	Pt500	2 x 5mm	XE-4630-001	XE-4600-001	-	-
A	Pt500	2 x 10mm	XE-4633-001	XE-4603-001	-	-
A	Pt1000	2 x 10mm	XE-4533-001	XE-4503-001	XE-4563-001	-
A	Pt1000	1 x 3mm	-	XE-4516-001	-	-
A	Pt1000	1 x 1.7mm	-	XE-4514-001	-	-
B	Pt100	3.2mm x 1.6mm, 0.9mm thickness	-	-	-	XE-4480-001



Click here to view our range of PRT sensor cable / wire to suit various applications.

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A Wire Wound Detectors



B Dual Element










Resistance	Dimensions (Width x length)	Tolerance Class A	Tolerance Class B	Tolerance Class 1/10 Din	Dual Element (Pt100 x2) Tolerance Class A	Dual Element (Pt100 x2) Tolerance Class B
		Order code	Order code	Order code	Order code	Order code
Pt100	0.9 x 15mm	XE-4735-001	XE-4705-001	XE-4785-001	-	-
Pt100	1.5 x 8mm	XE-4738-001	XE-4708-001	XE-4788-001	-	-
Pt100	1.5 x 15mm	XE-4740-001	XE-4710-001	XE-4790-001	XE-4840-001	XE-4810-001
Pt100	1.5 x 25mm	XE-4742-001	XE-4712-001	XE-4792-001	-	-
Pt100	2.8 x 15mm	XE-4746-001	XE-4716-001	XE-4796-001	XE-4846-001	-
Pt100	2.8 x 25mm	XE-4747-001	XE-4717-001	XE-4797-001	XE-4847-001	XE-4817-001



Click here to view our range of PRT sensor cable / wire to suit various applications.

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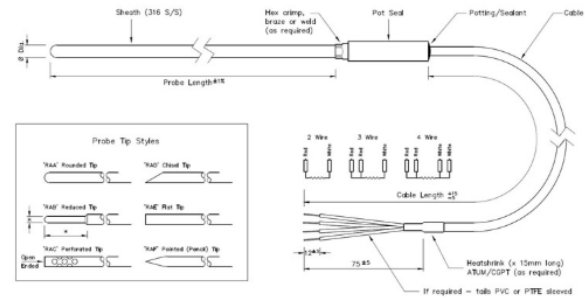
Build Your Own Custom PRT Sensor

<p>RA Style</p>  <p>Platinum Resistance Probe with Cable</p>	<p>RC Style</p>  <p>Platinum Resistance Probe with Terminal Head</p>	<p>RE Style</p>  <p>Platinum Resistance Thermometer Insert</p>
<p>RG Style</p>  <p>Platinum Resistance Thermometer Detector With Leads</p>	<p>RC 'RJT' Style</p>  <p>Platinum Resistance Thermometer Head Assembly</p>	<p>RC 'TRI-CLAMP' Style</p>  <p>Platinum Resistance Thermometer Head Assembly</p>
<p>RS Style</p>  <p>Flexi RTD</p>	<p>RCX 'RC Extension' Style</p>  <p>RCX 'RC Extension' Style</p>	<p>HC Style</p>  <p>Platinum Resistance Thermometer</p>

Labfacility are specialists in the design and manufacture of custom-built temperature sensors. Click the link below to select and complete our custom configurator forms and send us your specific requirements.

You will be contacted by a member of our sales team who will be happy to help and provide you with a quotation.

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Name *	Company *	Email *	Telephone / Mobile *
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Tip Style	No. of Elements	No. of wires	Tolerance Class
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Probe Diameter (mm)	Probe Length (mm)	Pot Seal Type	Cable Length (mtr)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cable Type	Termination	Quantity Required	Customer required working temperature range
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Notes	Country *		
<input type="text"/>	<input type="text"/>		

The Temperature Handbook - A comprehensive guide to Temperature Measurement by Labfacility



The Labfacility Temperature Handbook is a comprehensive text for users of thermocouples, PRTs and thermistors and associated instrumentation. Detailed enough for engineers it is also suitable for technicians and students. Written with a practical bias, the handbook contains considerable reference data and basic theory and is therefore of great value as a training aid for those entering the field of temperature measurement and control.

The handy A5 size book contains 140 pages, 40 of them being reference data and uses 65 illustrations. The current revised thermocouple and Pt100 tables based on ITS90 are featured and the new IEC colour codes for thermocouple insulations are included in full colour in addition to the former ANSI, DIN and BS codes.

The broadened scope of the handbook includes detailed temperature sensor selection guidance, sensor theory and practice and comprehensive applications guidance. Practical aspects treated in depth include thermocouple installation and application, alternative thermocouple types and construction, accuracy and response and interconnection configurations; thermistors; sheath materials and thermowells for the different sensors and temperature calibration.

Additional enhanced chapters describe temperature control, transmitters and instrumentation. The 40 page reference section carries comprehensive data on thermocouple and platinum resistance thermometry, thermocouple and PRT tables, general thermometry data and other reference information including °C/°F conversion tables, fixed points and specification standards.

An installation problem solving guide, comprehensive 9 page glossary of terms and "Frequently Asked Questions" add to the practical value of the text for laboratory and industrial users.

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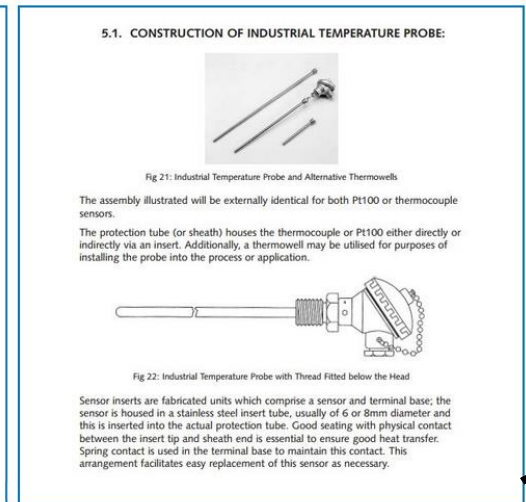
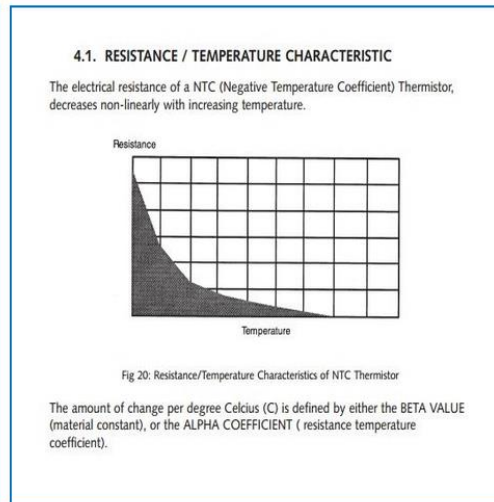
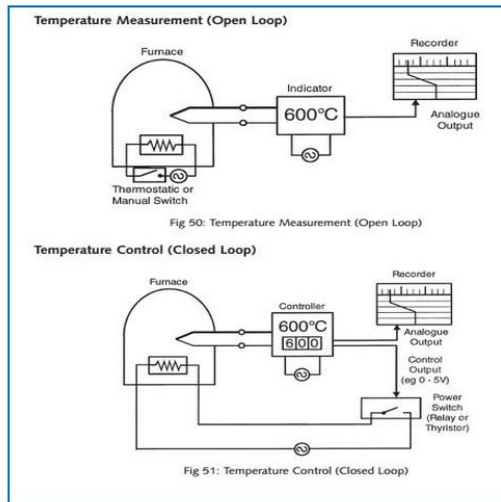
9.1 THERMOCOUPLE THERMOMETRY

9.1.1. Thermocouple Accuracies

Tolerance classes for thermocouples to IEC 584-2 : 1982.

Fe-Con (J)	Class 1	-40 +750°C: ±0.004 . t	or ±1.5°C
	Class 2	-40 +750°C: ±0.0075 . t	or ±2.5°C
	Class 3	-	-
Cu-Con (T)	Class 1	-40 +350°C: ±0.004 . t	or ±0.5°C
	Class 2	-40 +350°C: ±0.0075 . t	or ±1.0°C
	Class 3	-200 + 40°C: ±0.015 . t	or ±1.0°C
NiCr -Ni (K) and NiCrSi-NiSi (N)	Class 1	-40 +1000°C: ±0.004 . t	or ±1.5°C
	Class 2	-40 +1200°C: ±0.0075 . t	or ±2.5°C
	Class 3	-200 + 40°C: ±0.015 . t	or ±2.5°C
NiCr-Con (E)	Class 1	-40 +800°C: ±0.004 . t	or ±1.5°C
	Class 2	-40 +900°C: ±0.0075 . t	or ±2.5°C
	Class 3	-200 + 40°C: ±0.015 . t	or ±2.5°C
Pt10Rh-Pt (S) and Pt13Rh-Pt (R)	Class 1	0 +1600°C: ±[1+(t-1000).0.003]	or ±1.0°C
	Class 2	-40 +1600°C: ±0.0025 . t	or ±1.0°C
	Class 3	-	-
Pt30Rh-Pt6Rh (B)	Class 1	-	-
	Class 2	+600 +1700°C: ±0.0025 . t	or ±1.5°C
	Class 3	+600 +1700°C: ±0.005 . t	or ±4.0°C

Note: t = actual temperature
Use the larger of the two deviation values



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 is the difference between a Mineral Insulated (MI) and a fabricated sheath?

A. An MI is flexible, a fabricated sheath is rigid.

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

A. To published, internationally specified tolerances as standard, typically $\pm 2.5^{\circ}\text{C}$ for popular thermocouples, $\pm 0.5^{\circ}\text{C}$ for PRT. Higher accuracy sensors can be supplied to order, e.g. $\pm 0.5^{\circ}\text{C}$ for type T thermocouple, $\pm 0.2^{\circ}\text{C}$ 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. My thermocouple is sited a long way from my controller, is this a problem?

A. It could be; 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. Should I choose a Type K or Type N thermocouple?

A. Generally, Type N is more stable and usually lasts longer than Type K; N is a better choice for high temperature work depending on the choice of sheath material.

Q. Does it matter what type of steel I specify for the thermocouple sheath?

A. Often no, sometimes yes. In some cases, reliability depends on the ideal choice of material.

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 are so many different types of thermocouple used?

A. They have been developed over many years to suit different applications world-wide.

Q. What is a duplex sensor?

A. One with two separate sensors in a single housing

Q. Why use a thermowell?

A. To protect the sensor from the process medium and to facilitate its replacement if necessary.

Q. I use many thermocouples in testing and experiments, can I make my own thermocouple junctions?

A. Yes, using a benchtop welder and fine thermocouple wires – it is easy and inexpensive to make unsheathed thermocouples.

Q. Why should I use actual thermocouple connectors instead of ordinary electrical connectors?

A. Good quality thermocouple connectors use thermocouple alloys, polarized connections and colour coded bodies to guarantee perfect, error-free interconnections.

Q. I need to measure quickly changing temperature; what type of sensor should I use?

A. A fast-response (low thermal mass) thermocouple.

Q. There are several different types of extension cable construction; is the choice important?

A. Yes; some are waterproof, some mechanically stronger, some suitable for high or low temperature.

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. Which thermocouple type do I need for my application?

A. This depends on several factors including the nature of the process, heated medium and temperature.

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.

Q. What sensor will I need to work in molten metal or a corrosive atmosphere?

A. There is no simple answer but special grades of Stainless Steel, Inconel 600, Microbell and Ceramics offer alternatives.

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.



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[Multicore Cable \(43\)](#)

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