

# CS506 & CS205/107 10-Hour Fuel Moisture/ Temperature Sensors

## Description

Campbell Scientific offers sensors that emulate and measure the moisture content and temperature of similarly sized twigs on the forest floor. These 10-hour fuel moisture and fuel temperature sensors are often incorporated in our pre-configured or custom fire-weather stations.

When connected to a datalogger with telemetry capability, the user can automatically monitor changing fuel conditions without having to visit the measurement site. The fuel moisture and fuel temperature sensors are compatible with our CR510, CR800, CR850, CR10X, CR1000, and CR3000 dataloggers. Compatible telemetry options include spread spectrum radios, narrow-band radios, cellular phones, and satellite transmitters.

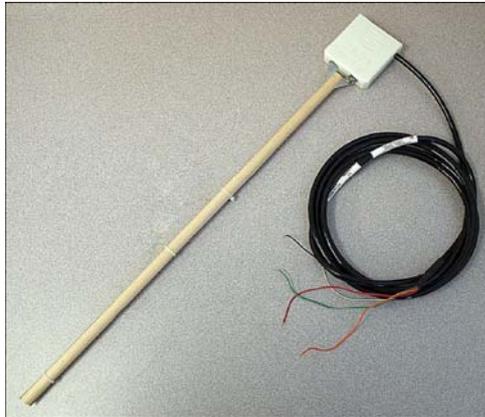
## CS205/107 Fuel Temperature

To measure fuel temperature, both the CS205 Fuel Temperature Stick and a 107 Temperature Probe are required. The CS205 provides a ponderosa pine dowel that is fabricated to USFS specifications. A hole is bored into one end of the dowel, where our thermistor-based 107 probe is inserted. The 107 measures the temperature inside of the dowel. The CS205 and the 107 are sold separately.

## Fuel Moisture

### CS506 Fuel Moisture Sensor

Our fuel moisture sensor, the CS506, reports the status of small-diameter (10-hour) forest fire fuels as percent moisture by weight (1% = 1 g). It consists of an epoxy-



encapsulated electronics package that uses Time Domain Reflectometry (TDR) technology to measure the moisture content of the 009619 10-hour Fuel Moisture Stick. The sensor produces a +/-0.7 Vdc square-wave frequency that is read using an analogue or pulse channel on a Campbell Scientific datalogger. The datalogger then converts the frequency measurement to percent fuel moisture via a quadratic calibration.

### 009619 10-Hour Fuel Moisture Stick

The 009619 10-hour Fuel Moisture Stick consists of a ponderosa-pine dowel fabricated to USFS specifications. It has a 1/2-inch diameter and a 20-in. length - the same dimensions as those used on the traditional weighing fuel moisture racks. Each dowel has undergone two additional sorts to optimize probe-to-probe repeatability and to allow probe interchangeability without individual calibration. The response of the CS506 sensor is similar to the traditional weighing racks because the entire dowel surface is exposed for moisture exchange.

## Key Features

Automatic measurement of both fuel moisture and fuel temperature

Simple mounting for combined sensors

Dowel fabricated to United States Forestry Service (USFS) specifications

Interchangeable dowels easily replaced without special tools

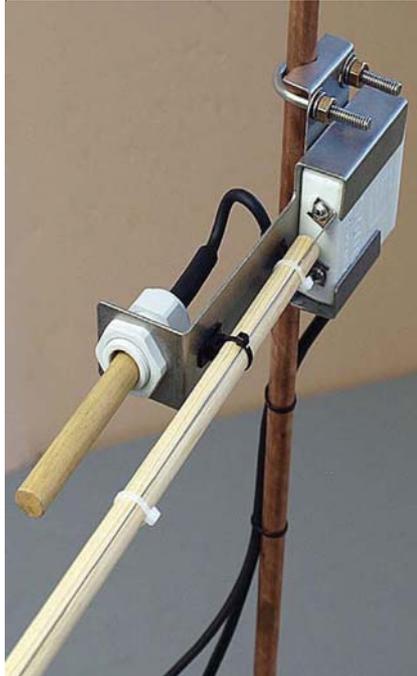
Direct connection to Campbell Scientific dataloggers

Remote data retrieval options can eliminate the need for manual measurements and reduce site visits

## 009620 Fuel Moisture/Temperature Mounting Kit

The Mounting Stake is often used to mount the sensors in the field. This stake places the CS506 and the CS205/107 probes twelve inches above the forest floor. Because the probes are mounted parallel to each other, shadowing is minimized. Cable ties are included for securing the cables to the side of the stake.

*The 009620 is available for mounting the CS506 and CS205/107 10-hour fuel moisture sensors.*



### Replacement Dowels (009619)

The dowels of the fuel moisture stick and fuel temperature stick (model CS205) are easily replaced in the field with a Phillips screwdriver and an adjustable wrench. Customers should replace the dowels each spring; more frequent replacements may be required in some environments. The more wet/dry cycles the dowels experience; the more frequently they will need to be replaced.

## Ordering Information

### Fuel Temperature

*You must order both a fuel temperature stick and a temperature probe. Typically the fuel temperature stick/probe is measured along side a fuel moisture sensor/stick (see below). The sensors can be mounted side-by-side on a Fuel Moisture & Temperature Mounting Stake.*

**CS205** 10-hour Fuel Temperature Stick (requires a 107 temperature probe; see below)

### Temperature Probes (choose one)

**107** Temperature Probe (-35° to +50°C). Standard cable lengths are 3, 5 and 10 m.

### Fuel Moisture

*You must order both a fuel moisture stick and a moisture probe. Typically the fuel moisture stick/probe is measured alongside a fuel temperature sensor/stick (see above). The sensors can be mounted side-by-side on a Fuel Moisture & Temperature Mounting Stake.*

**009619** 10-hour Fuel Moisture Stick (requires a CS506 probe; see below)

### Fuel Moisture Probes

**CS506** Fuel Moisture Sensor/10-hour Fuel Moisture Stick with user-specified cable length. Standard cable lengths are 3, 5 and 10 m.

### Mounting Kit

**009620** Fuel Moisture & Temperature Mounting Stake

### Replacement Dowels

*Dowel replacement is recommended every spring; more frequent replacement may be required in some environments (i.e., those with a large number of wet/dry cycles).*

**009619** 10-hour Fuel Moisture Stick

**CS205** 10-hour Fuel Temperature Stick



*The dowels can be easily replaced using a Phillips screwdriver and an adjustable wrench. The CS205 is shown above.*

## Specifications

### CS205 10-Hour Fuel Temperature Stick

**Material:** Ponderosa Pine  
**Length:** 11.4 cm (4.5 in.)  
**Diameter:** 1.3 cm (0.5 in.)  
**Weight:** 9.07 g (0.32 oz)

### 107 Temperature Probe

**Sensor:** -BetaTherm 100K6A1 Thermistor  
**Measurement Range:** -35° to +50°C  
**Steinhart-Hart Equation Error (CRBasic dataloggers only):**  $\leq \pm 0.01^\circ\text{C}$  over -35° to +50°C  
**Polynomial linearization accuracy (Edlog dataloggers only):** Typically  $\leq \pm 0.5^\circ\text{C}$  over -38° to +50°C range,  $\leq \pm 0.1^\circ\text{C}$  over -24° to +48°C range  
**Interchangeability Error:** Typically  $\leq \pm 0.1^\circ\text{C}$  over 0° to 50°C range  
**Length:** 10.4 cm  
**Diameter:**  $< 0.6$  cm  
**Weight:** 136 g with 3 m cable

### 009619 10-Hour Fuel Moisture Sticks

**Material:** Ponderosa Pine  
**Diameter:** 1.3 cm (0.5 in.)  
**Length:** 50.8 cm (20 in.)  
**Weight:** 45 g (0.1 lb.)

### CS506 10-Hour Fuel Moisture Sensors

**Operating Range:** 0 to 70% moisture content

### Fuel Moisture Accuracy:

range	worst case	rms error
0 to 10%	$\pm 1.25\%$	$\pm 0.74\%$
10 to 20%	$\pm 2\%$	$\pm 0.9\%$
20 to 30%	$\pm 3.4\%$	$\pm 1.94\%$
30 to 50%	$\pm 4.11\%$	$\pm 2.27\%$

**Power Supply:** 5 to 18 Vdc  
**Enable Voltage:** off at 0 V ( $< 1$  Vdc)  
on at 5 V ( $> 4$  Vdc; maximum 18 Vdc)  
**Current Use:** 65 mA active; 45  $\mu\text{A}$  quiescent  
**Output Signal:**  $\pm 0.7$  Vdc square wave with an output frequency of approximately 31 to 58 kHz  
**Weight:**  $< 0.5$  kg ( $< 1$  lb)  
**Dimensions:** 10.16 x 6.35 x 1.91 cm (4 x 2.5 x 0.75 in.)