



# MIRA *Pico N<sub>2</sub>O/CO*

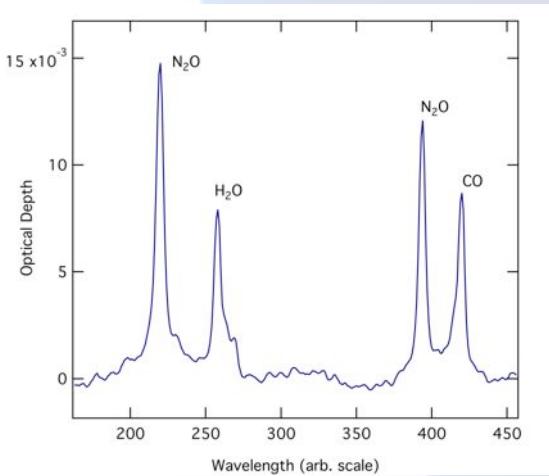
## Ultrasensitive N<sub>2</sub>O/CO Analyzer



**Monitor N<sub>2</sub>O and CO levels in real-time with sub-ppb sensitivity using the World's first handheld, laser-based N<sub>2</sub>O/CO gas analyzer.**

Introducing the MIRA *Pico N<sub>2</sub>O/CO*, the World's first portable, battery powered ultrasensitive nitrous oxide and carbon monoxide gas analyzer. The *Pico N<sub>2</sub>O/CO* is based on Aeris' revolutionary, miniature laser-based sensor engine, which achieves sub-ppb sensitivity and accuracy in seconds. Self-powered Pico systems can be uniquely employed for a wide range of fixed, handheld, mobile, and drone applications.

The *Pico N<sub>2</sub>O/CO* provides precise, accurate and wide range concentration data via the proven method of tunable diode laser absorption spectroscopy. However, Aeris MIRA Series analyzers uniquely operate in the *middle infrared (MIR) region*, achieving unparalleled specificity and sensitivity in a compact, low power consumption platform. The ability to simultaneously monitor *N<sub>2</sub>O* and *CO* in real-time with a portable analyzer enables a wide range of field applications previously impractical due to traditional size, weight, power, and cost constraints. The *Pico N<sub>2</sub>O/CO* represents a paradigm shift in fieldable laser-based gas analysis systems.



*Distinct spectral "fingerprints" of N<sub>2</sub>O and CO in the middle infrared region. Several lines are scanned at a 1kHz repetition rate, enabling the simultaneous measurement of carbon monoxide, nitrous oxide and water vapor. Both nitrous oxide and CO levels are reported as raw concentrations or as dry mole fractions.*

### Key Features

- Real-time, sub-ppb/s sensitivity
- Autonomous, built-in calibration for CO
- 1 or 2Hz operation
- GPS ready for creating N<sub>2</sub>O/CO "maps"
- Built-in wifi, RS-232, and optional analog out
- Lowest, 15W power consumption
- Maintenance-free sensor, User-serviceable filters
- Built-in 6hr battery, built-in sampling pump
- Compact, 2.75kg Lab-In-a-Lunchbox<sup>TM</sup>

### Real-Time Ambient and Source Monitoring

CO is an EPA Priority Pollutant as well as proxy for thermogenic CO<sub>2</sub>, while nitrous oxide is the #3 GHG that is produced in combustion processes, livestock operations, and activities such as soil fertilization. The MIRA *Pico N<sub>2</sub>O/CO* provides a powerful new tool for field applications of these important species including regional pollution monitoring (CO) and natural gas leak tracer or soil nitrification studies (N<sub>2</sub>O). As an absorption-based method, MIRA Pico systems achieve high sensitivity and linearity over an extremely wide concentration range, only requiring zeroing to achieve high accuracy as span does not change after initial calibration. To improve accuracy due to slow instrument drift, Pico systems come equipped with two programmable sample ports and associated software that enable differential measurements to be performed autonomously (described below). In many cases, this built-in differential capability effectively reduces or altogether eliminates the need for expensive calibration gases or zero gas generators.

### About Aeris Technologies, Inc.

Aeris Technologies, Inc. provides ultrasensitive gas analyzers for trace gas monitoring applications. Aeris is redefining the *state-of-the-art* in laser-based gas analysis systems, reaching unparalleled size, weight, power, and cost milestones.

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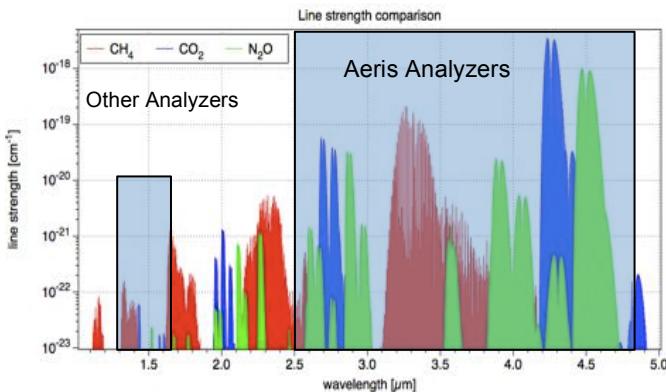
## System Specifications

Metric	Specification
Measurement method	Middle-Infrared Laser Absorption Spectroscopy
Sensitivity ( $\sigma$ )	CO and N <sub>2</sub> O: 500ppt/s
Accuracy (w/zero)*	CO: <1ppb, N <sub>2</sub> O: <1ppb, (2ppb w/o zeroing)
Temp/Humidity	10-40°C/10 to 95% RH (non-condensing)
Concentration Range	<1ppb to 500 ppm**
Size (Nominal)	11.5" W x 8" D x 3.75" H
Weight	2.75 kg (6 lbs), with 6 hour battery and pump
Power Consumption	15W
Voltage, current	110-220VAC: 0.2A, 12-15V DC: 1.5A
Interface/Outputs	WiFi, USB, RS232, analog out (optional)
Memory	32GB, expandable
Data Update Rate	1 or 2 Hz

\* Auto-differential measurement mode using scrubber or zero gas \*\* Higher concentrations possible

### Core Technologies

MIRA series analyzers combine Aeris' Patented multipass absorption cell with solid-state MIR laser technology to achieve sub-ppb sensitivity and ppb level accuracy in an extremely robust and compact package. The MIRA Platform operates in the mid-IR, where CO and N<sub>2</sub>O absorption lines are thousands of times stronger than commonly used near-IR spectra.



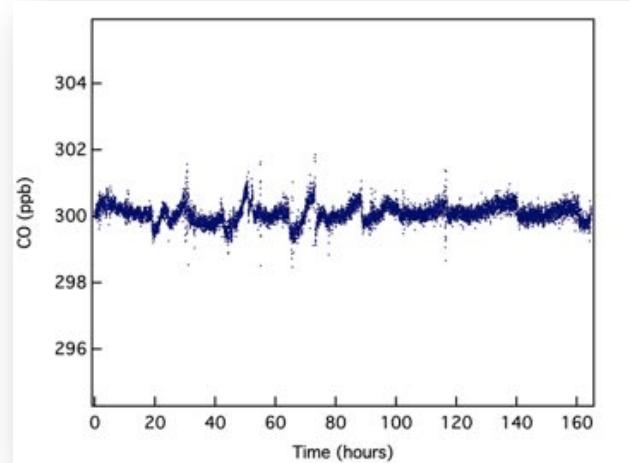
The Patented sensor engine used in all MIRA analyzers uniquely achieves a long absorption path length in an extremely small volume, providing ultra-high sensitivity and rapid response time with reduced pumping and power requirements.



MIRA laser-based sensor engine, comprising a fixed, hermetic optical bench, integrated laser and detector subassemblies, and ultra-compact, 60cc, 13m path length optical multipass cell.

### Differential Mode for Built-In Drift Compensation

MIRA Pico N<sub>2</sub>O/CO gas analyzers achieve a 500ppt/s sensitivity level, and even lower ppt-accuracy levels can be achieved with signal averaging. To obtain the highest accuracy, Pico systems come with two programmable sampling ports that can be used for either periodic rezeroing (or calibration), or for differential measurements. In the case of CO, a compact, long-life, catalytic scrubber can be used as a "zero port", effectively removing slow instrument drift at the sub-ppb level to achieve ppt level accuracy. In the case of nitrous oxide, although effective scrubbers do not exist, the user can either supply a zero or calibration gas to perform the same function, or take a differential measurement between, for example, pre- and post chamber gases for determining fluxes in soil chamber studies. In this case, the zero drift is effectively removed to provide the absolute emission rate of the soil.



Pico CO concentration stability measured from a tank with periodic rezeroing via the built-in scrubber. In this case, neither calibration nor zero gases are required to obtain 1ppb level accuracy for an indefinite period of time.