AIM Model 8500

AIR INSTRUMENTS & MEASUREMENTS, LLC

DUV Open-Path Gas Analyzer, for Ambient Air Monitoring

MEASURING any or all:

NO, NO_2, NH_3, HONO, O_3, H_2O_2, SO_2, SO_3, Cl_2, ClO_2, BTX, and others

The AIM Model 8500 open-path analyzer incorporates the most advanced technology available, and is derived from AIM's popular 5000 Series EPA compliant analyzers.

The Model 8500 employs DOAS (differential optical absorption spectroscopy), with a patented PLS pattern recognition processing of the dispersive UV spectral signature, with digital signal processing and communications. Outputs include 4-20 MA analog, Programmable digital outputs, and modem interface [optional]

The Model 8500 is available as a high resolution limited wavelength range analyzer, or low resolution broad wavelength range, or the combination of the two. The high sensitivity achieved with UV spectroscopy allows measurements typically from ppb to ppm levels, and optical pathlengths of 10's to 100's of meters.

The Model 8500 was developed from more than 30 years of practical field in-situ, open-path ansd remote sensing IR and UV experience, in over 4,000 installations in 35 countries.

FEATURES

- ***Open-Path*** **-** No sample contact
- ***Fast Response Time*** **-** Fraction of a second – allows prompt detection, analysis and adjustments/warnings.
- ***High Sensitivity*** **-** Accurate measurements from ppb level concentrations and higher.
- ***High Precision*** **-** ≤ 1 % of Range
- ***High Accuracy*** - ≤ 1% of Range
- ***Low Drift*** **-** ≤ 1% of Range over 24 hours [zero and span]
- ***EPA Compliant*** - With an in-line internal calibration cell for manual or automatic cylinder gas calibrations.
- ***Reliable Design*** -The Model 8500 Analyzer features a simple, low-maintenance, rugged design. The dispersive system with a 2048 array detector and no moving parts, and the PC based signal processing insure long-term trouble-free operation.

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Bulletin 8500C8/05

MODEL 8500 DISPERSIVE UV ANALYZER

Principle of operation: UV absorption spectroscopy; pattern recognition Differential Absorption Optical Spectroscopy [DAOS]

Sampling Technique: The Sample is measured in place in the Ambient air

Analysis and Spectral Ranges: The Model 8500 UV absorption analyzer takes a complete spectra over the range selected, typically from below 200 nm to above 450 nm

Ambient temperature: 32°F to 105°F (0°C to 40°C) standard; (Extended range available with temperature control)

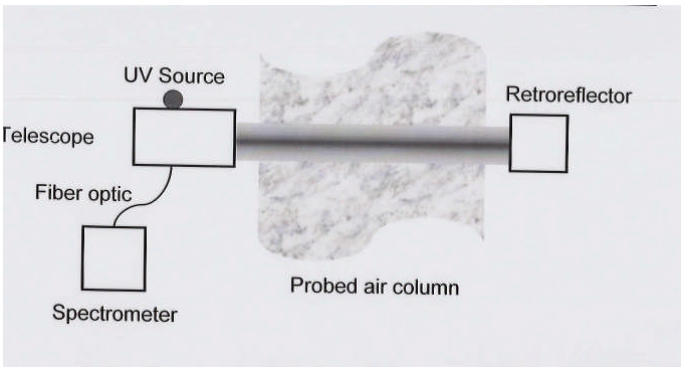
Power: 115 V ±10%, 10 amp, 50/60 Hz; 230 V ±10%, 5 amp, 50/60 Hz

INTRODUCTION to DOAS

DOAS stands for *Differential Optical Absorption Spectroscopy*, a name first applied in Europe in the 1980's, but an analytical technique that has been used in laboratories for at least 50 years. Its primary benefits are the ability to quantitatively and simultaneously measure many different analytes within a sample with low detection limits. AIM applies this in our Models 5600, 8647A and 9050.

In the AIM systems, a dispersive spectrometer captures a spectra of the sample or standard being analyzed. [A spectra is the recording of the absorption strength as a function of wavelength.] Absorption spectroscopy follows very well-known and predictable rules. If two analytes both absorb at the same wavelength, for example, the resulting absorption will be the sum of the two individual absorptions. *Therefore it is possible to mathematically treat the signal produced, to eliminate interferences, and to produce the spectrum for each analyte being sought.* The ability to differentiate between adjacent absorption features is improved with increased system resolution. In addition, modern pattern recognition signal processing techniques [such as AIM's proprietary PLS SVD software] allow the analysis of such low concentrations that no recognizable patterns are apparent when inspecting the spectra.

Standards Preparation - The first step is to record (or otherwise obtain) spectra for the specific analytes being sought, as well as the other analytes that might be present, at the same set of system operating parameters [i.e. resolution, etc] over a range of concentrations above and below the levels anticipated or sought in the samples. These spectra are stored in memory.



System Optical Set-Up - The analytical technique may be best known for its application to *Open-Path monitoring*, typically either single-pass [where the source is located at one end, and the detector at the other] or double-pass [where the source and detector are located at one end, and a reflector is located at the other]; but many other systems and applications exist [AIM applies it to remote sensing, in-situ monitoring and extractive analysis].

Sample Analysis - Modern analyzers allow the capture of a spectrum generally in less than 0.1 sec [most AIM systems capture the data within 10 msec]. Multiple spectra may be collected and added to improve Signal/Noise, and/or individual spectra may be analyzed to record changes as a function of time. Specific pre-selected analytes may be quantified by analyzing their specific absorption features, but also other "unknowns" can be analyzed by searching through a library of absorption spectra. In addition, the spectra can be stored for subsequent analysis for even a broader list of potential sample components.

Spectral Analysis - Since the absorption spectrum is a fundamental physical property, it is possible to compute the concentration of the absorbing gas directly from the measured spectra, without "calibrating" the analyzer each time with known concentrations of reference gases. This significantly reduces the time and cost of the analysis. However AIM does recommend the periodic introduction of cal gases as an independent verification of the credibility of the data.