

## State of the Art

### System ideal for top-level research

#### Overview

The CPEC200 is a turn-key, closed-path eddy-covariance (EC) flux system for long-term monitoring of atmosphere-biosphere exchanges of carbon dioxide, water vapor, heat, and momentum. A complete system consists of a closed-path gas analyzer (EC155), sonic anemometer (CSAT3A), datalogger (CR3000), and sample pump. A valve module is also available for automated zero and span.

The gas analyzer's intake design and small sample cell volume (5.9 ml) provide excellent frequency response (4.3 Hz cutoff frequency) with low total system power (12 W). Additionally, the now-available vortex intake greatly reduces maintenance and maintains frequency response compared to traditional inline filters.

#### Benefits and Features

- › Standard system consists of:
  - Sonic anemometer (CSAT3A)
  - Closed-path gas analyzer (EC155)
  - Datalogger (CR3000)
  - Enclosure with control electronics (CPEC200 enclosure)
  - Pump module
  - Mounting hardware, tubing, cables
- › Other available options:
  - Valve Module provides automatic field zero and span, and the CPEC200 Scrub Module provides a convenient source of zero gas
  - Onboard data storage using CompactFlash cards; maximum 16 GB or 16 months at 10 Hz measurement frequency
  - Remote data collection, including direct (Ethernet, RS-232, short haul modem, landline<sup>a</sup>) and wireless (RF, cellular<sup>a</sup>, satellite<sup>b</sup>)
- › Excellent system frequency response (see graph on next page)

- › Low power
- › Ease of use
  - Vortex intake greatly reduces maintenance compared to inline filters
  - Datalogger program requires minimal input from station operator
  - Active system flow control; EC and zero/span flows set by datalogger program variables
  - System operates continuously during inclement weather
  - Heated sample intake prevents condensation
  - Installation requires minimal tools

<sup>a</sup> Collecting high frequency time series is possible, but may be cost prohibitive.

<sup>b</sup> Only online statistics can be collected using satellite.



## Science Measurements

CO<sub>2</sub> and H<sub>2</sub>O are measured with an EC155 Closed-Path Gas Analyzer. Three-dimensional wind speed and sonic air temperature are measured with a CSAT3A sonic anemometer head.

## CPEC200 System Enclosure

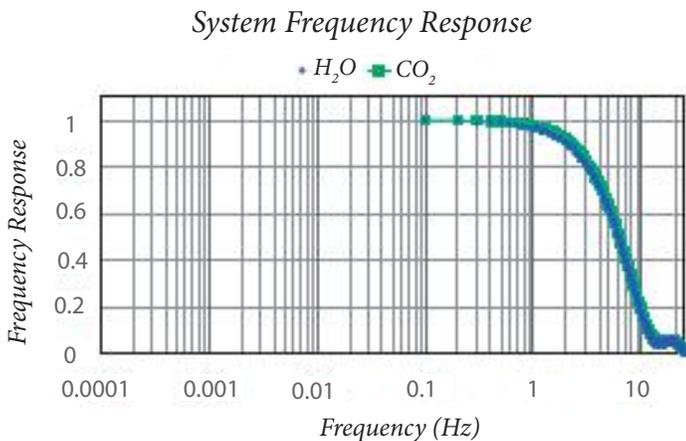
A fiberglass enclosure houses the datalogger, optional data storage peripheral, optional valve module, and the electronics that interface with the CPEC200 pump module. The CPEC200 system enclosure can be mounted to a tripod mast, CM106B tripod leg base, tower legs, or a large diameter pole.

## CPEC200 Pump Module

The pump module, a standard component of the CPEC200 system, consists of a small dual-head diaphragm pump with a brushless DC motor mounted inside a fiberglass enclosure. An integral cable connects the pump module to the CPEC200 system enclosure, which provides power, temperature measurement and control, pressure measurement, and pumping speed measurement and control.

## Valve Module (Optional)

Campbell Scientific offers two valve module versions, for the CPEC200. The basic three-valve module enables the CPEC200 system to automatically perform zero, CO<sub>2</sub> span, and H<sub>2</sub>O span measurements. The six-valve module includes three additional valves to allow more CO<sub>2</sub> span tanks to be measured. The valve module is housed inside the CPEC200 system enclosure. The outlet of the manifold has a proportional valve to automatically control the flow of zero/span gas. The CPEC200 Scrub Module may be ordered to provide a convenient source of zero gas.



CPEC200 frequency response.



EC155 gas analyzer with CSAT3A sonic anemometer.

## Specifications<sup>c</sup>

- View EU Declaration of Conformity documentation at: [www.campbellsci.com/cpec200](http://www.campbellsci.com/cpec200)
- Operating Temperature: -30° to +50°C
- Input Voltage: 10.5 to 16.0 Vdc
- Power
  - Typical: 12 W
  - Maximum (at cold startup): 35 W

## System Enclosure

- Dimensions: 52.1 x 44.5 x 29.7 cm (20.5 x 17.5 x 11.7 in)
- Weight
  - Basic System: 11.6 kg (25.5 lb)
  - CR3000: 1.6 kg (3.7 lb)
  - CFM100/NL116: 154 g (5.4 oz)

## Pump Module

- Cable Length: 3.0 m (10 ft)
- Inlet Connection: 3/8 inch Swagelok®
- Pressure Sensor Range: 15 to 115 kPa
- Pumping Speed: 3 to 9 LPM (automatically controlled at the set-point, typically 7 LPM)
- Dimensions: 35.6 x 29.2 x 13.5 cm (14.0 x 11.5 x 5.3 in)
- Weight without mounting bracket: 5.4 kg (11.8 lb)

## Valve Module

- Inlets
  - Three-Valve Module: Zero, CO<sub>2</sub> span, and H<sub>2</sub>O span
  - Six-Valve Module: Zero, CO<sub>2</sub> span 1 to CO<sub>2</sub> span 4, and H<sub>2</sub>O span)
- Outlets: Analyzer and H<sub>2</sub>O bypass
- Connections: 1/4 inch Swagelok®
- Flow Rate: 0.5 to 5 LPM (automatically controlled at user-entered set point)
- Dimensions: 14.0 x 12.7 x 14.0 cm (5.5 x 5.0 x 5.5 in)
- Weight
  - Three-Valve Module: 1.5 kg (3.3 lb)
  - Six-Valve Module: 1.9 kg (4.2 lb)

<sup>c</sup>Refer to the EC155 and CSAT3A product brochures for closed-path gas analyzer and sonic anemometer specifications.

