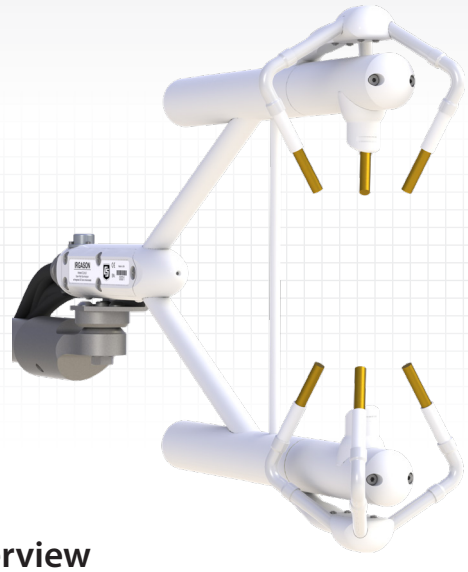
CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

IRGASON

Integrated Open-Path CO_2/H_2O Gas Analyzer and 3D Sonic Anemometer



Patented Design[a]

Gas analyzer and sonic anemometer in one sensor

Overview

Campbell Scientific's IRGASON fully integrates the open-path analyzer and sonic anemometer. Designed specifically for eddy-covariance flux measurements, the patented design is easier to install and use than separate sensors and provides increased measurement accuracy.

The IRGASON simultaneously measures absolute carbon dioxide and water vapor, air temperature, barometric pressure, and three-dimensional wind speed and sonic air temperature.

Benefits and Features

- Combined support structure causes less flow distortion than two separate sensors
- Truly colocated gas analyzer and sonic anemometer avoids flux loss due to sensor separation
- Synchronized gas analyzer and sonic anemometer measurements avoid the need to correct for time lag
- Low power consumption; suitable for solar power applications
- Measurements are temperature compensated without active heat control
- Low noise
- Maximum output rate of 60 Hz with 20 Hz bandwidth
- Angled windows to shed water and are tolerant to window contamination
- Field rugged
- Field serviceable
- Factory calibrated over wide range of CO_2, H_2O, pressure, and temperature in all combinations encountered in practice
- Extensive set of diagnostic parameters
- Fully compatible with Campbell Scientific dataloggers; field set-up, configuration, and field zero and span can be accomplished directly from the datalogger
- Sonic Temperature: Determined from three acoustic paths; corrected for crosswind effects
- Rain: Innovative signal processing and transducer wicks considerably improve performance of the anemometer during precipitation events

IRGASON Outputs

- U_x (m/s)
- U_y (m/s)
- U_z (m/s)
- Sonic Temperature (°C)
- Sonic Diagnostic
- CO_2 Density (mg/m^3)
- H_2O Density (g/m^3)
- Gas Analyzer Diagnostic
- Ambient Temperature (°C)
- Atmospheric Pressure (kPa)
- CO_2 Signal Strength
- H_2O Signal Strength
- Source Temperature (°C)

[a]*U.S. Patent No. D680455*

General Specifications[b]

- Operating Temperature Range: -30° to +50°C
- Calibrated Pressure Range: 70 to 106 kPa
- Input Voltage Range: 10 to 16 Vdc
- Power @ 25°C: 5 W (steady state and power up)
- Measurement Rate: 60 Hz
- Output Bandwidth: 5, 10, 12.5, or 20 Hz; user programmable
- Output Options: SDM, RS-485, USB, analog (CO_2 and H_2O only)
- Auxiliary Inputs: air temperature and pressure
- IRGASON Head and Cables Weight: 2.8 kg (6.1 lb)
- EC100 Electronics Weight: 3.2 kg (7.1 lb)
- Cable Length: 3.0 m (10.0 ft) from IRGASON to EC100
- Warranty: 3 years or 17,500 hours of operation, whichever comes first

Gas Analyzer Specifications[b,c]

- Path Length: 15.37 cm (6.05 in)

Performance

	CO_2	H_2O
Accuracy[d]	1%[e]	2%[e]
Precision RMS (maximum)[f]	0.2 mg/m³ (0.15 µmol/mol)	0.004 g/m³ (0.006 mmol/mol)
Calibrated Range	0 to 1,000 µmol/mol [g]	0 to 72 mmol/mol (38°C dewpoint)
Zero Drift with Temperature (maximum)	±0.55 mg/m³/°C (±0.3 µmol/mol/°C)	±0.037 g/m³/°C (±0.05 mmol/mol/°C)
Gain Drift with Temperature (maximum)	±0.1% of reading/°C	±0.3% of reading/°C
Cross Sensitivity (maximum)	±1.1 x 10^{-4} mol CO_2 /mol H_2O	±0.1 mol H_2O/mol CO_2

Sonic Anemometer Specifications[b]

Measurement Path

- Vertical: 10.0 cm (3.9 in)
- Horizontal: 5.8 cm (2.3 in)

Transducer Diameter

- 0.64 cm (0.25 in)

Range

- u_x: ±30 m s^{-1}
- u_y: ±60 m s^{-1}
- u_z: ±8 m s^{-1}
- T_s: -50° to +60°C
- Wind Direction: ±170°

Accuracy[h]

- Offset Error
  u_x, u_y: <±8.0 cm s^{-1}
  u_z: <±4.0 cm s^{-1}
  Wind Direction: ±0.7° while horizontal wind at 1 m s^{-1}
- Gain Error
  Wind Vector within ±5° of horizontal: <±2% of reading
  Wind Vector within ±10° of horizontal: <±3% of reading
  Wind Vector within ±20° of horizontal: <±6% of reading
- Measurement Precision RMS
  u_x, u_y: 1 mm s^{-1}
  u_z: 0.5 mm s^{-1}
  Sonic Temperature: 0.025°C
  Wind Direction: 0.6°

Barometer Specifications[b]

	-BB Basic Barometer	-EB Enhanced Barometer (Vaisala PTB110)
Total Accuracy	±3.7 kPa at -30°C, falling linearly to ±1.5 kPa at 0°C (-30° to 0°C), ±1.5 kPa (0° to 50°C)	±0.15 kPa (-30° to +50°C)
Measurement Rate	10 Hz	1 Hz

Ambient Temperature Specifications[b]

- Manufacturer: BetaTherm 100K6A1IA
- Total Accuracy: ±0.15°C (-30° to +50°C)

[b] Subject to change without notice.

[c] A temperature of 20°C and pressure of 101.325 kPa was used to convert mass density to concentration.

[d] Assumes the gas analyzer was properly zero and spanned using the appropriate standards; CO_2 span concentration was 400 ppm; H_2O span dewpoint was at 12°C (16.7 ppt); zero/span temperature was 25°C; zero/span pressure was 84 kPa; subsequent measurements made at or near the span concentration; temperature is not more than ±6°C from the zero/span temperature; and ambient temperature is within the gas analyzer operating temperature range.

[e] Standard deviation of calibration residuals.

[f] Nominal conditions for precision verification test: 25°C, 86 kPa, 400 µmol/mol CO_2, 12°C dewpoint, and 20 Hz bandwidth.

[g] 0 to 3,000 µmol/mol available upon request.

[h] The accuracy specification for the sonic anemometer is for wind speeds <30 m s^{-1} and wind angles between ±170°.