middleton research

PRODUCT SHEET
MRC-940-PA101

FTIR Accessory: PA101
Photoacoustic gas analysis module

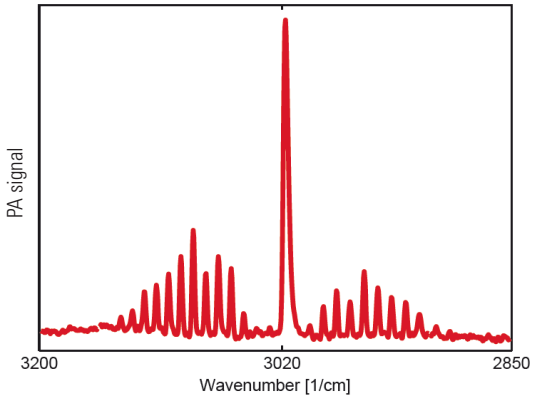
Sensitivity

The PA101 measures low concentrations in very low volume gases.

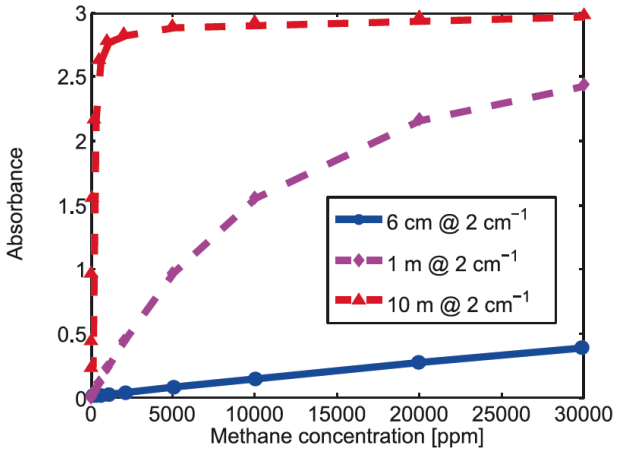
Linearity

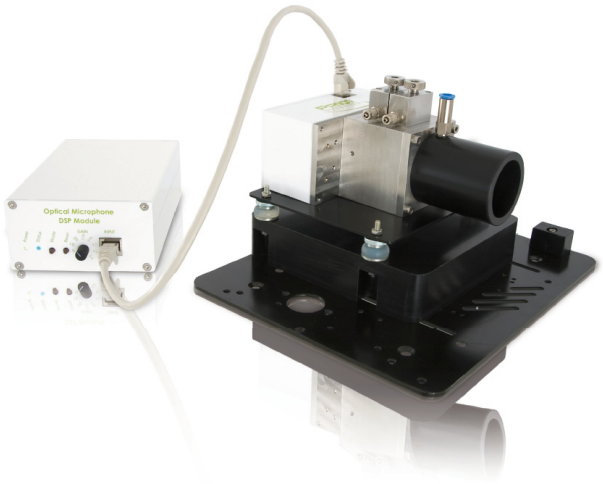
The photoacoustic signal, unlike the conventional infrared detector output, is highly linear in a very wide dynamic range because new photoacoustic technology allows the use of a short absorption path length without losing sensitivity.

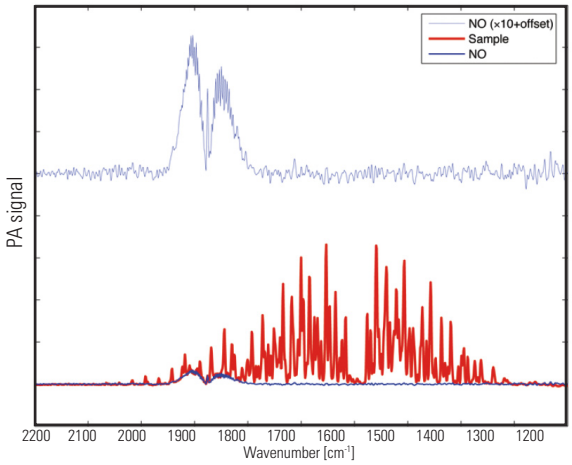
Wide linearity range allows the efficient subtraction of unwanted signals, such as water. Generally water vapor occurs in much higher amounts in gas mixtures than the analyte gas and it is usually very difficult to subtract using conventional detection.



Above: Infrared spectrum of the 3000 cm^{-1} band of 100 ppm methane, measured from 10 mL gas volume, 2 cm^{-1} resolution, 100 scans with 2.5 kHz FTIR mirror speed.



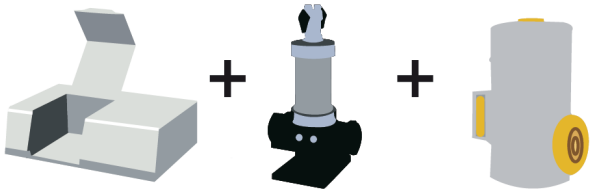




Above: A spectrum of 90 ppm nitric monoxide measured in the presence of water vapor (red) and the same spectrum after the subtraction of water spectrum (blue). The subtracted water spectrum was measured from laboratory air and the fit was made with simple linear substitution (2 cm^{-1} resolution, 100 scans with 2.5 kHz mirror speed).

Left: A simulated FTIR measurement of methane gas at 3017 cm^{-1} with 6 cm, 100 cm, and 1000 cm absorption path lengths and with 2 cm^{-1} resolution. The use of short 6 cm absorption path length in PA101 guarantees highly linear signal in a very wide dynamic range.

Conventional FTIR Gas Measurement System



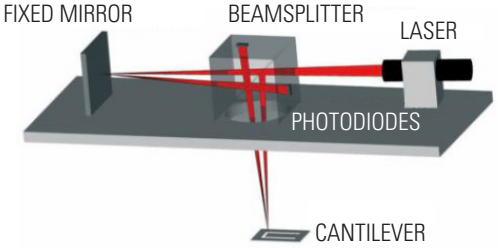
→ large gas volume
→ non-linear
→ limited dynamic range

Gasera Photoacoustic System

→ low gas volume
→ highly linear
→ wide dynamic range

The PA 101 replaces the conventional long path gas cell and the IR-detector.

Ultra-sensitive Optical Microphone



The heart of the system is the patented photoacoustic detector consisting of a MEMS cantilever coupled with a laser interferometer to measure microscopic movements of the cantilever microphone.

PA101 Components

- Gas cell with inlet and outlet valves
- Optical cantilever microphone with built-in laser interferometer
- Digital Signal Processing Module
- Power supply (+12 VDC)
- Cables to connect the modules and to connect to the FTIR instrument

Specifications

- Cell volume: Approx. 10 mL
- Cell material: Stainless steel (AISI 1316)
- Minimum detectable pressure variation in the sample cell: 7.7 x 10^{-7} Pa/√Hz (RMS)
- Electronic interface: BNC cable to detector input on the FTIR
- Electronic output: +/- 2.5 VDC interferogram signal
- Recommended FTIR scan rate: 2.5 kHz or less (HeNe frequency)
- Weight: cell module 2.3 kg, DSP module 0.7kg

Note: Sample compartment baseplate mountings are available for most FTIRS.

Ordering Information

Please contact Middleton Research (info@middletonresearch.com) for further information or to order the PA101 FTIR accessory.

PA101 accessory created and manufactured by Gasera Ltd. (Finland)