AERODYNE RESEARCH, Inc.

Aerodyne Mini-TILDAS N_2O Monitor

Unprecedented precision and time response for N_2O and H_2O with options for CO & CO_2 or CH_4 in a compact, transportable package.

Features:

- < 30(10) ppt precision for N_2O in 1(100) s at 2200 or 2230 cm^{-1}
- < 60(20) ppt precision for N_2O in 1(100) s at 1270 cm^{-1}
- Fast time response (10 Hz)
- Choice of N_2O/CO at 2200 cm^{-1}, N_2O/CO/CO_2 at 2230 cm^{-1} or N_2O/CH_4 at 1270 cm^{-1}.
- All measurement choices include a determination of H_2O, allowing for the report of dry air mixing ratios.

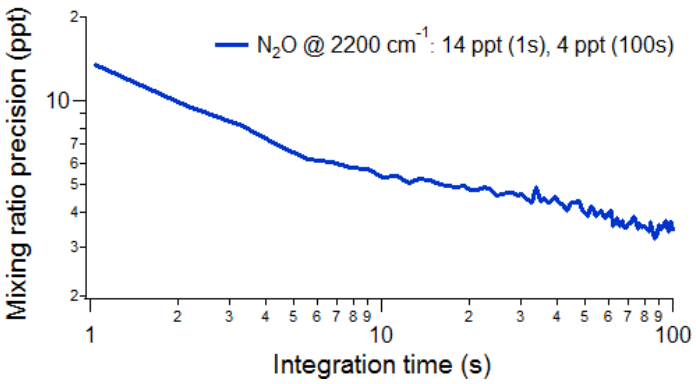
Rugged, field-ready instruments

Direct absorption spectroscopy allows for highly specific and accurate gas detection

Mid-IR detection enables maximum measurement sensitivity

TILDAS Technology

Aerodyne instruments use tunable infrared laser direct absorption spectroscopy (TILDAS) at mid-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 stratosphere/troposphere exchange.
- Laboratory measurements of discrete samples.
- Mobile measurements aboard aircraft, marine, and ground-based platforms.
- Atmosphere-biosphere exchange via chamber studies or eddy covariance flux measurements

Aerodyne N_2O Advantages

- 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.
- 19” rack mountable for easy installation.
- Turn-key design allows unattended operation in remote field sites.

Performance Specifications:

N_2O/CO precision @ 2200 cm^{-1} (1σ)

	1 sec	100 sec
N_2O	30 ppt	10 ppt
CO	100 ppt	40 ppt
H_2O	10 ppm	5 ppm

N_2O/CO/CO_2 precision @ 2230 cm^{-1} (1σ)

	1 sec	100 sec
N_2O	30 ppt	10 ppt
CO_2	100 ppb	40 ppb
CO	1 ppb	0.4 ppb
H_2O	10 ppm	5 ppm

N_2O/CH_4 precision @ 1270 cm^{-1} (1σ)

	1 sec	100 sec
N_2O	60 ppt	20 ppt
CH_4	300 ppt	100 ppt
H_2O	10 ppm	5 ppm

Time response

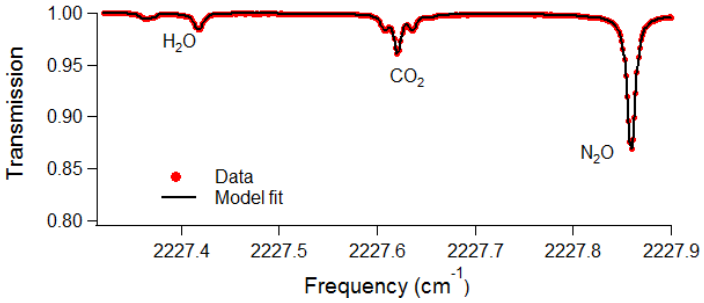
1-10 Hz data rate
<0.1 s minimum Rise/Fall time (1/e)
(depends on vacuum pump)

Enhanced Measurement Options

16 channel valve control for complex sampling

Low volume multi-pass cell for limited sample size and power pumps

Experimental spectrum @ 2230 cm^{-1} acquired at 1 Hz



Installation

19” rack mountable or benchtop

Operating conditions

Operating temperature: -20 to 50 ºC
Sample flow rate: 0 to 20 slpm

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
Electrical Power: 500 W, 120/240 V, 50/60 Hz
(with Varian IDP-3 vacuum pump)

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

REFERENCES:

Lebegue, Benjamin, et al. "Comparison of nitrous oxide (N_2O) analyzers for high-precision measurements of atmospheric mole fractions." *Atmospheric Measurement Techniques* 9.3 (2016): 1221-1238.

Shurpali, N.J., et al., “Neglecting diurnal variations leads to uncertainties in terrestrial nitrous oxide emissions.” Scientific Reports, 2016. 6: p. 25739.

Rannik, Ü., et al. "Intercomparison of fast response commercial gas analysers for nitrous oxide flux measurements under field conditions."*Biogeosciences* 12.2 (2015): 415-432.