AERODYNE RESEARCH, Inc.

Aerodyne Dual-TILDAS $O_2/CO_2/H_2O$ Monitor

Oxygen measurements at unprecedented speed and precision, with water and carbon dioxide corrections

Features:

- < 10 ppm precision for O_2 in 1 second
- < 3 ppm long term O_2 precision
- Fast time response (10 Hz) of eddy covariance applications
- Simultaneous measurements of H_2O for dilution correction
- Precise detection of CO_2 for O_2/CO_2 exchange studies

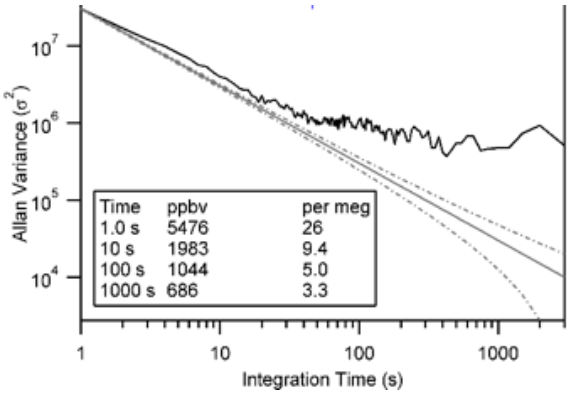
Rugged, field-ready instruments

Direct absorption spectroscopy allows for highly specific and accurate gas detection

Near-IR detection for maximum specificity

TILDAS Technology

Aerodyne instruments use tunable infrared laser direct absorption spectroscopy (TILDAS) at mid- and near-IR wavelengths to probe molecules at their strongest "finger-print" transition frequencies. We further enhance sensitivity by employing a patented multi-pass broad-band absorption cell that provides optical path lengths up to 76 m. Direct absorption spectroscopy allows for fast (<1 sec) absolute trace gas concentrations without need for elaborate calibration procedures. Moreover, TILDAS instruments are free of measurement interference from other molecular species, enabling extremely specific detection.



Applications

- Determination of atmospheric sources, sinks, and transport of CO_2 through O_2/CO_2 ratio.
- Biosphere exchange.
- Eddy flux emission/consumption measurements.
- Mobile measurements aboard aircraft, marine, and ground-based platforms.
- Carbon capture and sequestration monitoring.
- Breath analysis.

Aerodyne $O_2/CO_2/H_2O$ Advantages

- Measurement precision comparable or better than other approaches.
- Time response up to 10 Hz enables eddy covariance studies.
- Powerful TDLWintel software provides flexible instrument control, and real-time data analysis.
- Valve control capable of complex scheduling and automatic background and calibrations.
- Simultaneous measurements of CO_2 and H_2O for dilution correction and O_2:CO_2 exchange all in one instrument

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Performance Specifications:

Species precision (1σ at ambient conditions*)

	1 sec	100 sec
O_2	10 ppm	3 ppm
CO_2	<0.1 ppm	<0.03 ppm
H_2O	<3 ppm	<1 ppm

*1 slpm flow rate and 90 torr sample pressure

Dynamic Range (air)

	min	max
O_2	0 ppm	100%
CO_2	0 ppm	3000 ppm
H_2O	0 % RH	100% RH

Enhanced Measurement Options

16 channel valve control for complex sampling

Low volume multi-pass cell for limited sample size

Fast time response for eddy covariance measurements

Time Response

1-10 Hz data rate
0.05 s minimum Rise/Fall time (1/e)
(depends on vacuum pump)

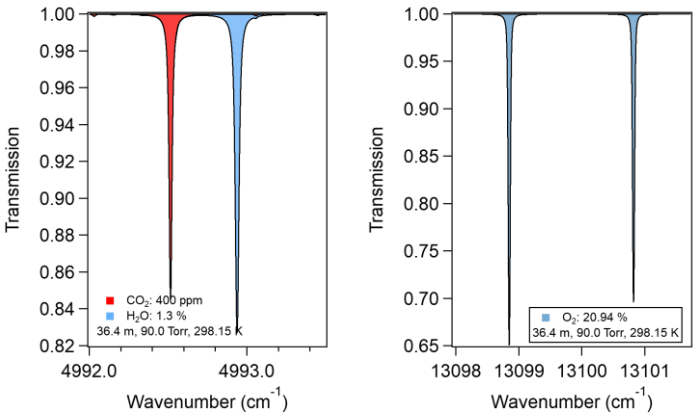
Operating Range

Sample temperature: -20 to 50 °C
Sample pressure: 30 to 100 Torr
Sample flow rate: 0 to 10 slpm

Related Instrumentation

Instrument is also available in a single-laser compact TILDAS configuration, with O_2 detection only

Near-IR spectrum for O_2, CO_2, H_2O



Installation

Benchtop system

Instrument Components

Core instrument
Thermoelectric chiller
Keyboard, mouse, and monitor
Vacuum pump (customer specified)
Inlet sampling system (customizable)

Data Outputs

RS-232, USB, ethernet

Size, Weight, Power

Dimensions:430mm x 660mm x 270mm
Weight: 35 kg (core instrument) + 15 kg (chiller) + pump weight
Max power: 125 W, 120/240 V, 50/60 Hz (core instrument)
+ 300 W (chiller) + pump power

Aerodyne specializes in collaboration and custom design. Please contact us if you would like to discuss additional measurement options and applications.

REFERENCES:

McManus, J.B. et al., *"Dual quantum cascade laser trace gas instrument with astigmatic Herriott cell at high pass number"* Applied Optics, **50**, A74 (2011)

McManus, J.B. et al., "*Design and performance of a dual-laser instrument for multiple isotopologues of carbon dioxide and water"* Applied Physics B, **23**, 6569 (2015)

Keeling, R.F., S. Piper, and M. Heimann, *"Global and hemispheric CO_2 sinks deduced from changes in atmospheric O_2 concentration"* Nature, **381**, 218 (1996).