

# 107, 108, 109 & 105E Temperature Probes



107 Probe



105E Probe

## Description

The 107, 108 and 109 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 -55°C to +70°C, whereas the 108 probe is optimised for use from -5°C to +95°C and both are optimised to minimise errors with long cables. The 109 measures from -50° to +70°C and is primarily designed for use with the CR200 datalogger. (The 109 is the only one of these probes that can be used with the CR200.)

The 105E 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 probe should be installed in a radiation shield such as the MET20 (separate datasheet available), as shown overleaf.

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 300 m giving an additional error of the order of 0.1°C (0.6°C for the 109).

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

## Water temperature

The probes can be submerged to 10 m. Please note that the 107, 108 or 109 are not weighted. Therefore, the installer should either add a weighting system or secure the probe to a fixed, submerged object, such as a piling.

## Soil temperature

The 107, 108 and 109 are suitable for shallow burial only. These probes should be placed horizontally at the desired measurement depth to avoid thermal conduction from the surface to the thermistor. Placement of the probe's cable inside a rugged conduit may be advisable for long cable runs - especially in locations subject to digging, mowing, traffic, use of power tools, or lightning strikes.

## Key Features

Rugged, versatile sensors

Low cost

High accuracy

Long cables available

Multiplexers available for multiple probe applications

Overall absolute accuracy of the thermistor probes is comparable to a platinum resistance thermometer (PT100)

*The 105E probe is the lowest cost probe. It has lower absolute but good relative accuracy.*

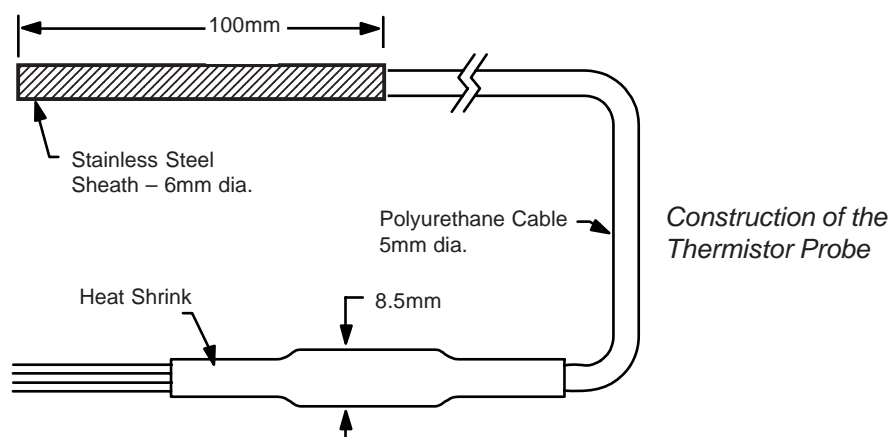
## Typical Applications

Logging and alarm systems for temperature-critical storage or transport

Automatic weather stations

Scientific and industrial research

## 107, 108, 109 Common Specifications



### 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 CR10X Measurement and Control Module.

### Maximum Number of Probes

One datalogger excitation channel will drive several hundred 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).

Time constant in air (63%): <80s in air at a windspeed of 1 ms<sup>-1</sup>

Temperature survival range: -55 to +100°C (with fixed cable at low temperatures)

Accuracy depends mainly on a combination of the thermistors interchangeability, bridge resistor error and the errors in the linearisation applied as shown in the table below. The total error for the 107 is <math>\pm 0.3^\circ\text{C}</math> over -25 to +50°C and <math>\pm 0.7^\circ\text{C}</math> for the 108 over -5 to +95°C. Errors for older loggers using the P11 instruction are slightly larger as they use a simpler polynomial for linearisation; their range of measurement may be limited too. Contact Campbell Scientific for further details.

Probe specific specifications	107	108	109
Sensor:	Betatherm 100K6A	Betatherm 100K6A	Betatherm 10K3A1
Temperature measurement range:	-55° to +70°C	-5° to +95°C	-50° to +70°C
Thermistor interchangeability error:*	<math>\pm 0.18</math> over -25 to +50°C <math>\pm 0.3</math> over -55 to +70°C	<math>\pm 0.16^\circ\text{C}</math> over -5 to +95°C	<math>\pm 0.36</math> over -25 to +50°C <math>\pm 0.6</math> over -50 to +70°C
CRBasic instruction linearisation error:	<math>\pm 0.03^\circ\text{C}</math> over -55 to +70°C	<math>\pm 0.01^\circ\text{C}</math> over -5 to +95°	<math>\pm 0.03^\circ\text{C}</math> over -50° to +70°C
Bridge resistor errors:*(worst case)	<math>\pm 0.13^\circ\text{C}</math> over -25 to +50°C <math>\pm 0.35^\circ\text{C}</math> over -55 to +70°C	<math>0.49^\circ\text{C}</math> over -5 to +95°C	<math>\pm 0.035^\circ\text{C}</math> over -50 to +70°C
Maximum recommended cable length:	300 m	300 m	30 m

\*Applies to European made sensors only.

## 105E Specifications

### Thermocouple Type

Constantan (Type E)

### Calibration

Thermocouple wire is checked using a 3-point calibration over -30 to +50°C (calibration report provided)

Typical Accuracy:  $\pm 0.5^\circ\text{C}$  plus reference sensor errors

Complete sensors calibrated to special order.

Time Constant: as 107/108

### Cable

Length: 3m standard

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)

Purple: chromel (high)



Probe installed in MET20 Radiation Shield

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