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WHEN MEASUREMENTS MATTER

CSAT3A
3-D Sonic Anemometer, Head Only

Precision Measurements

Best instrument for flux and other high-level turbulence research projects

Overview

The CSAT3A 3-D Sonic Anemometer is the 3-D sonic anemometer of choice for eddy-covariance measurements. It has an aerodynamic design, a 10 cm vertical measurement path, operates in a pulsed acoustic mode, and withstands exposure to harsh weather conditions. Three orthogonal wind components (u_x, u_y, u_z) and the speed of sound (c) are measured and output at a maximum rate of 50 Hz. The CSAT3A head is operated by the EC100 electronics, which also control either an EC150 or EC155 gas analyzer.

Measurements can be triggered from two sources:

❯ Datalogger's SDM command

❯ EC100's internal clock

The SDM protocol supports a group trigger for synchronizing multiple CSAT3As.

Benefits and Features

❯ Innovative design provides precision turbulence measurements with minimal flow distortion

❯ Usually combined with EC150 or EC155 gas analyzers giving near complete colocation for eddy-covariance measurements

❯ Compatible with most Campbell Scientific dataloggers

❯ Measurements can be used to calculate momentum flux and friction velocity

❯ Campbell Scientific's fine wire thermocouples are an option for fast-response temperature measurements

❯ Field rugged

❯ Innovative signal processing and transducer wicks considerably improve performance of the anemometer during rain events

❯ Sealed sonic transducers and electronics

Detailed Description

The CSAT3A is an optional component of an EC150 open-path or EC155 closed-path CO_2/H_2O gas analyzer. It attaches to a common mounting bracket and connects to the gas analyzer's EC100 electronics module.

For comprehensive details, visit: **www.campbellsci.com.au/csat3a**

Specifications

Measurement Path Length	❯ 10.0 cm (3.94 in.) vertical ❯ 5.8 cm (2.3 in.) horizontal	
Path Angle from Horizontal	60°	
Construction	Sealed sonic transducers and electronics	
Anemometer Head Materials	Stainless-steel tubing	
Electronics Box Materials	Welded aluminum	
Operating Temperature Range	-30° to +50°C	
Voltage Supply	10 to 16 Vdc	
Current	❯ 200 mA (60 Hz measurement rate) ❯ 100 mA (20 Hz measurement rate)	
Digital SDM Output Signal	CSI 33.3 k baud serial interface for datalogger/sensor communication. (Data type is 2-byte integer per output plus 2-byte diagnostic.)	
Support Arm Diameter	1.59 cm (0.63 in.)	
Transducer Diameter	0.64 cm (0.25 in.)	
Transducer Mounting Arm Diameter	0.84 cm (0.33 in.)	
Anemometer Head Dimensions	47.3 x 42.4 cm (18.6 x 16.7 in.)	
Anemometer Head Weight	1.7 kg (3.7 lb)	

Measurements

Outputs	u_x, u_y, u_z, c (u_x, u_y, u_z are wind components referenced to the anemometer axes; c is speed of sound.)
Speed of Sound	Determined from three acoustic paths; corrected for crosswind effects.
Measurement Rate	Programmable from 1 to 60 Hz, instantaneous measurements. Two over-sampled modes are block averaged to either 20 Hz or 10 Hz.

Output Bandwidths	5, 10, 12.5, or 20 Hz
Output Rate	10, 20, 25, or 50 Hz
Measurement Resolution	❯ Resolution values are for instantaneous measurements made on a constant signal; noise is not affected by sample rate. ❯ 1 mm/s rms (u_x, u_y) ❯ 0.5 mm/s rms (u_z) ❯ 15 mm/s (0.025°C) rms (c)
Offset Error	❯ Offset error and gain error values assume the -30° to +50°C range, wind speeds of < 30 m/s, and wind angles between ±170°. ❯ < ±8.0 cm/s (u_x, u_y) ❯ < ±4.0 cm/s (u_z)
Gain Error	❯ Offset error and gain error values assume the -30° to +50°C range, wind speeds of < 30 m/s, and wind angles between ±170°. ❯ < ±2% of reading (wind vector within ±5° of horizontal) ❯ < ±3% of reading (wind vector within ±10° of horizontal) ❯ < ±6% of reading (wind vector within ±20° of horizontal)
Rain	Innovative ultrasonic signal processing and user-installable wicks considerably improve the performance of the anemometer under all rain events.

Digital USB and RS-485 Output Signal

Baud Rate	230400 bps (maximum)
Data Type	Comma-delimited ASCII

SDM, USB, & RS-485 Digital Outputs Reporting Range

Full-Scale Wind	±65.535 m/s autoranging between four ranges (Least significant bit is 0.25 to 2 mm/s.)
Speed of Sound	300 to 366 m/s (-50° to +60°C) Least significant bit is 1 mm/s (0.002°C).

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