

**Matthey**

N.B. Only the 100P30 is now in production.

# Thermafilm

## platinum resistance temperature detectors

### FEATURES

● Stable in sealed steel tubes ●  
to maximum rated temperature

- Thick film design/fast response
- 100 ohm calibration: 38.5 ohm F.I.
- High stability
- Three  $R_0$  tolerance grades  $\pm 0.075\%$ ,  $\pm 0.1\%$ ,  $\pm 0.25\%$
- Meets BS 1904 and DIN 43760
- Excellent vibration and shock resistance
- Direct replacements for 3 mm dia. wire wound devices. (Type 100P30)

Because of their high accuracy and reliability, Platinum Resistance Thermometers are becoming more and more the preferred method of temperature measurement over the range  $-70^\circ\text{C}$  to  $+600^\circ\text{C}$ .

Matthey Thermafilm Detectors are thick film PRTD's (Platinum Resistance Temperature Detectors) precisely manufactured in an automated production line to new standards of accuracy, stability and reproducibility. Thermafilm offers not only low cost replacements for conventional wire wound PRTD's but high accuracy, high sensitivity alternatives to thermocouples and technically superior replacements for thermistors.

Thermafilm is available in three grades of tolerance. Grades 1 and 2 detectors meet the requirements of BS 1904 and DIN 43760 in all respects. Grade 3 detectors (at lower cost) are identical in performance to Grade 2 but have a wider tolerance ( $\pm 0.25\%$ ) on ice point resistance,  $R_0$ . In addition, Thermafilm has operational advantages such as superior thermal response; much better resistance to vibration and shock; and the ability to remain stable at  $600^\circ\text{C}$ .

Thermafilm Detectors are available now in three different configurations covering a wide range of possible uses. Types 100S25 and 100W47 are produced on flat substrates and are ideal for applications when air, gas, or surface temperature measurements are to be made. Type 100P30 is rod shaped and designed to be a direct size replacement for conventional wire wound elements, but with all the advantages of faster response, excellent stability, and better resistance to vibration and shock. Other shapes and sizes can be considered to suit special applications.

#### Operational Stability in sealed probes

Matthey Thermafilm detectors have been thoroughly tested in air for long periods at temperatures up to  $600^\circ\text{C}$ . The results show excellent stability. However, many applications require PRTD's to be sealed into metal probes. Matthey have therefore tested Thermafilm 100P30 sealed into probes made from stainless steel to AISI 316 = En 58 J (BS 907). The results after 250 hours at  $600^\circ\text{C}$  show that the drift in  $R_0$  remains within  $\pm 0.05\%$ .

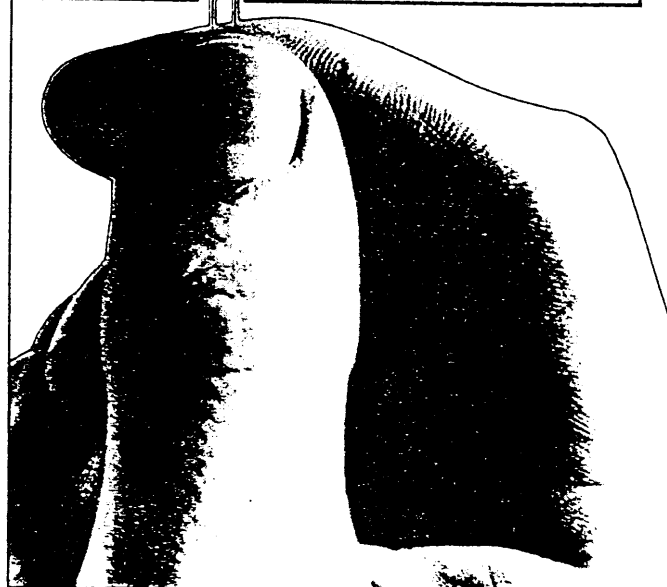
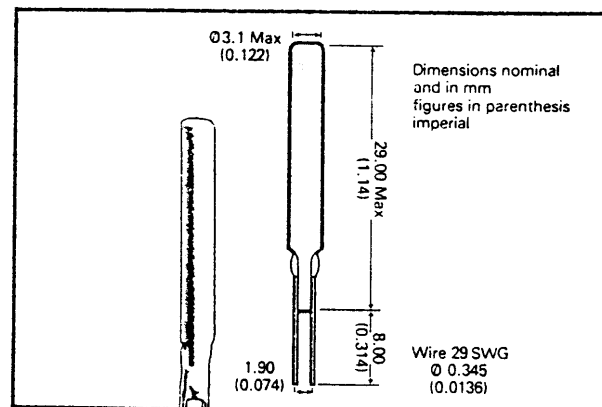
●●● Calibration Certificates can be supplied to order. ●●●

### 100P30

A 3 mm diameter cylindrical device which is a direct replacement for conventional PRTD's made from high purity platinum wire.

It consists of a high stability platinum track deposited onto a rigid rod shaped substrate covered with a protective coating of ceramic glaze.

This construction ensures not only high stability and exceptional resistance to vibration and shock, but gives a thermal response faster than comparable wire devices

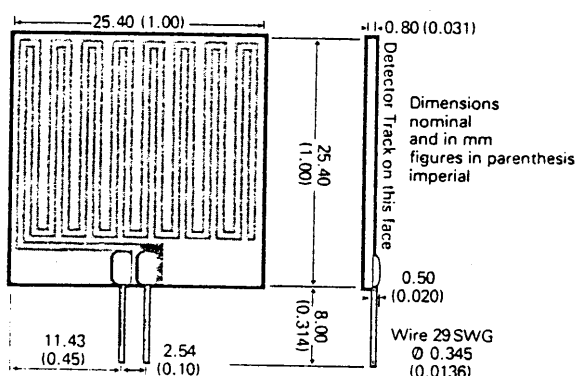


# 100S25

A 25 mm square flat printed device ideal for applications where conventional detectors might not be practical. The large sensing area is of particular advantage for radiated heat and surface temperature measurements. Other applications include laser focussing, medical electronics and cold junction compensation for thermocouples.

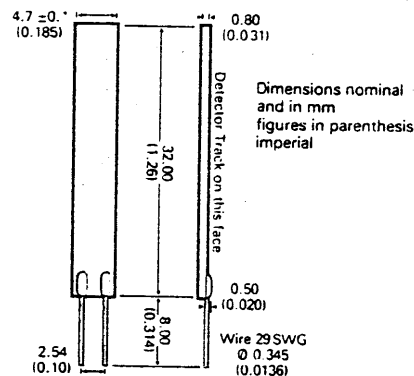
Thermafilm 100S25 consists of a high stability platinum track printed on to a rigid alumina substrate whose high thermal conductivity ensures a fast thermal response. A protective ceramic glaze coating covers the detector body and ensures good insulation resistance.

One face of the device is flat and completely insulated. It can, therefore, be placed in intimate thermal contact with flat surfaces.



# 100W47

Type 100W47 is a 4.7 mm wide flat device which is very suitable for surface temperature measurements (e.g. busbars, pipework etc). It is also designed to fit inside 6 mm (¼") O.D. tubes or probes where it becomes self locating across the diameter.



## Actual Sizes

100P30

100S25

100W47

## Technical Data

### 100S25

### 100W47

### 100P30

Configuration	Flat, Square	Flat, Rectangular	Rod Shaped
Fundamental Interval	38.5Ω (Nominal)	38.5Ω (Nominal)	38.5Ω (Nominal)
Ice Point Resistance R <sub>0</sub>			
Grade I	100±0.075 Ω	100±0.075 Ω	—
Grade II	100±0.1 Ω	100±0.1 Ω	100±0.1 Ω
Grade III	100±0.25 Ω	100±0.25 Ω	100±0.25 Ω
Self Heating*	<0.005°C/mW	<0.005°C/mW	<0.01°C/mW
Surface Insulation	10 MΩ at room temp and 240V or 1 MΩ at 500°C & 50v		
Thermal Response**	<0.25 secs	<0.15 secs	<0.3 secs
Stability after temperature cycling***	<±0.05%	<±0.05%	<±0.05%
Capacitance (at 1KHz)	<25pF	<15pF	<10pF
Inductance	—	—	<1μH
Temperature Range	−70°C to +600°C	−70°C to +600°C	−70°C to +600°C

\* When immersed in well stirred water at the ice point. \*\* Time to reach 63% of ultimate temperature (as BS 1904 test). \*\*\* After 10 cycles between minimum and maximum rated temperatures.

## Matthey Printed Products Limited

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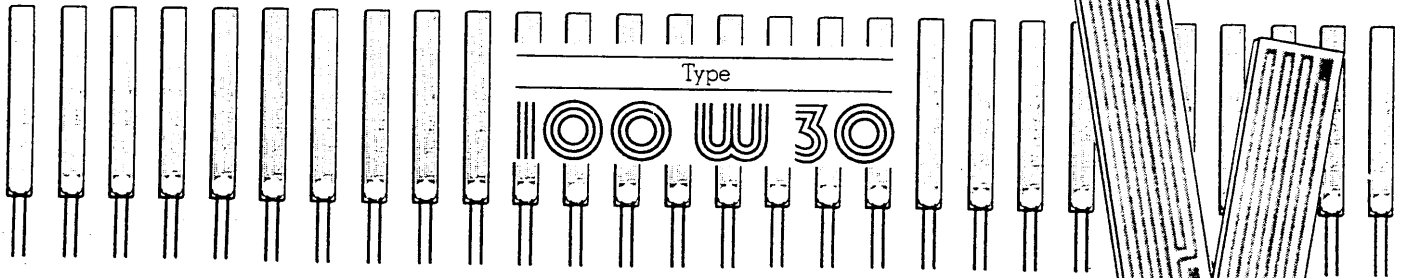
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Matthey

# Thermafilm

Platinum Resistance Temperature Detectors



## Second generation **Thermafilm** a new freedom in temperature measurement

Platinum Resistance Temperature Detectors (PRTD's) have long been acknowledged as the finest temperature sensors available for the range - 70 to + 600°C

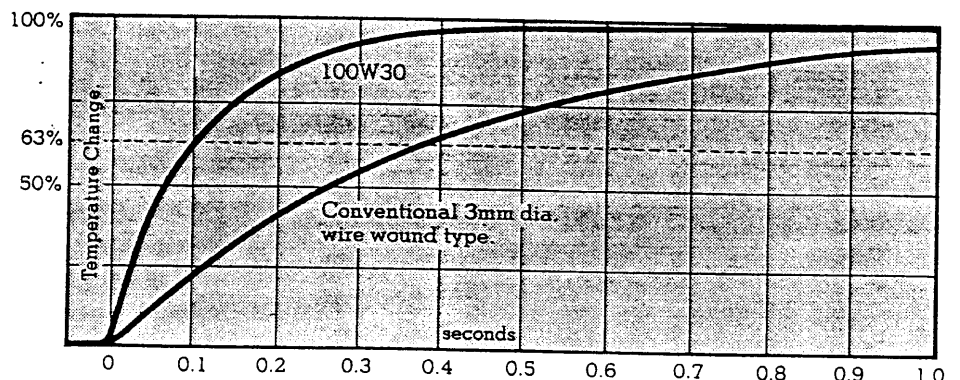
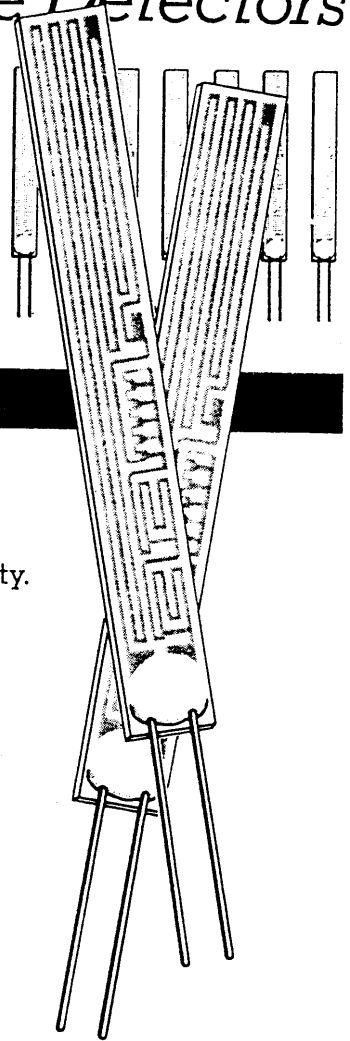
In some applications where their performance would be desirable, high production costs have made them too expensive. As a result, cheaper, less accurate sensors other than PRTD's have sometimes been used, compromising performance and reliability and often resulting in higher instrumentation costs.

The new Thermafilm 100W30 has been developed to provide high quality at lower cost. Users of Pt 100 RTD's can substitute 100W30 for the conventional detectors (38.5Ω fundamental interval) throughout the world. 100W30 has the same fine characteristics as the rest of the Thermafilm PRTD product group but new production techniques have made possible even lower prices.

Thermafilm 100W30 reaches 63% of any temperature in 25% of the time of conventional PRTD's (see ▲ overleaf)

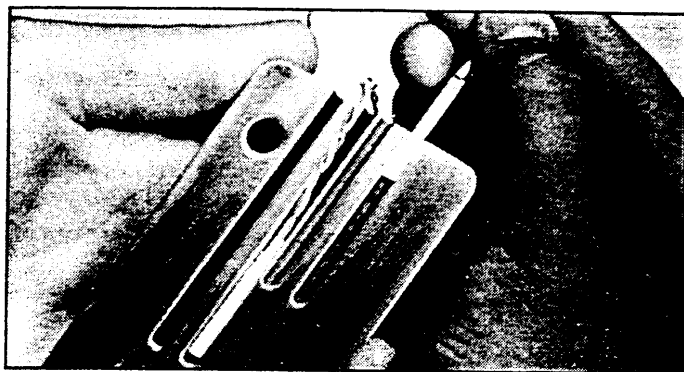
### Key Features:

- Size and lead position equivalent to the most popular size PRTD.
- Thick film design for long term stability.
- Thermafilm construction gives fast thermal response.
- Good resistance to vibration due to solid state design (see Technical Data)
- Made to BS1904, DIN43760 and IEC751 specification.
- Direct replacement for 3mm diameter PRTD's.

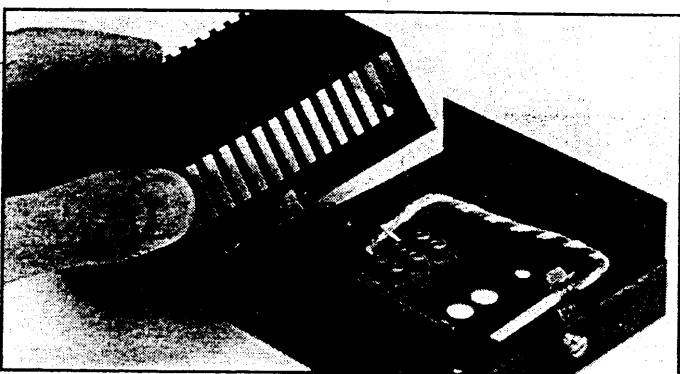


## Thermafilm 100W30 is ideally suited for:

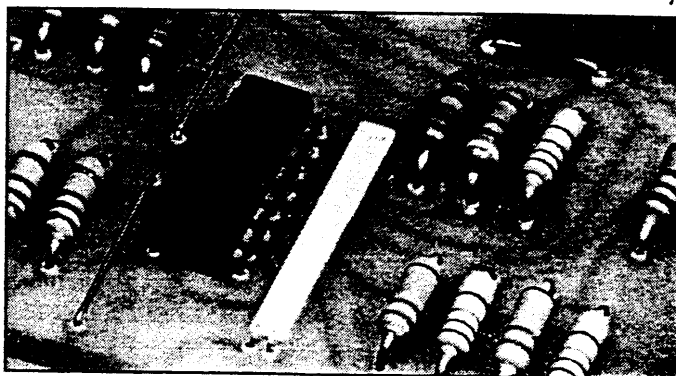
1. Fitting into probes or drilled wells. For fastest thermal response 100W30 can be potted securely and easily with heat conducting compound into a probe or well.



2. Air temperature sensing — for which 100W30 can be fitted, exposed, in a ventilated housing.



3. Temperature compensation. 100W30 can be attached to a PCB etc. for ambient compensation of circuitry e.g. cold junction compensation for thermocouples.



4. Surface mounting for contact temperature measurements.

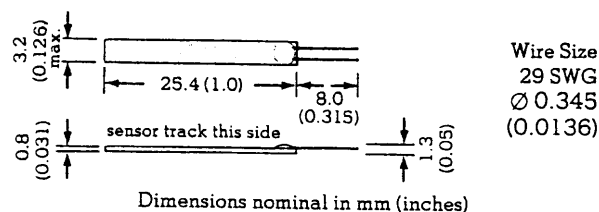


### Technical Data

Type	Thick Film PRTD	
Tolerance at 0°C <sup>▲</sup> Class A	±0.15°C	(100Ω±0.06%)
Class B	±0.3°C	(100Ω±0.12%)
Class C	±0.65°C	(100Ω±0.25%)
Surface Insulation	10 <sup>9</sup> MΩ at room temp & 250V or 50MΩ at 600°C & 50V	
Thermal Response <sup>▲</sup>	<0.1 secs.	
Self Heating <sup>□</sup>	<0.006°C/mw	
Stability after Temperature Cycling <sup>■</sup>	<±0.05%	
Temperature Range	-70°C to +600°C	
Vibration	Thermafilm detectors correctly mounted have been tested to military specification MIL-STD-202E method 204C with no significant effect.	
Fundamental Interval	38.5Ω (nominal)	

- ▲ Closer or wider tolerances can be supplied to quotation.
- ▲ Time to reach 63% of ultimate temperature (BS1904 test).
- When immersed in well stirred water at the ice point.
- After 10 cycles between minimum and maximum rated temperatures.

### Thermafilm 100W30 — size



Calibration certificates can be provided at time of purchase

Thermafilm 100W30 is covered by the following patents: JP463, JP634

## MATTHEY ELECTRONICS

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# Matthey ELECTRONICS

## Thermafilm "PLUS" Range – 4/200 Probe

The Thermafilm "Plus" range offers the quality and performance of basic Thermafilm sensors plus extra features to fulfil the needs of PRTD users.

### Features

- Contains 100P30 sensor for maximum reliability
- 4mm diameter high grade stainless steel.
- Fast Thermal Response.
- 4, 3, or 2 wire compatible.
- Moveable compression fitting.

Thermafilm Probe 4/200 is a multi purpose fast response Platinum Resistance Thermometer probe specially designed to satisfy a wide spectrum of users by offering a remarkable specification at low cost.

### The Sensor

The rugged stainless steel body houses an accurate Thermafilm 100P30 thick film Platinum Resistance Temperature Detector which meets BS1904 Grade II and DIN43760 standards and has the advantages over more conventional detectors of fast thermal response, excellent stability and resistance to vibration and shock.

### The Probe

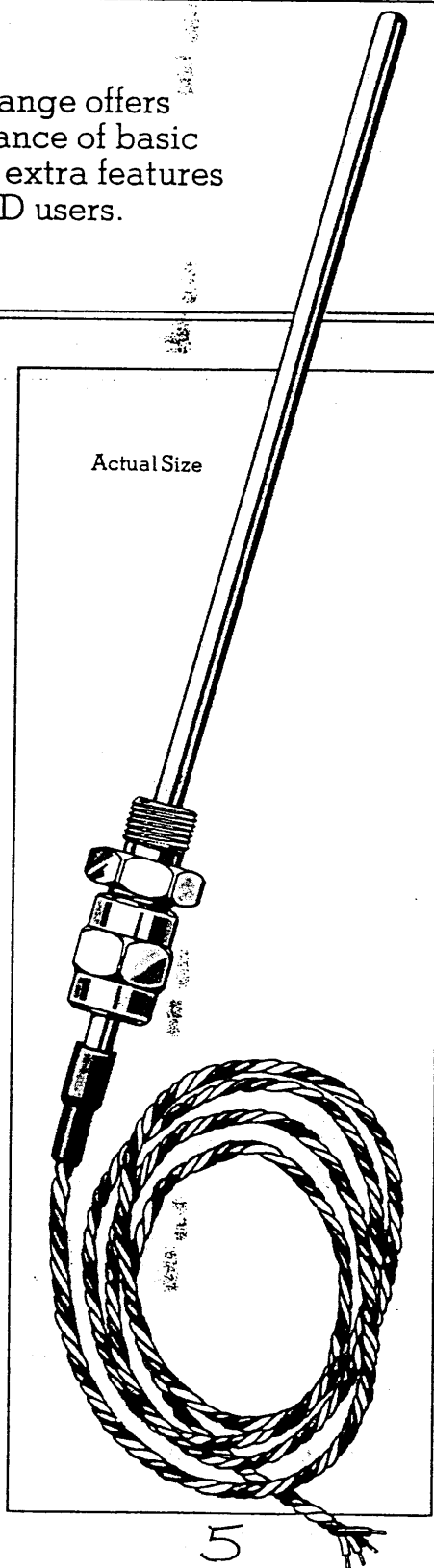
4/200 uses high grade, seamless 4mm OD stainless steel tube with electron beam welded tip to provide a conveniently slim probe without sacrificing physical strength. It has a  $\frac{1}{8}$ " BSP compression fitting moveable over its total length to allow flexibility in siting the probe.

To give faster thermal response than conventional probes, 4/200 is filled with a heat conducting material which also enhances the ruggedness of the assembly. In achieving this feature, its maximum working temperature is limited to 200°C. For higher temperatures the standard Thermafilm probe range should be consulted.

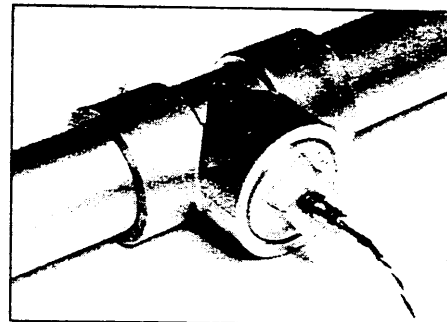
### The Leads

Four PTFE insulated multistrand leads are welded directly to the Thermafilm sensor. The point of exit from the probe is epoxy sealed and protected from stress by a Polyolefin sleeve. An external length of 1 metre is provided. The leads are colour coded red and white in accordance with the convention for 4 terminal PRTD's. By simply removing one wire a 3 wire system can be used or by joining the wires red to red and white to white, a two wire system, with much reduced lead resistance can be achieved.

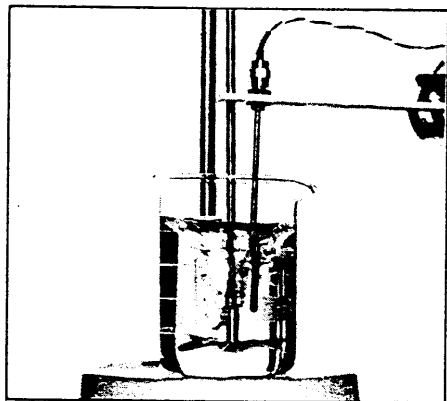
Actual Size



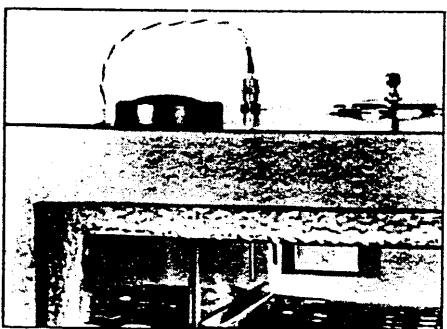
### Typical Applications



Pipework immersion probe.

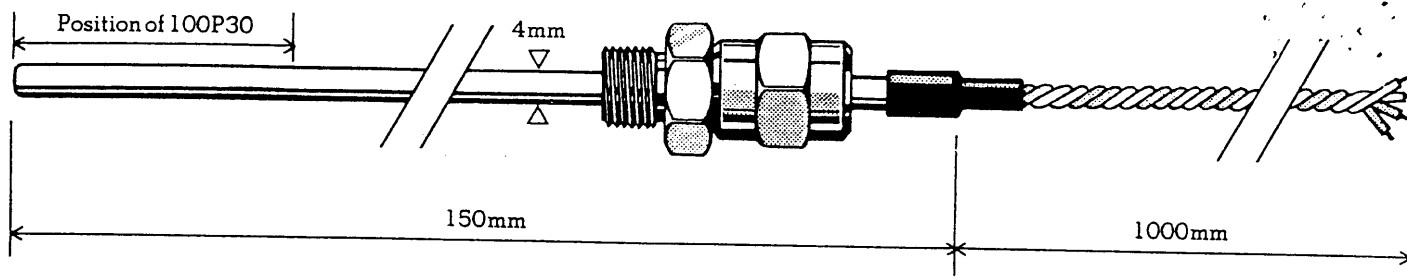


General purpose Laboratory probe.



Oven/incubator probe.

## Dimensions

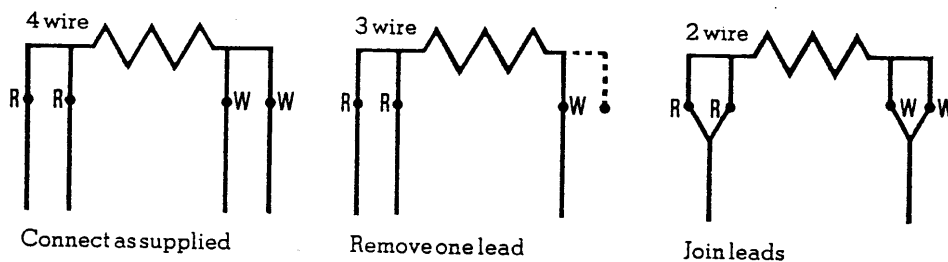


## Specifications

Ice Point Resistance	100 ohms $\pm$ 0.1 ohm
Temperature Range	-70°C to +200°C
Thermal Response*	Typically 1.2 secs.
Sheath Material	Stainless Steel AISI Grade 316
Lead Material	4 $\times$ PTFE insulated 7 $\times$ 0.2mm silver plated copper
Compression Fitting	1/4" BSP

\*Time to reach 63% of the final temperature when immersed in water flowing at 1 m/sec (BS1904 Section 3.15).

## Connection Methods



## Resistance vs Temperature relationship (BS. 1904)

$t_{ss}$ (°C)	-0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-100	60.28	56.21	52.12	48.01	43.88	39.72	35.54	31.34	27.11	22.83	18.56
-0	100.00	96.09	92.16	88.23	84.29	80.32	76.34	72.35	68.34	64.32	60.28
	+0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100
+0	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50
+100	138.50	142.29	146.06	149.82	153.57	157.31	161.04	164.76	168.46	172.16	175.83
+200	175.83	179.50	183.16	186.82	190.45	194.07	197.69	201.29	204.88	208.46	212.02

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