

## Fast Response

Ideal for monitoring  
solar panel temperature

### Overview

The CS220 thermocouple measures the temperature of a surface by direct contact. It typically monitors the temperature of a solar panel, but can also monitor the temperature of other devices.

Panel temperature is an important measurement in solar energy applications because the solar panel output is affected by its temperature. As the solar panel temperature increases, the output decreases.

### Benefits and Features

- › Well-suited for solar energy applications
- › Thermocouple tolerance meets ASTM E230-ANSI MC 96.1 (reference junction at 0°C)
- › Easy to install
- › Compatible with most Campbell Scientific dataloggers<sup>1</sup>

### Type E Thermocouples

Type E thermocouples are comprised of a chromel wire and a constantan wire joined at a measurement junction. A voltage potential is generated when the measurement end of the thermocouple is at a different temperature than the reference end of the thermocouple. The magnitude of the voltage potential is related to the temperature difference. Therefore, temperature can be determined by measuring the differences in potential created at the junction of the two wires.

A reference temperature measurement (typically measured at the datalogger wiring panel) is required. Options for measuring the reference temperature include:

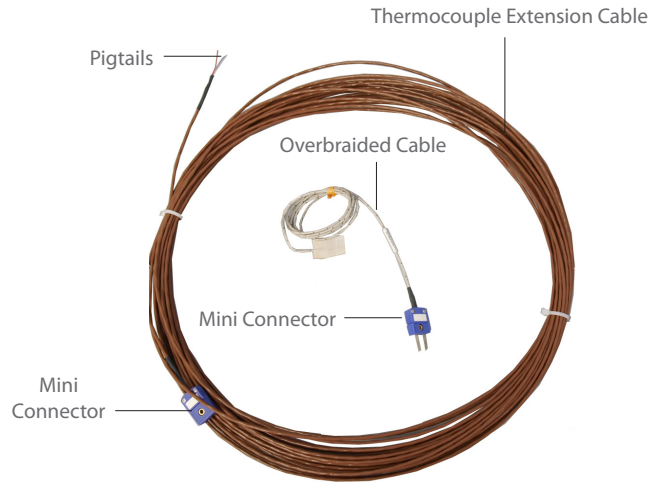
- › Thermistor built into the CR6, CR800, CR850, CR1000, or CR3000 wiring panel
- › PRT built into the wiring panel of the CR9050 or CR9051E input module for the CR9000X Measurement and Control System

<sup>1</sup>The CS220 is not compatible with our CR200(X)-series or CR510 dataloggers.



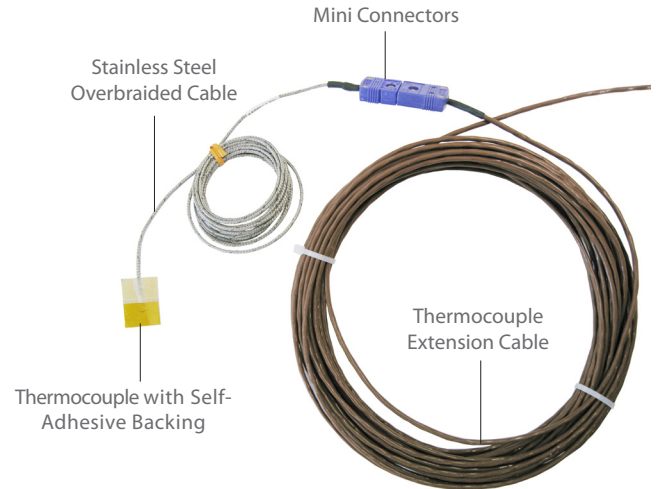
## Installation

The CS220 usually adheres in the center of the back panel of a solar module. Once the mounting location is determined, clean the back panel surface. Use extreme caution removing the masking paper from the measurement end of the thermocouple; damage can occur if masking paper is not removed carefully. Once masking paper is removed, firmly press thermocouple to the panel.



The CS220 is shipped with a stainless-steel overbraided cable and a thermocouple extension cable. The pigtails of the extension cable connect to the datalogger (see Wiring Table).

Adhere the cable strain relief 2 to 3 inch from the end. Connect the mini connector on the stainless-steel overbraided cable to the mini connector on the thermocouple extension cable. Wire the pigtails of the thermocouple extension cable to the datalogger, as determined by the datalogger program/wiring table.



The mini connectors of the thermocouple extension and overbraided cables attach to each other (shown above). Adhesive under the masking paper secures the sensor to a solar panel.

## Wiring Table

Wire Color	Wire Label	Datalogger Channel	
		Differential Measurements	Single-ended Measurements
Purple	Signal	Diff. High	SE Channel
Red	Signal Reference	Diff. Low	$\frac{1}{\equiv}$ or AG
Clear	Shield		$\frac{1}{\equiv}$ or AG

## Ordering Information

### Thermocouple

**CS220-L** Type E Surface Mount Fast Response Thermocouple. Enter the cable length, in feet, after the -L. The recommended cable length is 50 ft (CS220-L50). Specify a cable length of zero feet (CS220-L0) to get a replacement sensor that includes the stainless-steel overbraided cable, but not the thermocouple extension cable.

### Common Accessory

**27015** Roll of Kapton tape for locations where the temperature may exceed 70°C.

## Specifications

- › Thermocouple Type: Chromel-Constantan
- › Typical Output: 60  $\mu$ V/°C
- › Thermocouple Tolerances (reference junction at 0°C): Meets ASTM E230-ANSI MC 96.1 Special Limits of 1.0°C or 0.4% (0° to 900°C)
- › Maximum Temperature of Adhesive: adheres for up to 260°C

- › Accuracy: Refer to the "Thermocouple Measurement" section in your datalogger manual
- › Length of Stainless-Steel Braided Cable: 1.0 m (3.3 ft)
- › Thermocouple Length: 2.54 cm (1.00 in)
- › Thermocouple Width: 1.91 cm (0.75 in)
- › Weight with 50-ft cable: 238 g (8.4 oz)