

107 Probe (108, 109 identical)

105E Probe

Rugged, Accurate, Versatile

Can be used in a variety of applications

Overview

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 3 m cable. The polyurethane cable is very tough, UV-resistant and totally waterproof.

The 107 probe operates over the range -55°C to $+70^{\circ}\text{C}$, whereas the 108 probe is optimised for use from -5°C to $+95^{\circ}\text{C}$ and both are optimised to minimise errors with long cables. The 109 measures from -50° to $+70^{\circ}\text{C}$ and is primarily designed for use with the CR200X datalogger, but can be used with other loggers

too. (The 109 is the only one of these probes that can be used with the CR200X.)

The 105E is a robust thermocouple probe suitable for measuring air and soil temperatures. The probe connects directly to most Campbell Scientific dataloggers that support thermocouples. The sensing junction is completely sealed in potting compound in a stainless steel sheath, providing excellent protection.

Standard cables are 3, 5, 10 m and longer multiples of 5 m.

Installation

Air temperature

For measurement of air temperature the probe should be installed in a radiation shield such as the RAD06. The louvred construction of these radiation shields allow air to pass freely through the shield, keeping the sensor at or near ambient temperature. The shield's white colour reflects solar radiation.

The RAD06 uses a double-louvred design that offers improved sensor protection from driving rain, snow, insect intrusion and has lower self-heating in bright sunlight combined with higher temperatures and low wind speeds giving better measurements.

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.

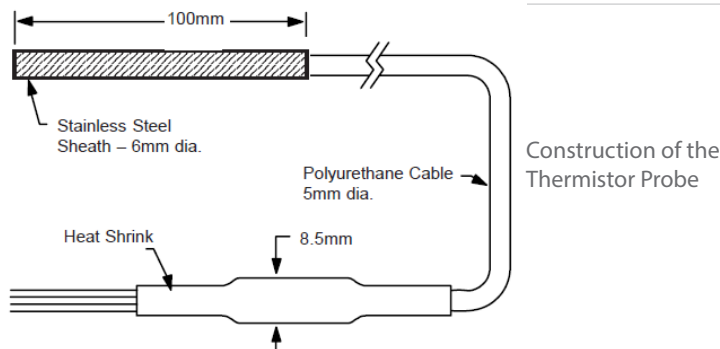
Benefits and Features

- › 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 accuracy but good relative accuracy.

Typical Applications

- › Logging and alarm systems for temperature-critical storage or transport
- › Automatic weather stations
- › Scientific and industrial research



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⁻¹

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 $\pm 0.3^\circ\text{C}$ over -25 to +50°C and $\pm 0.7^\circ\text{C}$ 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.

107, 108, 109 Common Specifications

Probe specific specifications	107	108	109
Sensor:	Betatherm 100K6A	Betatherm 100K6A	Betatherm 10K3A1iA
Temperature measurement range:	-55°C to +70°C	-5°C to +95°C	-50°C to +70°C
Thermistor interchangeability error:	$\pm 0.18^\circ\text{C}$ over -25 to +50°C $\pm 0.3^\circ\text{C}$ over -55 to +70°C	$\pm 0.16^\circ\text{C}$ over -5 to +95°C	$\pm 0.1^\circ\text{C}$ over 0° to 70°C range $\pm 0.13^\circ\text{C}$ for -10 to +70°C increasing to $\pm 0.5^\circ\text{C}$ at -50°C
CRBasic instruction linearisation error:	$\pm 0.03^\circ\text{C}$ over -55 to +70°C	$\pm 0.01^\circ\text{C}$ over -5 to +95°C	$\pm 0.03^\circ\text{C}$ over -50 to +70°C
Bridge resistor errors:* (worst case)	$\pm 0.13^\circ\text{C}$ over -25 to +50°C $\pm 0.35^\circ\text{C}$ over -55 to +70°C	0.49°C over -5 to +95°C	$\pm 0.035^\circ\text{C}$ 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: 3 m 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: 5 mm

Exposed length: 60 mm

Connections

Red: constantan (low)

Yellow: shield (ground)

Purple: chromel (high)



Probe installed in RAD06 Radiation Shield

View EU Declaration of Conformity Documentation at: www.campbellsci.eu/air-temperature-sensors



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