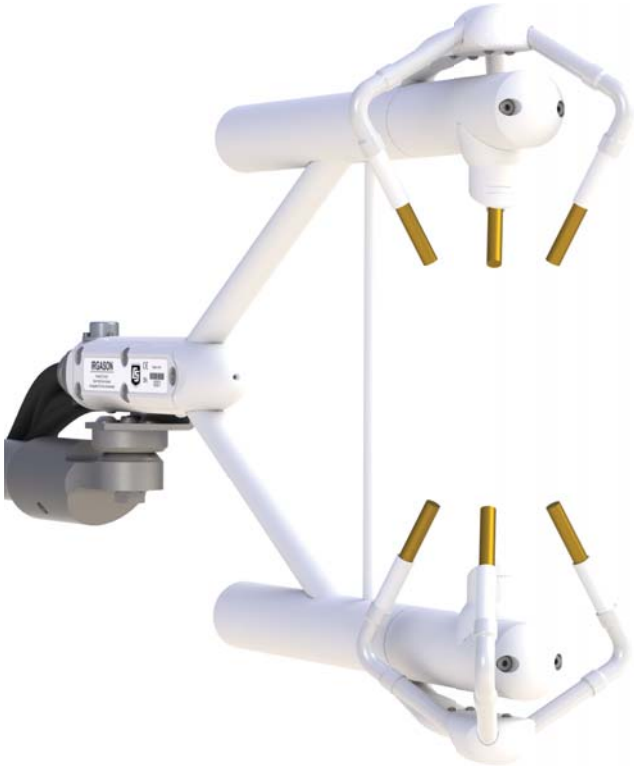
# IRGASON

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

Campbell Scientific's IRGASON is an integrated open-path analyzer and sonic anemometer specifically designed for eddy-covariance flux measurements. It simultaneously measures absolute carbon dioxide and water vapor densities, air temperature, barometric pressure, and three dimensional wind speed and sonic air temperature.



IRGASON gas analyzer and 3D sonic anemometer.

## Features/Benefits

- Unique optical layout allows for a slim aero-dynamic shape with minimal wind distortion and body heating
- Measurements are temperature compensated without active heat control
- Co-located analyzer and sonic anemometer measurement volumes
- Analyzer and sonic anemometer measurements are temporally synchronized by a common set of electronics
- Low power consumption; suitable for solar power applications
- Low noise
- Maximum output rate of 50 Hz with 25 Hz bandwidth
- Tolerant to window contamination
- Angled windows to shed water
- Field rugged
- Field serviceable (easy access to chemical bottles)
- Factory calibrated over wide range of $CO_2$, $H_2O$, pressure and temperature in all combinations encountered in practice
- Extensive set of diagnostic parameters to warn of questionable data
- Fully compatible with Campbell Scientific dataloggers; field setup, configuration, and field zero and span can be accomplished directly from the datalogger

## 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

[a] *Subject to change without notice.*

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

[c] *The noise RMS specifications assume 25°C, 597 mg/m$^3$ $CO_2$ density, 85 kPa, 14 g/m$^3$ water density, and 25 Hz bandwidth.*

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

[e] *The measurement resolution values for the sonic anemometer are for instantaneous measurements made on a constant signal.*

## General Specifications[a]

**Operating Temperature:** -30° to +50°C

**Operating Pressure:** 70 to 106 kPa

**Power:** 5 W (steady state and power up) at 10 to 16 Vdc

**Fundamental Measurement Rate:** 100 Hz

**Output Signal:** SDM, RS-485, USB

**Output Rate:** 5 to 50 Hz; user programmable

**Output Bandwidth:** 5, 10, 12.5, 20, or 25 Hz; user programmable

**Auxiliary Inputs:** air temperature and pressure

**Weight**
- **IRGASON Head & Cables:** 2.8 kg (6.1 lb)
- **EC100 Electronics:** 3.2 kg (7 lb)

**Umbilical Cable Length:** 3 m (9.8 ft) from IRGASON head to electronics

## Gas Analyzer Specifications[a, b]

**Factory Calibrated Range**
- **$CO_2$:** 0 to 1830 mg/m$^3$ (0 to 1000 ppm)
- **$H_2O$:** 0 to 42 g/m$^3$ (-60° to +37°C dew point)

**Path Length:** 15.37 cm (6.05 in)

### *$CO_2$ Performance*

**Zero Drift with Temperature (maximum):** ±0.55 mg/m$^3$/°C (±0.3 µmol/mol/°C)

**Gain Drift with Temperature (maximum):** ±0.1% of reading/°C

**Noise RMS (maximum)[c]** 0.2 mg/m$^3$ (0.15 µmol/mol)

**Sensitivity to $H_2O$ (maximum):** ±1.1 x 10$^{-4}$ mol$CO_2$/mol$H_2O$

### *$H_2O$ Performance*

**Zero Drift with Temperature (maximum):** ±0.037 g/m$^3$/°C (±0.05 mmol/mol/°C)

**Gain Drift with Temperature (maximum):** ±0.3% of reading/°C

**Noise RMS (maximum)[c]** 0.004 g/m$^3$ (0.006 mmol/mol)

**Sensitivity to $CO_2$ (maximum):** ±0.1 mol$H_2O$/mol$CO_2$

## Sonic Anemometer Specifications[a]

### *Accuracy[d]*

**Offset Error**
- **$u_x$, $u_y$:** <±8.0 cm s$^{-1}$
- **$u_z$:** <±4.0 cm 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 Resolution[e]**
- **$u_x$, $u_y$:** 1 mm s$^{-1}$ rms
- **$u_z$:** 0.5 mm s$^{-1}$ rms
- **c:** 15 mm s$^{-1}$ (0.025°C)

**Speed of Sound:** Determined from 3 acoustic paths; corrected for crosswind effects

**Rain:** Innovative ultrasonic signal processing and user installable wicks considerably improve the performance of the anemometer under all rain events

## Barometer Specifications[a]

### *-BB Basic Barometer*

**Manufacturer:** Freescale MPXAZ6115A

**Total Accuracy:** ±2.2 kPa (0° to +85°C); rises linearly from 2.2 kPa at 0°C to 5.5 kPa at -30°C

### *-EB Enhanced Barometer*

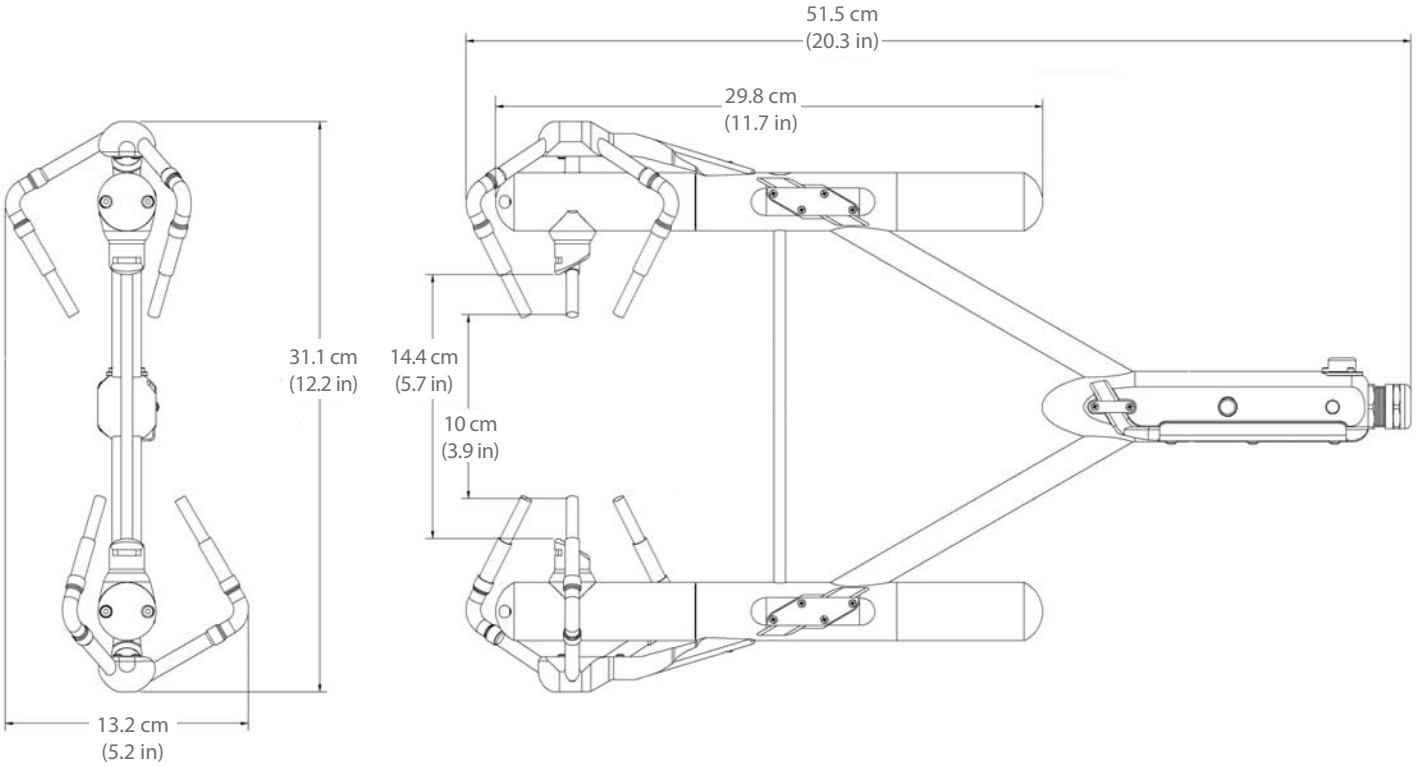
**Manufacturer:** Vaisala PTB110

**Total Accuracy:** ±0.85 kPa (0° to +60°C); rises linearly from 0.85 kPa at 0°C to 1.90 kPa at -30°C

## Ambient Temperature Specifications[a]

**Manufacturer:** BetaTherm 100K6A1IA

**Total Accuracy:** ±0.15°C (-30° to +50°C)




## Ordering Information

### Flux Sensor

**IRGASON** Integrated $CO_2$ and $H_2O$ Open-Path Gas Analyzer

#### Pressure Sensor Options

**-BB** Basic Barometer

**-EB** Enhanced Barometer

#### IRGASON Carrying Case Options

**-NC** No IRGASON Case

**-IC** IRGASON Carrying Case

### Zero and Span Accessories

**26390** IRGASON & EC150 Zero & Span Shroud Kit

**27278** IRGASON & EC150 Lab Stand Kit

### Cables

*For the following cables, enter the length, in feet after the -L, and choose –PT for the cable termination option.*

**CABLEPCBL-L** Two-conductor, 16-AWG cable with a Santoprene® jacket is used to power the EC100 electronics box.

**CABLE4CBL-L** Four-conductor, 22-AWG cable with drain wire and Santoprene jacket is used to attach the SDM connector on the EC100 electronics box.

**CABLE3TP-L** Three-twisted pair, 24-AWG cable with drain wire and Santoprene jacket is recommended for use with the RS-485 output (<500 ft length).



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