



CST100

Concentrated Solar Monitoring Package

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(435) 755-0774**

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Campbell Scientific's CST100 is an automated data acquisition system specifically designed for concentrated solar technology (CST) monitoring applications. The standard package is designed to meet CaISO EIRP Solar Telemetry Standards. Systems are easily customized with accessories for every aspect of the station, from communications to mounting options. Typical applications include resource assessment and performance monitoring where active direct normal irradiance measurements are required.

Features/Benefits

- Contains a Campbell Scientific CR1000 Measurement and Control Datalogger
- Uses ISO 9060-classified thermopile-style sensors that measure direct normal irradiance (DNI) and global horizontal radiation (GH)
- Includes dual axis tracker for DNI measurement with <math><0.05</math> degree field of view
- Reduces installation time by using a prewired/preprogrammed integrated design
- Supports various communication technologies such as IP, cellular, RS-485, and satellite.
- Complies with Modbus, Canbus, and DNP 3.0 protocols simplifying system integration
- Provides a battery back system that allows data collection during power outages and network failure
- Consists of a modular design that promotes customization

System Components

The CST100 consists of a sensor array with mounts, 4-ft crossarm, solar tracker with mounting stand, and Nema 4X environmental enclosure that houses the CR1000 datalogger, power supply, and communications peripheral. The enclosure, meteorological sensors, and crossarm can be easily mounted to a tripod, tower, or user-supplied pole (1.25-in. to 2.1-in. outer diameter). AC power (100 to 240 Vac, 50/60 Hz) must be routed to the CST100 for recharging the battery and powering the solar tracker.

The standard sensor array is composed of the CMP11 secondary-standard pyranometer, CHP1 pyrheliometer, 107 ambient air temperature sensor, and 034B wind speed and wind direction set. Sensors commonly added to the CST100 system include a second CMP11 pyranometer, a shading assembly that provides diffuse measurements, a TB4 tipping bucket rain gauge, and the CS100 barometric pressure sensor.

Ordering Information

Concentrated Solar Monitoring Package

CST100 Campbell Scientific Concentrated Solar Monitoring Station includes the sensor array, sensor mounts, enclosure, electronics, crossarm, solar tracker, and solar tracker mounting kit. Additional sensors, communication peripherals, software, and instrument mounts are ordered separately.

Standard Components of CST100

The following products are included with each CST100 purchase; you do not need to order them separately. The components may be purchased as replacement items.

CR1000-XT	Measurement and Control Datalogger with extended temperature testing (-55 to +85C)
PS100	12 Vdc Power Supply with Charging Regulator and 7 Ahr Sealed Rechargeable Battery.
CMP11-L20	Kipp & Zonen Secondary Standard Pyranometer with a 20-ft cable.
CHP1-L20	Kipp & Zonen pyrhelimeter with a 20-ft cable.
SOLYS2-L20	Kipp & Zonen Solar Tracker with a 20-ft cable.
27107	SOLYS2 mounting stand.
27059	Top mount plate for SOLYS2
27060	Tilted CMP Mounting Kit for SOLYS 2
034B-L14-PW	Met One Wind Speed and Direction Wind Set with a 14-ft cable and a prewired connector.
107-L9-PW	Ambient Air Temperature Probe with a 9-ft cable and a prewired connector
41303-5A	RM Young 6-Plate Gill Solar Radiation Shield
PWENC16/18	16-in x 18-in Prewired Weather-Resistant Enclosure.
CM204	4-ft Sensor Crossarm with one CM210 Mounting Kit. The CM204 can be attached to a tripod mast, tower leg, or user-supplied vertical pipe (1.0-in to 2.1-in OD).

Additional Sensors and Sensor Accessories

CMP11-L20	Kipp & Zonen Secondary Standard Pyranometer with a 20-ft cable. Order this if you want two CMP11s.
CMP6-L20	Kipp & Zonen First Class Pyranometer with a 20-ft cable.
CMP21-L20	Kipp & Zonen Secondary Standard Pyranometer with an internal thermistor for temperature compensation. Cable length is 20 feet.
27052	Desiccant refill for CMP6, CMP11, and CMP21.
CVF3	Ventilation Unit for CMP6, CMP11, and CMP21; keeps dome free from dew, ice, and dust..
27055	CVF3 replacement filters
27058	SOLYS 2 shading ball for diffuse measurements.
CS100	Setra 278 Barometer (600 to 1100 hPa), 30-in. cable
TB4-L-PW	Hydrological Services Rain Gage with 0.01-in. tip, with 8-in. orifice, and prewired connector. Enter cable length, in feet, after the -L. Recommended cable length is 25 ft (TB4-L25-PW).
110PV-L50	Surface mount thermistor with 50-ft cable. It is used for back of solar panel temperature measurements
CS220-L50	Type E surface mount thermocouple with 50-ft cable used for back of solar panel temperature measurements

Communication Peripherals

NL120	Ethernet Interface for CR1000 Datalogger.
NL115	Ethernet Interface & CompactFlash Module for CR1000 Datalogger. CFMC2G CompactFlash card typically used with this (see below).
CFMC2G	2 GB CompactFlash Memory Card for use with the NL115 (64 MB, 256 MB, and 1 GB also available).
RAVENXTV	AirLink CDMA Cellular Digital Modem for Verizon Systems.
RAVENXTG	AirLink GPRS Cellular Digital Modem for AT&T Systems.

Software

LoggerNet	Datalogger Support Software.
LoggerNet Admin	Administration Datalogger Support Software (Server and Clients)
LNDB	LoggerNet Database Software

Instrumentation Mounts

UT10	10-ft Tower with Base, Adjustable Mast, and Ground Kit (20-ft and 30-ft towers also available).
CM110	10-ft (3 m) Stainless-Steel Tripod can provide a sturdy support for the enclosure, sensors, and crossarm (15-ft and 20-ft stainless steel tripods and 6-ft and 10-ft, galvanized-steel tripods also available).
CM310	56-in. Mounting Pole with Cap (23-in and 47-in mounting poles also available); must choose a pedestal option (see below).

Pedestal Options for CM310 (choose one)

-NP	No Pedestal Base. Select this if you are embedding the CM310 directly in a concrete foundation or supplying your own method for supporting the pole.
-PJ	Pedestal J-Bolt Kit that provides leveling capability for permanent installations.
-PS	Pedestal Short Leg Kit that includes three 23-in legs (feet can be secured to the ground via the 17049 Grounding Spikes).
-PL	Pedestal Long Leg Kit that includes three 39-in legs (feet can be secured to the ground via the 17049 Grounding Spikes).

Specifications

CR1000 Measurement & Control Datalogger

Temperature Range: -25° to +50°C

Accuracy of Voltage Measurement

0° to+40°C: ±(0.06% of reading + offset)

-25° to+50°C: ±(0.12% of reading + offset)

Memory:

2 MB Flash for OS
4 MB for CPU usage, program storage, and data storage

Power Requirements: 9.6 to 16 Vdc

Typical Current Drain: ~0.6 mA (sleep mode);
1 to 28 mA (w/1 fast SE meas.)

Specifications

107-L-PW Temperature Probe (includes radiation shield)

Measurement Range:	-35° to +50°C
Sensor:	BetaTherm 100K6A1B Thermistor
Accuracy:	Error $\pm\pm 0.01^\circ\text{C}$ over measurement range

034B-L-PW Wind Set

Sensor:	Cup anemometer (wind speed), vane (wind direction)
Wind Speed Range:	0 to 49.5 m s ⁻¹ (0 to 110.7 mph) with a starting threshold of 0.4 m s ⁻¹ (0.9 mph)
Wind Direction Range:	0° to 360° mechanical; 0° to 356° electrical
Wind Speed Accuracy:	± 0.11 m s ⁻¹ (± 0.25 mph) when <10.1 m s ⁻¹ (<22.6 mph); $\pm 1.1\%$ (± 2.5 mph) of true when >10.1 m s ⁻¹ (>22.6 mph)
Wind Direction Accuracy:	$\pm 4^\circ$

SOLYS2 Suntracker

Pointing Accuracy:	<0.05°
Payload:	± 5 s
Power Supply:	18 to 30 Vdc and 90 to 264 Vac (50/60 Hz)
Mounting Base:	Tripod Stand
Operating Temperature	
DC:	-20° to +50°C
AC:	-40° to +50°C
Dimensions:	20 x 13 x 15 in. (50 x 34 x 38 cm)
Weight	
Tracker:	51 lb (23 kg)
Tripod Stand:	11 lb (5 kg)
Communication Interface:	Ethernet / Web interface
Transmission Type:	Inverted tooth belts
Power Consumption:	21 W (reduces to 13 W at night) 100 W extra when heater is operating (AC only)

CHP1 Pyrheliometer

Spectrum Range:	200 to 4000 nm
Sensitivity:	7 to 14 $\mu\text{V W}^{-1} \text{m}^2$
Response Time:	<5 s
Zero Offset B:	<1 W m ⁻²
Temperature Dependence of Sensitivity:	<0.5% (-20° to +50°C)
Field of View:	5° $\pm 0.2^\circ$
Operating Temperature:	-40° to +80°C
Nonlinearity:	<0.2 %
Maximum Irradiance:	4000 W m ⁻²

Pyranometers

Spectrum Range:	285 to 2800 nm
Sensitivity	
CMP11, CMP21:	7 to 14 $\mu\text{V W}^{-1} \text{m}^2$
CMP6:	5 to 20 $\mu\text{V W}^{-1} \text{m}^2$
Response Time	
CMP11, CMP21:	± 5 s
CMP6:	18 s
Zero Offset	
CMP11, CMP21:	± 7 W m ⁻² (A); ± 2 W m ⁻² (B)
CMP6:	± 15 W m ⁻² (A); ± 4 W m ⁻² (B)
Directional Error (up to 80° with 1000 W/m² beam)	
CMP11, CMP21:	<10 W m ⁻²
CMP6:	<20 W m ⁻²
Temperature Dependence of Sensitivity (-10° to 40°C)	
CMP11, CMP21:	$\pm 1\%$
CMP6:	$\pm 4\%$
Field of View:	180°
Operating Temperature:	-40° to +80°C
Maximum Irradiance	
CMP11, CMP21:	4000 W m ⁻²
CMP6:	2000 W m ⁻²

CS220-L Back of Panel Thermocouple

Description:	Type E Thermocouple meets ASTM E230-ANSI MC 96.1 Special Limits of 1.0°C or 0.4% (0° to 900°C).
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110PV-L Back of Panel Thermistor

Temperature Range:	-40° to +135°C
Temperature Uncertainty	
0° to +70°C:	$\pm 0.2^\circ\text{C}$
71° to 105°C:	$\pm 0.5^\circ\text{C}$
106° to 135°C:	$\pm 1^\circ\text{C}$

CS100 Barometric Pressure Sensor

Sensor:	Setraceram™ capacitive sensor and IC analog circuit
Operating Temperature:	-40° to 60°C
Measurement Range:	600 to 1100 millibar
Accuracy	
+20°C:	± 0.5 mb
0° to +50°C:	± 1 mb
-20° to +50°C:	± 1.5 mb
-40° to +60°C:	± 2 mb

TB4-L-PW Tipping Bucket Rain Gage

Sensor:	Tipping bucket with siphon
Orifice:	8.0-in diameter
Resolution:	0.01-in (0.25 mm)
Accuracy:	better than $\pm 2\%$ @ 19.7in. hr ⁻¹ (500 mm hr ⁻¹)

