CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

CS215

Temperature and Relative Humidity Probe

Competitively Priced; SDI-12 Output

General purpose temperature and RH sensor

Overview

The CS215 uses the Sensirion SHT75, a combined relative humidity and temperature element, to provide accurate, stable measurements. The element is based on Sensirion's CMOSens technology, which has been tested for more than two years in alpine conditions. The CS215 outputs an SDI-12 signal that is measurable by most Campbell Scientific dataloggers.

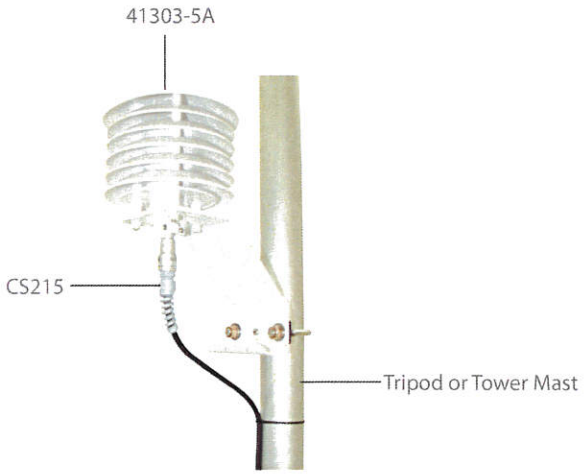
The Sensirion SHT75 element is field-replaceable, eliminating the downtime typically required for the recalibration process.

Benefits and Features

- Accurate and stable measurements
- Field changeable element allows on-site recalibration
- Each sensor element is individually calibrated so no further adjustment of the probe is required
- Low power consumption
- Digital SDI-12 output

Sensor Mounts

When exposed to sunlight, the CS215 must be housed ina 41303-5A or 41303-5B 6-plate radiation shield. The 41303-5A attaches to a crossarm, mast, or user-supplied pipe with a 2.5 to 5.3 cm (1.0 in. to 2.1 in.) outer diameter. The 41303-5B attaches to a CM500-series pole or a user-supplied pole with a 5.1 cm (2.4 in.) outer diameter.



Above is a sensor housed in the 41303-5A radiation shield. The U-bolt is placed in the holes on the side of the bracket to allow the 41303-5A to be attached to a mast or vertical pole.

Recommended Cable Lengths

2-m Height		Atop a tripod or tower via a 2-ft crossarm such as the CM202								
Mast/Leg	CM202	CM6	CM106	CM10	CM110	CM115	CM120	UT10	UT20	UT30
2.7 m (9 ft)	3.3 m (11 ft)	3.3 m (11 ft)	4.3 m (14 ft)	4.3 m (14 ft)	4.3 m (14 ft)	5.8 m (19 ft)	7.3 m (24 ft)	4.3 m (14 ft)	7.3 m (24 ft)	11.3 m (37 ft)
Note: Add 1 m (2 ft) to the cable length if mounting the enclosure to the leg base of a CM106, CM110, CM115, or CM120 tripod.										

Ordering Information

Air Temperature and Relative Humidity Probe

CS215-L CSL Temperature/RH Probe with user-specified cable length. Enter cable length, in feet, after the -L. Must choose a cable termination option (see below).

Cable Termination Options (choose one)

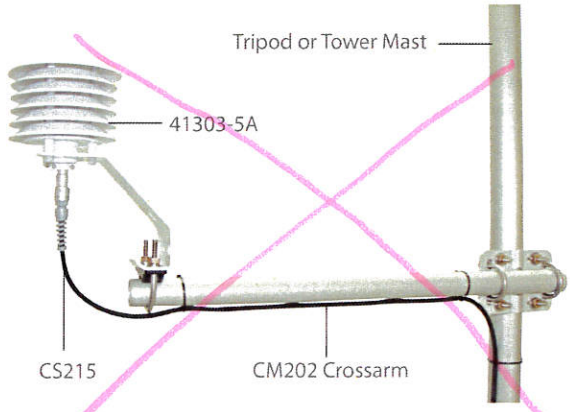
-PT Cable terminates in stripped and tinned leads for direct connection to a datalogger's terminals.

-PW Cable terminates in connector for attachment to a prewired enclosure.

Radiation Shields

41303-5A 6-Plate Gill Radiation Shield with U bolts for attachment to a Campbell Scientific crossarm or mast.

41303-5B 6-Plate Gill Radiation Shield with Band Clamp for attachment to a CM500-series or similar pole.



To attach the 41303-5A to a CM202, CM202SS, CM204, CM204SS, or CM206 crossarm, place the 41303-5A's U bolt in the bottom holes.

Specifications

- Sensing Element: Sensirion SHT75
- Communication Standard: SDI-12 V1.3 (responds to a subset of commands)
- Supply Voltage Range: 6 to 16 Vdc (typically powered by the datalogger's 12 Vdc supply)
- Typical Current Drain
  Quiescent: 120 µA
  During Measurement: 1.7 mA (takes 0.7 s)
- EMC Compliance: Tested and conforms to IEC61326:2002
- Operating Temperature Range: -40° to +70°C
- Length including strain relief: 18.0 cm (7.1 in)
- Diameter at sensor tip: 1.2 cm (0.5 in)
- Diameter at cable end: 1.8 cm (0.7 in)
- Weight w/10 ft cable 150 g (5.3 oz)

Air Temperature

- Measurement Range: -40° to +70°C
- Output Resolution: 0.01°C
- Accuracy
  25°C: ±0.3°C
  +5° to +40°C: ±0.4°C
  -40° to +70°C: ±0.9°C
- Response Time with Filter: < 120 s (63% response time in air moving at 1 m s^{-1})

Relative Humidity (RH)

- Measurement Range: 0 to 100% RH (-20° to +60°C)
- Output Resolution: 0.03% RH
- Accuracy at 25°C
  10% to 90% range: ±2% RH
  0% to 100% range: ±4% RH
- Short Term Hysteresis: < 1% RH
- Temperature Dependence: better than ±2% (-20° to 60°C)
- Stability (Typical): ±1.0% per year
- Response Time with Filter: < 20 s (63% response time in still air)
- Calibration Traceability: NIST and NPL standards

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WHEN MEASUREMENTS MATTER

107 and 108

Temperature Sensors

Rugged, Accurate, Versatile

Can be used in a variety of applications

Overview

The 107 and 108 are rugged, accurate sensors that measure air, soil, and water temperature in a variety of applications. These sensors consist of a thermistor encapsulated in an epoxy-filled aluminum housing. The housing protects the thermistor allowing the sensors to be buried or submerged. The 107 measures from -35° to +50°C, the 108 from -5° to +95°C.

Benefits and Features

- Versatile product—measures air, soil, or water temperature
- Compatible with AM16/32-series multiplexers allowing measurement of multiple sensors
- Easy to install or remove
- Durable
- Compatible with most dataloggers*

Installation

Air Temperature

When exposed to sunlight, the 107 and 108 sensors should be housed in a 41303-5A or 41303-5B 6-plate radiation shield. The louvered construction of these radiation shields allows air to pass freely through the shield thereby keeping the sensor at or near ambient temperature. The shields' white color reflects solar radiation.

The 41303-5A attaches to a crossarm, mast, or user-supplied pipe with a 2.5 to 5.3 cm (1.0 in. to 2.1 in.) outer diameter. The 41303-5B attaches to a CM500-series pole or a user-supplied pole with a 5.1 cm (2.4 in.) outer diameter.

Water Temperature

The sensors can be submerged to 15 m (50 ft) or 21 psi. Please note that neither the 107 nor 108 is weighted. Therefore, the installer should either add a weighting system or secure the sensor to a fixed, submerged object, such as a piling.

Soil Temperature

The 107 and 108 are suitable for shallow burial only. Placement of the sensor'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.

**The 107 and 108 are not compatible with the CR200(X)-series dataloggers. However, a similar sensor, the 109, has been developed specifically for our CR200(X)-series dataloggers.*

Ordering Information

Temperature Sensors

107-L Temperature Sensor (-35° to +50°C) with a user-specified cable length; enter the cable length (in feet) after the -L. Recommended cable length is shown below. Must choose a cable termination option (see below).

108-L Temperature Sensor (-5° to +95°C) with a user-specified cable length; enter the cable length (in feet) after the -L. Recommended cable length is shown below. Must choose a cable termination option (see below).

Cable Termination Options (choose one)

-PT Cable terminates in stripped and tinned leads for direct connection to a datalogger's terminals.

-PW Cable terminates in connector for attachment to a prewired enclosure.

Solar Radiation Shield for Air Temperature Measurements

41303-5A 6-Plate Gill Radiation Shield with U bolts for attachment to a Campbell Scientific crossarm or mast.

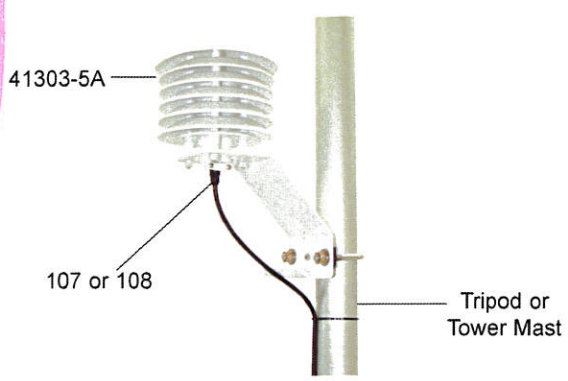
41303-5B 6-Plate Gill Radiation Shield with Band Clamp for attachment to a CM500-series or similar pole.

Specifications

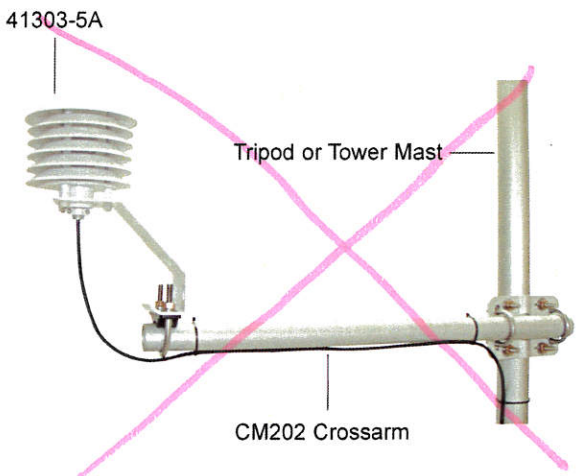
- Sensor: BetaTherm 100K6A1IA Thermistor
- Tolerance:
  107: ±0.2°C over 0° to 50°C range
  108: ±0.2°C over 0° to 70°C range
- Temperature Measurement Range
  107: -35° to +50°C
  108: -5° to +95°C
- Steinhart-Hart Equation Error (CRBasic loggers only): ≤±0.01°C over measurement range
- Polynomial Linearization Error (Edlog loggers only)
  107: Typically <±0.5°C over measurement range
  108: Typically <±0.5°C over -5° to +90°C range
- Time Constant in Air: 30 to 60 s in a wind speed of 5 m s^{-1}
- Maximum Cable Length: 305 m (1000 ft)
- Maximum Submersion Depth: 15 m (50 ft)
- Sensor Length: 10.4 cm (4.1 in.)
- Sensor Diameter: 0.76 cm (0.3 in.)
- Weight with 10 ft cable: 136 g (5 oz)

Recommended Cable Lengths for Air Temperature Measurements

2 m Height		Atop a tripod or tower via a 0.6 m (2 ft) crossarm such as the CM202						
Mast/Leg	CM202	CM106	CM110	CM115	CM120	UT10	UT20	UT30
2.7 m (9 ft)	3.4 m (11 ft)	4.3 m (14 ft)	4.3 m (14 ft)	5.8 m (19 ft)	7.3 m (24 ft)	4.3 m (14 ft)	7.3 m (24 ft)	11.3 m (37 ft)
Note: Add 0.6 m (2 ft) to the cable length if mounting the enclosure to the leg base of a CM106, CM110, CM115, or CM120 tripod.								



Above is a sensor housed in the 41303-5A radiation shield. The U-bolt is placed in the holes on the side of the bracket to allow the 41303-5A to be attached to a mast or vertical pole.



To attach the 41303-5A to a CM202, CM202SS, CM204, CM204SS, or CM206 crossarm, place the 41303-5A's U bolt in the bottom holes.

COMPONENT

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WHEN MEASUREMENTS MATTER

SR50A

Sonic Ranging Sensor

Overview

The SR50A* is a rugged, acoustic sensor that provides a non-contact method for determining snow or water depth. The SR50A determines depth by emitting a ultrasonic pulse and then measuring the elapsed time between the emission and return of the pulse. An air temperature measurement is required to correct for variations of the speed of sound in air.

Benefits and Features

- Rugged enough for harsh environments
- User-selectable options for output
- Uses a multiple echo processing algorithm to help ensure measurement reliability
- Compatible with most Campbell Scientific dataloggers

Output

SDI-12, RS-232, and RS-485 output options are available for measuring the SR50A. Campbell Scientific's MD485 interface can be used to connect one or more SR50A sensors in RS-485 mode to an RS-232 device. This can be useful for sensors that require lead lengths that exceed the limits of either RS-232 or SDI-12 communications.

Mounting

To achieve an unobstructed view for the SR50A's beam, the SR50A is typically mounted to a tripod mast, tower leg, or user-supplied pole via the CM206 6-ft crossarm. The 19517 mounting kit attaches directly to the crossarm. The 19484 mounting stem attaches to the crossarm via the 17953 NU-RAIL fitting, CM220 right-angle mount, CM230 adjustable-angle mount, or CM230XL adjustable -angle mount. The CM230 or CM230XL should be used if the surface is at an angle.

**The SR50A is manufactured by Campbell Scientific Canada.*

Ordering Information

Sonic Ranging Sensor

SR50A-L CSC Sonic ranging sensor with user-specified cable length; specify the cable length, in feet, after the L. Requires either the 19517 Mounting Kit or 19484 Mounting Stem to attach to the CM206 crossarm. Must choose a cable termination option (see below).

Cable Termination Options (choose one)

-PT Cable terminates in stripped and tinned leads for direct connection to a datalogger's terminals.

-PW Cable terminates in connector for attachment to a prewired enclosure.

RS-485 Interface

MD485 RS-485 Multidrop Interface that is typically used when the application requires long cable lengths.

Mounting Hardware

19517 SR50A Mounting Kit that attaches directly to the CM206 crossarm. A U-bolt is included for attachment to the crossarm.

19484 Mounting Stem for attachment to a CM206 crossarm via the 17953 NU-RAIL fitting, CM220 mount, CM230 mount, or CM230XL mount.

17953 1-inxh x 1-inch NU-RAIL Crossover Fitting that attaches the 19484 mounting stem to a crossarm.

CM220 Right Angle Mounting Kit that attaches the 19484 mounting stem to a crossarm.

CM230 Adjustable Inclination Mount Kit for applications where the measurement surface is at an angle.

CM230XL Adjustable Angle Mounting Kit with Extended Length. Provides same functionality as the CM230 but places the SR50A further from the crossarm.

Specifications

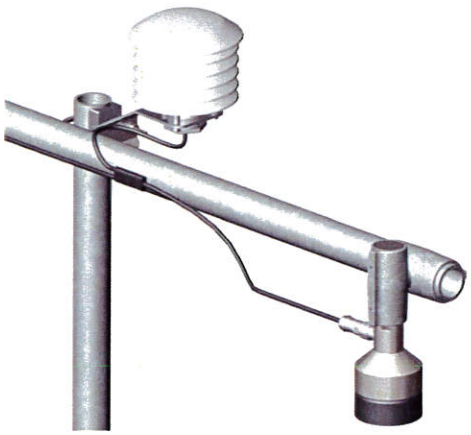
- Measurement Time: < 1.0 s
- Output Options: SDI-12 version 1.3, RS-232, RS-485 (output options selected by configuring internal jumpers)
- Baud Rates (RS-232, RS-485 modes): 1200 to 38400 bps
- Power Requirements: 9 to 18 Vdc (typically powered by datalogger's 12 Vdc power supply)
- Measurement Range: 0.5 to 10 m (1.6 to 32.8 ft)
- Beam Acceptance: ~30°
- Resolution: 0.25 mm (0.01 in)
- Accuracy: ±1 cm (0.4 in.) or 0.4% of distance to target (whichever is greatest); requires external temperature compensation
- Operating Temperature Range: -45° to +50°C
- Length: 10.1 cm (4.0 in)
- Diameter: 7.5 cm (3 in)
- Weight: 1.0 kg (2.2 lb)

Power Consumption

- Active (typical): 250 mA
- Quiescent SDI-12 Mode: < 1.0 mA
- Quiescent RS-232/RS485 Modes: < 1.25 mA (≤9600 bps), < 2.0 mA (>9600 bps)

Maximum Cable Length

- SDI-12: 60 m (200 ft)
- RS-232: 60 m (200 ft); baud rates ≤9600 bps
- RS-485: 300 m (984 ft); cable lengths greater than 60 m require a heavier gage wire if the power supply drops below 11 Vdc



Above shows an SR50A attached to a crossarm via the 19484 mounting stem and a NU-RAIL fitting. A temperature probe housed in a radiation Shield is also attached to the crossarm.

This exploded view shows how the 19484 connects to the SR50A.

The 19517's bracket mounts directly to a crossarm. Two screws are used to attach the SR50A to the 19517 bracket.

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Tipping Bucket Raingauges

ARG100, SBS500/500H & 52202/52203

SBS500/SBS500H
Extremely rugged, coated aluminium construction, with optional heater

Rainfall sensors

Well proven method for automatic measurement of precipitation

Overview

Tipping bucket rain gauges provide a well proven method for the automatic measurement of precipitation. We offer five different models from two leading manufacturers including two heated variants. All models are compatible with any Campbell Scientific data logger.

ARG100 & SBS500/500H

Unlike conventionally shaped rain gauges the ARG100 and SBS500/500H are aerodynamically designed to minimise sampling errors that can occur during wind-driven rain. The deep collector body of the SBS series is also less susceptible to 'splash-out' errors. The profile of these gauges follows extensive research by the Institute of Hydrology at Wallingford in the UK, and is very similar to that derived theoretically and independently by the UK Meteorological Office as an 'ideal' shape.

Correction equations are available which extend accurate measurements in rainfall rates up to 1000 mm/hr.

The ARG100 is vacuum formed from UV-resistant plastic for a low cost yet rugged and precise instrument. The SBS500/500H collector bodies are precisely engineered from powder-coated aluminium, and the base from LM6 marine grade aluminium. They are corrosion-free, extremely rugged and provide increased rainfall catch with minimal airflow interference. The SBS500H is a heated version of the gauge.

Recommended installation is by bolting to a concrete base. However, for fast, semi-permanent installations on soft ground the optional RGB1 Levelling Baseplate is available for the ARG100. The SBS500 / SBS500H have a built-in levelling device.

RM Young 52202 & 52203

The YOUNG Tipping Bucket Rain Gauge uses a proven tipping bucket mechanism for simple and effective rainfall and snow measurement which meets the specifications of the World Meteorological Organisation (WMO).

The bucket geometry and material are specially selected for maximum water release, thereby reducing contamination and errors. A catchment area of 200 cm^2 and a measurement resolution of 0.1 mm meet the recommended specification of the WMO.

The extensive use of moulded thermoplastic components ensures maximum performance and value. Levelling screws and bullseye level are built-in for easy and precise adjustment in the field. Measured precipitation is discharged through a collection tube for verification of total rainfall. Model 52202 is heated for operation in cold temperatures whilst the unheated 52203, is available for use in moderate climates.

The 52202 heated gauge requires a reliable source of 24V A.C. power.

The 52202 includes a pole mount base (no pole is included).

Specifications

ARG100

Funnel Diameter: 254 mm

Overall Height: 340 mm

Tip Sensitivity:
Standard setting 0.20 mm of rain per tip (other setting 0.25 mm per tip; please specify with order)

Maximum rainfall rate (with software correction): 500 mm/hr

Output: Contact closure at tip

Cable: 6 m (other lengths available to order)

Weight: 1.0 kg

ARG100
A rugged, UV resistant gauge offering precision at low cost (shown with optional RGB1 Levelling Baseplate)

SBS500/SBS500H

Collector Area: 500 cm^2

Overall Height: 440 mm

Output:
Contact closure at tip (two reed switches providing two independent data channels).

Tip Sensitivity:*
Standard setting 0.20 mm of rain per tip (other setting 0.25 mm per tip; please specify with order)

Maximum rainfall rate (with software correction): 1000 mm/hr

Cable: 6 m (other lengths available to order)

Weight: 6 kg

Heaters: (SBS500H)
Thermostatically switched at approximately 1°C; current consumption 2.2A (typical) at 12V DC when operating (12mA when off)

* SBS1000 Series (available to special order) provides 0.1 mm / tip sensitivity

Internal view of the SBS500H high-quality raingauge with heater

52202/52203

Size: 18 cm dia x 30 cm high (39 cm high with mounting base)

Catchment Area: 200 cm^2

Resolution: 0.1 mm per tip

Accuracy: 2% up to 25 mm/hr
3% up to 50 mm/hr

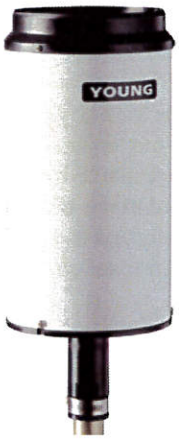
Output: Magnetic reed switch (N.O.) rating 24V A.C./D.C. 500 mA maximum

Operating Temperature: -20°C (heated)

Power: 18 Watts for heater only

Mounting: Clamp for 2.54 cm (3.4 cm dia.) iron pipe or 3 bolts on 160 mm dia. circle

Other: Levelling adjustment, thermostatic control for heater, intake screen



52202/52203
Heated/unheated rain gauges to WMO specification

Calibration (all models)

The nominal sensitivity of a raingauge is set by the manufacturer, and each gauge is subsequently calibrated to provide a calibration factor, which is given on a certificate provided with each new gauge. This factor can then be used in a datalogger program to improve the accuracy of recorded measurements.

Recalibration can be done either statically or dynamically when required (full details are provided in the raingauge manual). Campbell Scientific Ltd. offers a recalibration and maintenance service.

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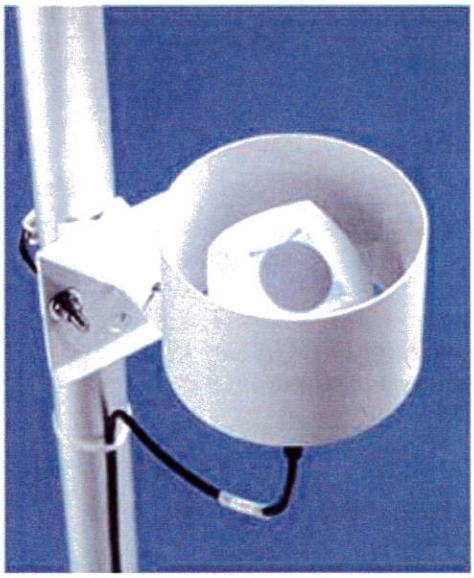
RD01 Rain Detector



Features

Can be used with all Campbell Scientific dataloggers

External windshield to protect and improve sensitivity

Integral heater keeps instrument free from frost and condensation

3 outputs

Rain/No Rain:

- open-collector

Rainfall Intensity:

- analogue voltage (0-1V)
- 1.5-6KHz frequency output

The RD01 is a rain detector based on the principle of measuring the capacitance of the material present on a sensing element. The capacitance of the sensor element, set at an angle, changes according to the accumulation of raindrops on the sensor surface.

An integral heater keeps it free of frost and condensation, and helps speed drying to detect the end of a rain event. The heater will also activate at low temperatures to detect snow fall by melting it. An external circular windshield, protects the element from damage and improves its sensitivity to light rain.

The instrument has three different outputs:

1. "Rain ON/OFF" output, which detects whether it is raining/ snowing (ON) or not (OFF), which can be used to control a relay coil or similar devices. This is an open-collector output.

2. Analogue voltage output (calibrated, 0-1V) which indicates the precipitation rate.

3. A 1,5…6KHz frequency output (not calibrated), which provide an indication of current precipitation intensity.

The ON/OFF output has a delay circuit that indicates the "end of a rain" event with a 5 minute delay, so that the "end of rain" condition is not indicated too soon in the event of light or intermittent rain.

The heater can be disabled when power consumption is critical. To do it, set the Heater OFF input on 0V. The sensor will still detect rain in this state but will not melt ice nor detect the end of a rain event so quickly.

CSL 802 October 2008

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www.campbellsci.co.uk

Specifications

Sensor

Type:	Capacitative, with integrated heater
Sensor sensing area:	6.6cm²
Angle of element:	30°
Sensitivity:	Min. wet area 0.05 cm²
ON delay/Trip delay (OFF>>ON):	<0.1 ms
OFF delay/Shut-off delay (ON>>OFF):	< 5 min
Dimensions:	Diam. x height ϕ107 x 70 mm
Weight:	450g
Cable length:	5 m
Material:	BASF LURAN S777K

Electrical Features

Supply Voltage:	12Vdc ± 10%
Current Consumption:	130mA (typical) 230mA (max) 10mA (with heater disabled)
Sensor Power Consumption:	0.1 . . . 2.3W

Outputs

Rain ON/OFF:	Open by default, closed in case of rain. Max. Voltage 15V Max. Current 50mA
Analogue Output:	0 . . .1V (0V = rain, 1V = dry sensor)
Frequency Output:	1500 . . . 6000Hz (wet . . . dry) Not calibrated

Operating Conditions

Operating Temperature -15 . . . +55°C
Storage Temperature -40 . . . +65°C