



Aerodyne Dual-TILDAS O₂/CO₂/H₂O Monitor

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

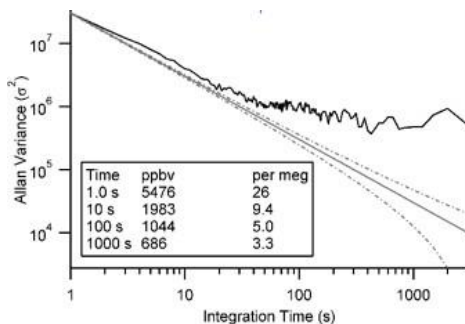


Features:

- < 10 ppm precision for O₂ in 1 second.
- < 3 ppm long term O₂ precision.
- Fast time response (10 Hz) of eddy covariance applications.
- Simultaneous measurements of H₂O for dilution correction.
- Precise detection of CO₂ for O₂/CO₂ exchange studies.

TILDAS TECHNOLOGY

Aerodyne instruments use tunable infrared laser direct absorption spectroscopy (TILDAS) at mid- and near-IR wavelengths to probe molecules at their strongest “fingerprint” 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 relatively free of measurement interference from other molecular species, enabling extremely specific detection.



Rugged, field-ready instruments

Direct absorption spectroscopy allows for highly specific and accurate gas detection

Near-IR detection for maximum specificity

APPLICATIONS

- Determination of atmospheric sources, sinks, and transport of CO₂ through O₂/CO₂ 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 O₂/CO₂/H₂O 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 CO₂ and H₂O for dilution correction and O₂:CO₂ exchange all in one instrument.

Dual-TILDAS O₂/CO₂/H₂O Monitor

SPECIFICATIONS

Species precision (1 σ at ambient conditions*)

	1 sec	100 sec
O ₂	10 ppm	3 ppm
CO ₂	<0.1 ppm	<0.03 ppm
H ₂ O	<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 ₂ O	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

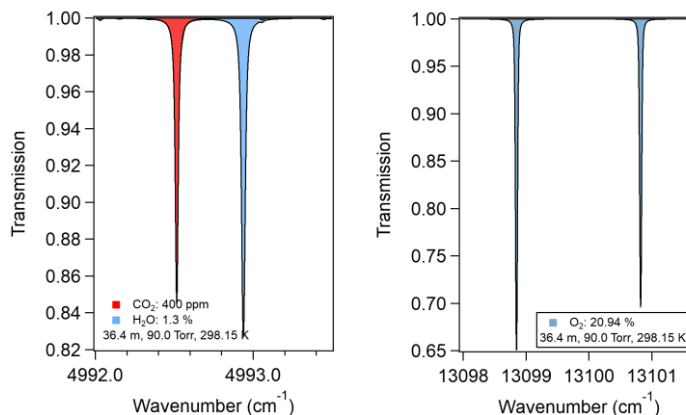
Sample pressure: 30 to 100 Torr

Sample flow rate: 0 to 10 slpm

Related Instrumentation

Instrument is also available in a single-laser compact TILDAS configuration, with O₂ detection only

Near-IR spectrum for O₂, CO₂, H₂O



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 CO₂ sinks deduced from changes in atmospheric O₂ concentration, Nature, 381, 218, 1996.