

CS220

Type E Surface Mount Fast-Response Thermocouple



The CS220 surface-mount thermocouple is typically used to measure the temperature on the back of a solar panel. Panel temperature is an important measurement in solar energy applications since the output of a solar panel is affected by its temperature. As the temperature of the solar panel increases, its output decreases.

The CS220 has a thermocouple tolerance (reference junction at 0°C) that meets ASTM E230-ANSI MC 96.1 Special Limits of 1.0°C or 0.4% (0° to 900°C).

CS220 Thermocouple Description¹

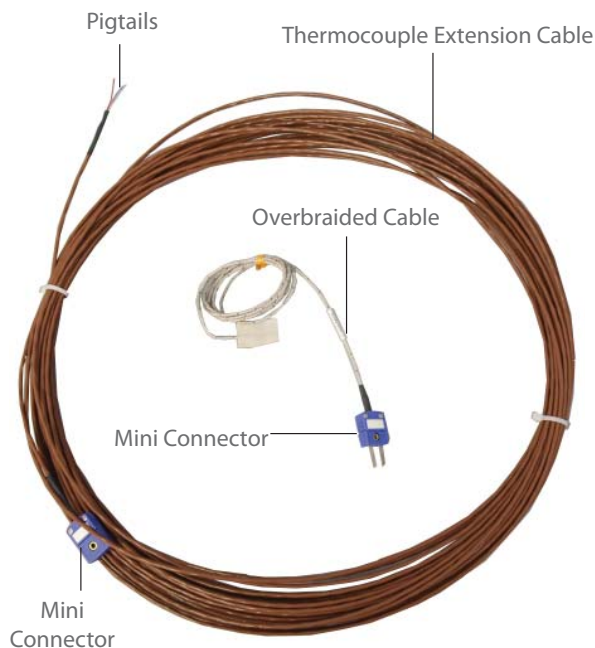
The CS220 is a 24-AWG, twisted pair, shielded, fast response type E thermocouple. A type E thermocouple consists of a chromel wire and a constantan wire joined at a measurement junction. A voltage potential is generated when the measurement end of the thermocouple is at a different temperature than the 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 datalogger² wiring panel) is required. Options for measuring the reference temperature include:

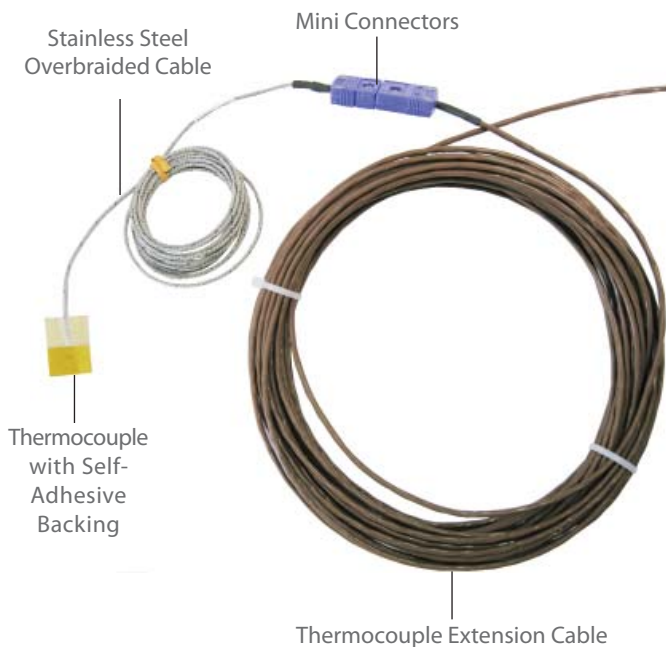
- Thermistor built into the wiring panel of a CR800, CR850, CR1000, CR3000, or CR5000 datalogger
- PRT built into the wiring panel of the CR9050 or CR9051E input module for the CR9000X datalogger
- PRT built into the wiring panel of the AM25T 25-Channel Solid State Multiplexer

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. Adhere the cable strain relief 2 to 3 in. 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 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 on page 2).



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.

¹Refer to the "Thermocouple Measurement" section in your datalogger manual for more information.

²Our CR200(X)-series dataloggers are not compatible with thermocouples.

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.

Insulated Terminal Covers

17324 CR1000WP Insulated Terminal Cover that reduces thermal gradients across the analog inputs of the CR1000's wiring panel.

18359 CR3000 Insulated Terminal Cover that reduces thermal gradients across the analog inputs of the CR3000's wiring panel.

Specifications

Type:	Chromel-Constantan
Typical Output:	60 $\mu\text{V}/^{\circ}\text{C}$
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
Weight:	238 g (8.4 oz) with 50-ft cable

Sensor Dimensions

Length:	2.54 cm (1.00 in)
Width:	1.91 cm (0.75 in)

Length of Stainless-Steel Braided Cable:

1.0 m (3.3 ft)

Temperature Error:

$T_r + TC_o + TC_v + L$

Where:

T_r = reference temperature error
 TC_o = TC output error
 TC_v = TC voltage error
 L = linearization error

