



FTIR
Gas Analysis
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MultiGas™ Purity

REAL-TIME TRACE IMPURITY DETECTION

The MultiGas Purity Analyzer is an FTIR based analyzer capable of ppb contaminant detection in high purity bulk process gases. Bulk gas production quality has been improved with the MultiGas Purity Analyzer for such gases as NH₃, NF₃, and hydrogen.

The MultiGas Purity Analyzer is composed of a 2102 Process FTIR Spectrometer, high-optical-throughput sampling cell, and applications-specific analysis software. These integrated components, along with automated bake-out functionality, provide unmatched precision and accuracy for bulk gas contaminant monitoring.

Features & Benefits

- Real-time, on-line purity analysis of bulk process gas
- ppb level impurity detection in bulk process gases such as NF₃, NH₃ and H₂
- Constructed for corrosive high purity gases
 - 316 SS welded sample lines and gas cell construction
 - Heated optical path eliminates moisture and atmospheric contaminants
 - Automated bake-out procedure
- High resolution analyzer deconvolves overlapping spectra
 - Enables speciation of impurities in the bulk gas
- Specialized zeroing and self-calibration software

Applications

Continuous monitoring of trace contaminants in high purity bulk gases in production environments, including:

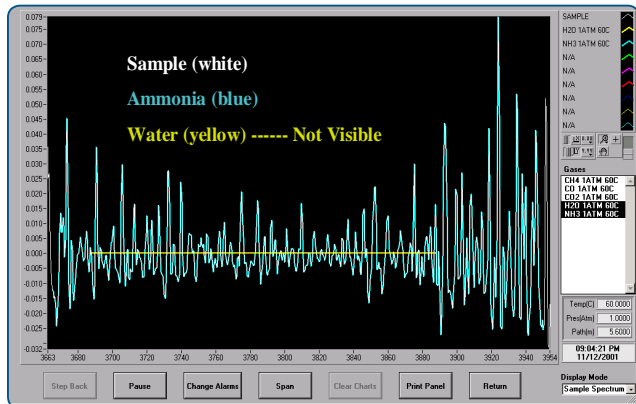
- H₂O, CO, CO₂, N₂O and CH₄ in NH₃
- H₂O, CO, CO₂, N₂O and HF in NF₃
- H₂O, CO, CO₂, HF, HCl, NH₃, CH₂Cl₂ and CHCl₃ in H₂
- H₂O, CO, CO₂, CH₄, and NH₃ in N₂O



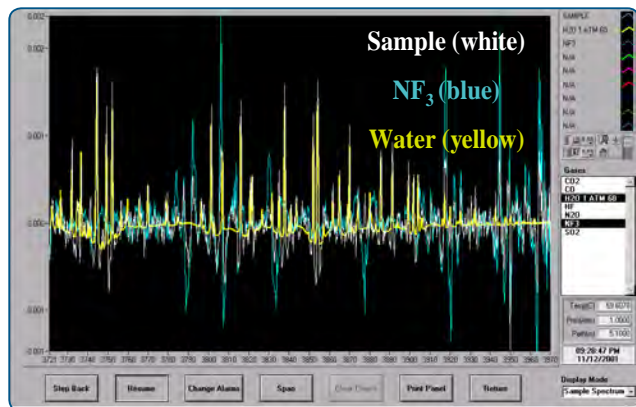
Spectral Analysis

The MultiGas analyzer features robust quantitative analysis software, which can analyze and report impurity concentrations. The gas temperature and pressure are maintained at pre-determined levels and monitored for process fluctuations.

Through advanced spectral analysis, the MultiGas analyzer can provide highly accurate sample readings without baseline variations or instrument drift. Interferograms are collected at high resolution, deconvolved, and then compared to the sample spectrum to determine the component spectra. These spectra, along with the calibration curves for the impurities, are used to derive the impurity concentration. This analysis is completely automated, and performed by classical least squares regression. Data display formats include concentration histories in graphical and tabular formats, the measured spectrum and spectral residuals.

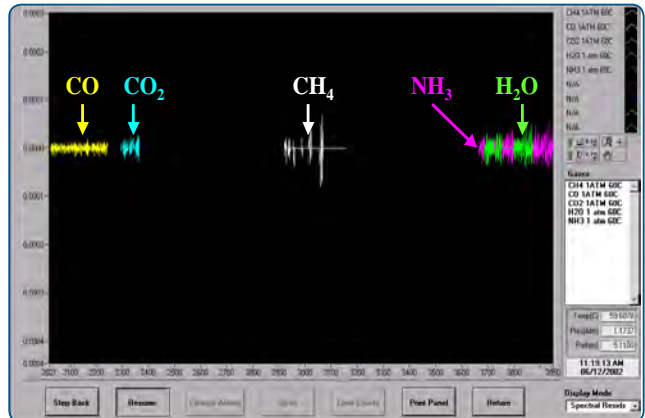


Ammonia Spectrum with Water Quantification Region



High resolution allows differentiation - speciates between water and NF₃

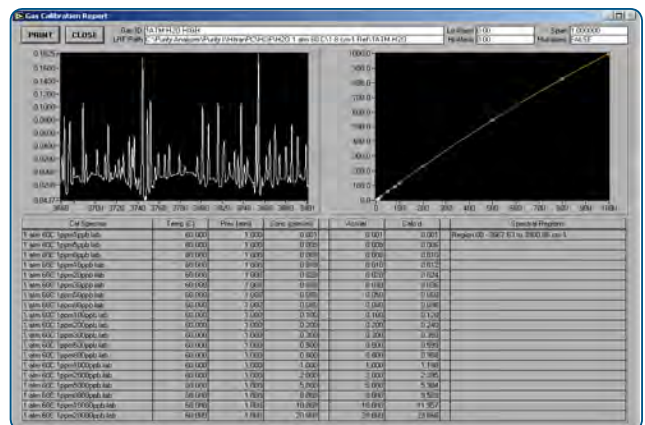
The residual spectrum is a visual indicator of potential quantitative errors which simplifies QA/QC. The spectral residuals represent the “left-over” spectral information, after all the reference spectra have been subtracted at their calculated values. Once spectra have been collected and saved, these spectra may be reprocessed at any time using the same or different calibration sets.



Residual Spectra: Calibration subtracted from sample demonstrates analysis quality

System Calibration

The MultiGas software features multi-point calibration curves that minimize errors due to spectral non-linearity. These impurity calibrations are provided with each instrument. Software utilities verify instrument performance to prevent calibration drift.



Graphical User Interface for Calibration



System Hardware

The 2102 Process FTIR Spectrometer is a compact process spectrometer capable of operating at spectral resolutions up to 0.5 cm^{-1} resolution.



2102 Process FTIR Spectrometer

This spectrometer is coupled to a patented low volume (200 mL) multi-pass gas cell with a 5.11 meter effective pathlength. The patented design of this cell incorporates aspheric, aberration-correcting mirrors which provide more than twice the optical throughput of a conventional multipass gas cell. For purity analysis, ambient temperature and pressure are monitored to ensure optimal sensitivity.

For compatibility with high purity applications, the gas cell body is constructed of nickel-plated 316 SS. The gas inlet and outlet connections are also 316 SS, and feature VCR® fittings. In addition, proprietary technology provides an ultra-low contamination seal for the gas cell mirrors and windows.



The 5.11m pathlength, 200 mL volume, long path gas cell measures 8½" x 2" x 3½".

The analyzer also features automated bake-out functionality, which is unique to the MultiGas Purity. This automated bakeout sequence features single push button operation to dry the analyzer.

Specifications

Analyzer

Measurement Technique	FTIR Spectrometry
Gases and Vapors Measurable	Most molecules except for N_2 , H_2 , and O_2
Ranges	Full scale concentration setting between 10ppb and 100% full scale
FTIR	2102 Process FTIR
Spectral Resolution	0.5 – 128 cm^{-1}
Scan Speed	2 scans/sec @ 0.5 cm^{-1}
Scan Time	1-300 sec
Infrared Source	Silicon Carbide @ 1200°C
Reference Laser	Helium Neon (15798.2 cm^{-1})
Detector	LN_2 -cooled MCT; TE-cooled MCT; Stirling-cooled MCT
Purge Pressure	20 psig (1.5 bar) max.
Spectrometer Purge Flow	4 L/min of purified ultra pure N_2
Optics Purge Flow	4 L/min of purified ultra pure N_2
Pressure Transducer	MKS Baratron®
Purge Connection	¼" VCR®
Computer Requirements	Desktop or notebook Intel Pentium® PC under Microsoft® Windows® 95/98/NT/2000/Me and XGA display (1024 x 768)
Recommended Minimum	Intel Pentium III, 850 MHz, Microsoft Windows 2000, 256 MB Intel Pentium, 200 MHz, Microsoft Windows 95, 64 MB
Communications	National Instruments GPIB
Output	RS232/422/485, analog output
Dimensions	17.5"W x 12.5"H x 25.5"D
Installation	19" rack mount chassis
Power	120 or 240 VAC, 50/60 Hz, 6 amps
Weight	125 lbs. (57 kg)



Specifications (continued)

Sampling Parameters

Sample Temperature	Ambient to 60°C (calibration temperature dependant)
Sample Flow	0.2 – 10 L/min
Sample Pressure	0.01 – 8 atm (calibration pressure dependant)

Gas Cell

Construction	Welded 316 stainless steel
Fittings	¼" VCR®
Tubing	Heated ¼" stainless steel
Mirrors	Nickel plated aluminum substrate, with rugged gold coating
Windows	CaF ₂ , KBr, ZnSe (others available)

Detection Limits

Low-level detection limits for the 5.11 meter gas cell and a mercury-cadmium-telluride (MCT) detector at 0.5 cm⁻¹ resolution for typical gases in pure corrosives:

Name	Formula	Bulk Media	Typical Detection Limit with 20/20™ Cell and 2 minute Measurement
Water	H ₂ O	NH ₃ , NF ₃ , N ₂ O, PH ₃ , AsH ₃	20ppb
Carbon Dioxide	CO ₂	NH ₃ and NF ₃	5ppb
Carbon Monoxide	CO	NH ₃ and NF ₃	6ppb
Hydrofluoric Acid	HF	NF ₃	9ppb
Methane	CH ₄	NH ₃	15ppb
Nitrous Oxide	N ₂ O	NF ₃	3ppb

Ordering Information

Please contact your local MKS office for price and availability information.



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