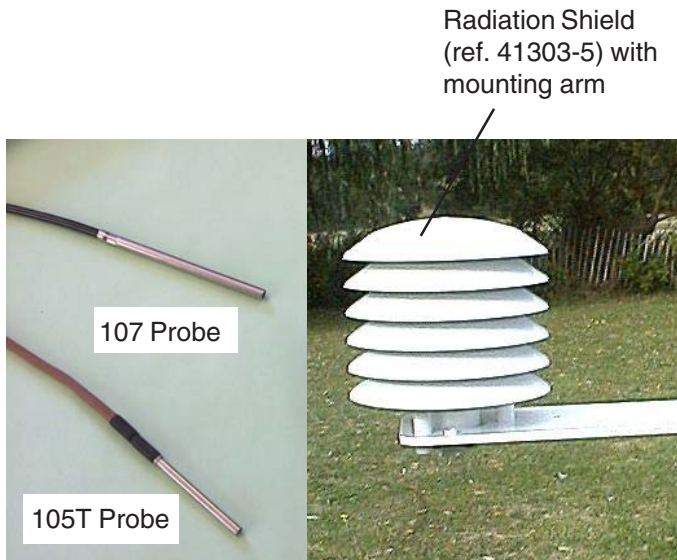


# 107, 108 & 105T Temperature Probes & 41303-5 Radiation Shield



**General-purpose probes for use in air, soil or water**

## Key Features

Rugged, versatile sensors

Low cost

High accuracy

Long cables available

Multiplexers available for multiple probe applications

## Description

The 107 and 108 Thermistor Probes connect directly to Campbell Scientific dataloggers and incorporate a precision thermistor in a water-resistant casing with a standard 3m cable. The polyurethane cable is very tough, UV-resistant and totally waterproof.

The 107 probe operates over the range  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ , whereas the 108 probe is optimised for use from  $-3^{\circ}\text{C}$  to  $+90^{\circ}\text{C}$ .

The 105T is a robust thermocouple probe suitable for measuring air and soil temperatures. In its standard form, the probe is 3m long and connects directly to most Campbell Scientific dataloggers. The sensing junction is completely sealed in potting compound in a stainless steel sheath, providing excellent protection.

## Installation

For measurement of air temperature the 107 or 108 Probes should be installed in a radiation shield such as the 41303-5, shown above.

Longer cable lengths (up to several hundred metres) are available to special order. The accuracy is only slightly degraded with cable length, a length of 300m giving an additional error of the order of  $0.1^{\circ}\text{C}$ .

105T probes are suitable for burial; the outer insulation is impervious to water and has good mechanical properties. Cable fitted to 105T probes is fully screened to minimise noise pick-up on long runs.

## Typical Applications

Logging and alarm systems for temperature-critical storage or transport

Automatic weather stations

Scientific and industrial research

## 107 and 108 Probe Specifications

### Accuracy\*

The overall accuracy of these probes is comparable to that of a platinum resistance thermometer (PT100) to DIN43760:1980. In practice, the accuracy depends on a combination of the thermistor's interchangeability specification, the precision of the bridge resistors and the linearisation error.

In the worst case, these errors could add to give a total error of  $\pm 0.3^{\circ}\text{C}$  over the range  $-20^{\circ}\text{C}$  to  $+48^{\circ}\text{C}$  for the 107 probe and  $\pm 0.4^{\circ}\text{C}$  over the range  $-3^{\circ}\text{C}$  to  $+92^{\circ}\text{C}$  for the 108 probe. (Note that these are the worst case errors; generally, the overall accuracy is better than  $\pm 0.2^{\circ}\text{C}$ .)

A major error component is the thermistor specification, given as  $\pm 0.1^{\circ}\text{C}$  over the range 0 to  $+70^{\circ}\text{C}$ , and  $\pm 0.3^{\circ}\text{C}$  (worst case) at  $-40^{\circ}\text{C}$ .

\* Figures apply to European made sensors only.

Although the thermistor interchangeability is typically better than this, the majority of the error can be determined with a single point calibration. This error can then be compensated for by entering an offset into the appropriate instruction.

### Linearisation Errors (Standard Instruction)

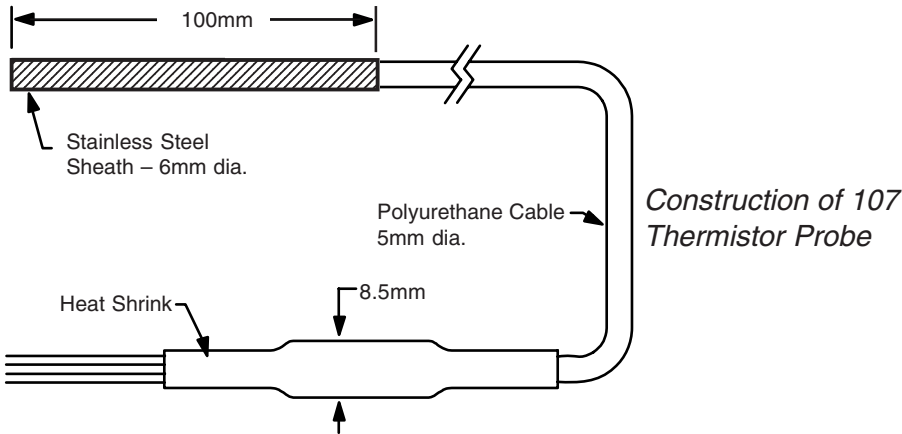
#### 107 Probe\*\*

Range $^{\circ}\text{C}$	Error
$-40^{\circ}\text{C}$ to $+56^{\circ}\text{C}$	$\pm 1.0^{\circ}\text{C}$
$-38^{\circ}\text{C}$ to $+52^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
$-23^{\circ}\text{C}$ to $+48^{\circ}\text{C}$	$\pm 0.1^{\circ}\text{C}$

#### 108 Probe

Range $^{\circ}\text{C}$	Error
$-3^{\circ}\text{C}$ to $+90^{\circ}\text{C}$	$\pm 0.1^{\circ}\text{C}$
$+23^{\circ}\text{C}$ to $+90^{\circ}\text{C}$	$\pm 0.07^{\circ}\text{C}$

\*\* It is possible to reduce the linearisation errors further (to  $< 0.02^{\circ}\text{C}$  theoretically) using more advanced but slower linearisation techniques – see the 107 sensor manual for further details.



### Bridge Resistors

**107 Probe:** Both 0.02% tolerance, 5ppm temperature coefficient

**108 Probe:** One 0.02% tolerance, 5ppm temperature coefficient, one 0.1% tolerance, 15ppm temperature coefficient

**Time constant:**  $< 80\text{s}$  in air (63% in air moving at 1 m/s)

### 10TCRT Thermocouple Reference Thermistor

The 10TCRT is a special version of the 107 Probe which is used to provide a reference temperature when making thermocouple measurements with a CR10 Measurement and Control Module.

### Maximum Number of Probes

One datalogger excitation channel will drive several hundred 107 or 108 probes. Each probe only requires a single-ended input. The practical limitation is the number of lead wires that can be inserted into a single excitation terminal (approximately 10).

## Radiation Shield and Mounting Arm

The model 41303-5 is a six-plate, low maintenance, radiation shield to give relatively accurate air temperature measurements with no power consumption. The radiation errors are similar to, or less than, those for a traditional Stevenson screen when compared to reference aspirated shields. The shield is supplied complete with a mounting arm.

## Radiation Shield Specifications

### Sensor Types:

Accommodates temperature and humidity sensors up to 12mm diameter.

### Radiation Error:

@  $1080\text{W}/\text{m}^2$  intensity – dependent on wind speed  
 $0.4^{\circ}\text{C}$  RMS @ 3m/s (6.7mph)  
 $0.7^{\circ}\text{C}$  RMS @ 2m/s (4.5mph)  
 $1.5^{\circ}\text{C}$  RMS @ 1m/s (2.2mph)

### Construction:

UV-stabilised white thermoplastic plates  
 Aluminium mounting arm (white)  
 Stainless steel U-bolt clamps

### Dimensions

120mm diameter x 120mm high (shield only)  
 Mounting fits vertical pipe 25-50mm diameter  
 Sensor separation from pipe = 200mm

### Weight:

Net weight (shield only) 600g

## 105T Specifications

### Thermocouple Type

Copper-constantan (Type T)

### Calibration

Thermocouple wire is calibrated using a 4-point calibration over the range  $-70^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  (calibration certificate provided)

Typical Accuracy:  $\pm 0.5^{\circ}\text{C}$

Complete sensors calibrated to special order.

Time Constant: as 107/108

### Cable

Length: 3m standard (extension cable type A3537 also available)

Insulation: Heavy plastic sheath, impermeable to water

### Sensing Junction

Soldered thermocouple junction encapsulated in potting compound within stainless steel outer sheath

### Dimensions of Sensing Head

Stainless steel:  
 Diameter: 5mm  
 Exposed length: 60mm

### Connections

Red: constantan (low)  
 Yellow: shield (ground)  
 Blue: copper (high)

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**Please contact Campbell Scientific for a complete list of sensors**

Campbell Scientific products are available from: