

TB4, TB4MM, CS700, CS700H



Hydrological Services Tipping Bucket Rain Gages

The TB4, TB4MM, CS700, and CS700H are tipping bucket rain gages manufactured by Hydrological Services. They funnel precipitation into a mechanism that tips when filled to the calibrated level. The TB4, CS700, and CS700H measure in 0.01-in. increments; the TB4MM measures in 0.2-mm increments.

Each of the rain gage's tips is marked by a dual reed switch closure that is recorded by a Campbell Scientific datalogger. After measurement, the water drains through two orifices (accepts 12 mm tubing) in the base, allowing the measured water to be collected in a separate container.

The TB4, TB4MM, CS700, and CS700H are ideal for locations where intense rainfall events may occur. They include a siphoning mechanism that allows the rain to flow at a steady rate regardless of rainfall intensity. The siphon reduces typical rain bucket errors and produces accurate measurements over a range of 0 to 19.69-in. per hour (50 cm per hour).

Heated Rain Gage

The CS700H is a heated rain gage for measuring the water content of snow. It includes an internal snow sensor that is activated when the air temperature drops below 4°C. If the snow sensor detects snow in the catch area (funnel), the heating elements automatically turn on and keep the funnel temperature at +10°C. The heater goes into a wait mode when snow has not been detected for 18 minutes. The heating element is also automatically deactivated when the air temperature drops below -20°C.

Mounting

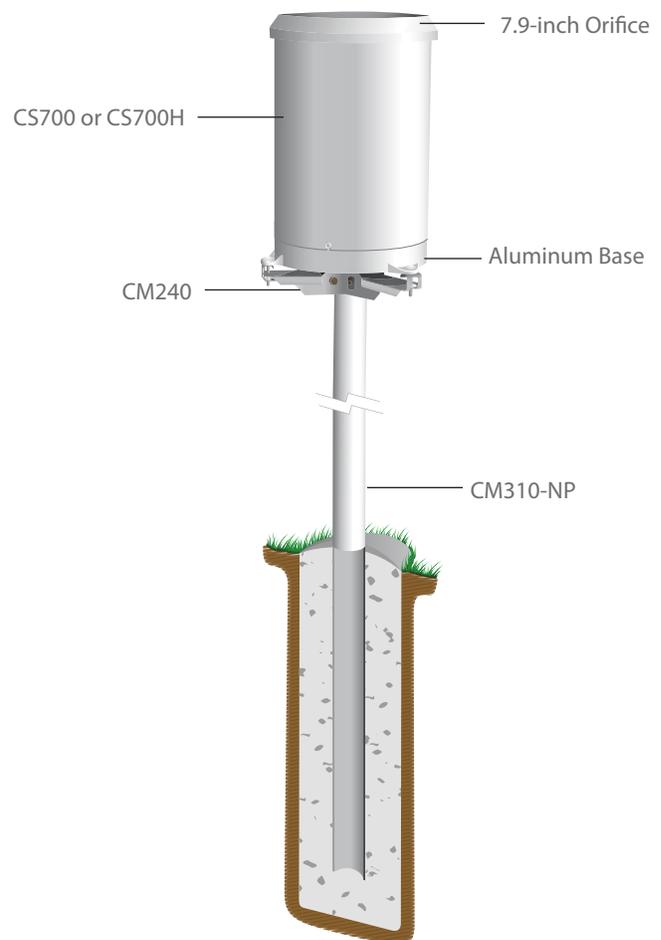
The base of the tipping bucket rain gage is supported by three legs. A CM240 Leveling Base and Mount or a user-supplied base plate with leveling capability is required. The CM240 may be attached to a CM300-series mounting pole, or to a user-supplied, 1.5-in. IPS (1.9-in. outer diameter), unthreaded pipe. A concrete pad is recommended.

Wind Screen

Campbell Scientific offers the 260-953 Wind Screen to help minimize the affect of wind on the rain measurements. This wind screen consists of 32 leaves that hang freely and swing as wind moves past them.



Both the TB4 and TB4MM have a UV-stabilized plastic base.



The CS700 and CS700H have a powder-coated aluminum base. The above rain gage is mounted onto a CM310 pole via the CM240 mount. The CM310 pole is embedded directly in a concrete pad (-NP no pedestal base option).

Ordering Information

Tipping Bucket Raingages

Recommended cable length is 25 ft, but many customers will order a 50-ft cable to place the gage away from the tower or tripod.

TB4-L	Tipping bucket with thermoplastic base and 0.01-in. tips. Enter cable length (in feet) after the -L. Must choose a cable termination option (see below).
TB4MM-L	Tipping bucket with thermoplastic base and 0.2-mm tips. Enter cable length (in feet) after the -L. Must choose a cable termination option (see below).
CS700-L	Tipping bucket with aluminum base and 0.01-in. tips. Enter cable length (in feet) after the -L. Must choose a cable termination option (see below).
CS700H-L-LP	Heated tipping bucket with aluminum base and 0.01-in. tips. Enter signal cable length (in feet) after the -L and enter the power-cable length after the -LP. Must choose a power supply option (see below).

Cable Termination Options for non-heated raingages (choose one)

-PT	Cable terminates in stripped and tinned leads for direct connection to a datalogger's terminals.
-PW	Cable terminates in a connector for attachment to a prewired enclosure.
-CWS	TB4/TB4MM cable terminates in a connector for attachment to a CWS900 interface. Connection to a CWS900 interface allows the TB4 or TB4MM to be used in a wireless sensor network. This option is only for the TB4 and TB4MM.

Power Supply Options for CS700H (choose one)

-AC	AC used to power the CS700H's heater. Includes a Phoenix Contact power supply that provides dependable power to the CS700H and other Campbell Scientific components in cold climates.
-DC	User-supplied batteries power the heater. This option is for remote areas using wind or solar power to recharge the batteries. Required battery capacity varies according to site location and application.

Mounting Poles

CM300	23-in. Mounting Pole with Cap
CM305	47-in. Mounting Pole with Cap
CM310	56-in. Mounting Pole with Cap

Pedestal Options for Mounting Poles (choose one)

-NP	No Pedestal Base
-PJ	CM340 Pedestal J-Bolt Kit
-PS	CM350 Pedestal Short Legs (23-in. legs)
-PL	CM355 Pedestal Long Legs (39-in. legs)

Common Accessories

CM240	Leveling Base and Mount for TB4, TB4MM, CS700, or CS700H.
260-953	Novalynx Alter-type Rain Gage Wind Screen

Specifications

Sensor Type:	Tipping bucket with siphon
Accuracy:	better than $\pm 2\%$ @ 19.7-in. hr ⁻¹ (500 mm hr ⁻¹)

Resolution	
TB4/CS700/CS700H:	0.01 in. (0.254 mm)
TB4MM:	0.008 in. (0.2 mm)

Measurement Range	
TB4/TB4MM:	0 to 19.7 in. hr ⁻¹ (0 to 500 mm hr ⁻¹)
CS700/CS700H:	0 to 27.6 in. hr ⁻¹ (0 to 700 mm hr ⁻¹)

Temperature Range	
TB4/TB4MM/CS700:	0° to 70°C
CS700H:	-40° to +70°C

Humidity Range:	0 to 100%
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Orifice Diameter:	7.9 in. (20 cm)
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Drain Tube Size:	Both filters accept 12 mm inner diameter tubing
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Weight with 25-ft signal cable (two-conductor shielded)

TB4/TB4MM:	4.4 lb. (2 kg)
CS700/CS700H:	7.4 lb. (3.3 kg)

Height

TB4/TB4MM:	13 in. (33 cm)
CS700/CS700H:	13.5 in. (34.2 cm)

Heated Rain Gage

Snow Sensor and Heater

Operating Parameters:	-20° to +5°C
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Average Power Generated:	35 W (150 W during initial minute warm up)
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Voltage Requirements

Main Power:	10 Vdc to 30 Vdc or 12 Vac to 28 Vac
SDI-12 Power:	9.6 Vdc to 16 Vdc (SDI-12 standard)

SDI-12 Interface:	optically isolated, 1200 baud, 7 bits, even parity
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Power Generated and Current Requirements*

Voltage:	12 Vdc
Average Wattage:	45 W; 70 W when heater is on
Average Ampere:	3.7 A (~65% duty cycle); 5.8 A when the heater is on

Phoenix Contact Power Supply (CS700H-AC only)**

Model Name:	Quint-PS/1AC/24DC/10
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AC Input Voltage Range:	85 Vac to 264 Vac
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Power Consumption

120 Vac:	~2.77 A
230 Vac:	~1.24 A

Protective Circuitry:	Transient Surge Protection Varistor
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Integrated Input Fuse:	6.3 A (slow blow, internal)
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Normal Output Voltage:	24 Vdc $\pm 1\%$
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*If you assume four 10-hr snow storms in a week, then the average weekly energy consumption is $4 \times 10 \times 45 \text{ W} = 1800 \text{ Whr/week}$; the average amp hours over one week are $4 \times 10 \times 3.7 \text{ A} = 150 \text{ Ahrs}$; and the amps averaged over a week are $150 \text{ Ahrs} / (24 \times 7) = 0.9 \text{ A}$.

**Additional specifications are provided in Phoenix Contact's manual for the Quint-PS/1AC/24DC/10.

