



Process &

Environmental
Analysis Solutions

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MultiGas™ 2030 1065-Ready

5 Hz ENGINE AND VEHICLE EMISSIONS MEASUREMENT AND CERTIFICATION ANALYZER

The new MultiGas™ 2030 1065-Ready FTIR analyzer combined with the new Engine and Vehicle Application Package was designed to meet Euro VI/Euro 6 and EPA 40 CFR part 1065/1066 requirements for exhaust emission compliance testing. The MKS FTIR analyzer is the worldwide choice for R&D development and certification test labs for light duty (LD) and heavy duty (HD) vehicle and engines as well as catalyst manufacturers. Different fuel source exhaust emissions are supported not only for raw exhaust measurements but anywhere along the exhaust train. The gas sample is introduced hot and wet directly into the FTIR with no need for chillers. The ruggedness of the MultiGas 2030 1065-Ready analyzer makes it an ideal choice for on-board measurements and is offered with a broadband detector for the full range of gases (requires liquid N₂ – LN₂) as well as a version with a shorter gas list that does not require LN₂.

Features & Benefits

- Designed to meet the Euro VI and EPA 40 CFR part 1065/1066 requirements
- 5 Hz data acquisition and analysis providing fast transient monitoring
- Capable of true 5Hz sampling rate - flows from 0.5 LPM up to 100 LPM
- High resolution (0.5 cm⁻¹) FTIR reduces interferences due to water and CO₂, providing unbiased, accurate readings
- New stainless steel gas cell design with 3/8" welded inlet/outlet lines, corrosion resistant Dursan™ coating for lowest residence time for "sticky" gases and optimized high temperature resistant insulation
- Low volume (200 mL), long path (5.11m) gas cell produces fast response time without compromising detection limits
- Single analyzer measuring over 20 component emissions spanning a large dynamic range – ready for future emissions components
- Engine and Vehicle Application Package includes drift-free calibrations configured for diesel, CNG, dual fuels and gasoline/ethanol blend emissions for 191°C
- 113°C calibrations are now also available for diesel fuel exhausts
- Rugged analyzer ideal for use in engine or vehicle test labs as well as on board as a portable emissions monitoring system (LN₂ free analyzer also available)
- Analyzer health diagnostics included to verify proper instrument performance
- Reduced cost of ownership due to lower daily maintenance and calibration requirements
- Optional high speed computer with factory configured software
- Connectivity to current customer systems through AK Protocol, OPC, Modbus, analog or digital I/Os and HTML available



Description

The MKS MultiGas 2030 1065-Ready analyzer includes a 5 Hz acquisition FTIR spectrometer coupled with a patented 5.11m high-optical-throughput, low volume (200 mL) gas sampling cell. The gas cell was redesigned for increased ruggedness and corrosion resistance. It can handle up to 100 LPM, providing a true 5 Hz sampling rate along with the 5 Hz data acquisition rate. The 3/8" inlet and outlet plumbing reduces backpressure and noise, enabling flows from 0.5 LPM up to 100 LPM while providing sensitivity that is unbeaten in the industry. The new cell has welded inlet and outlet which are more durable and resistant to leaks in cases where the gas cell needs to be cleaned frequently. The cell also includes improved insulation which ensures that the gas remains at correct temperature and that the instrument's internal components do not overheat.

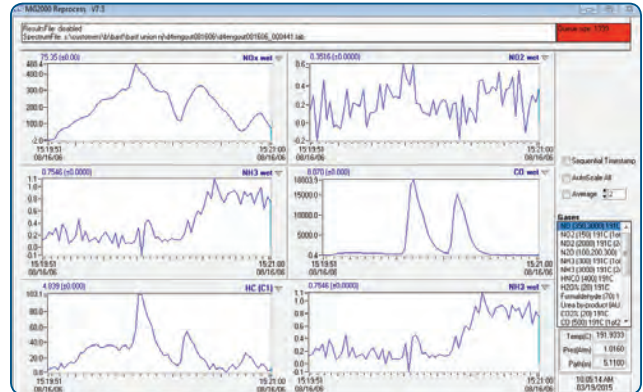
At a flow rate of 60 LPM the refresh rate of the gas sample is actually 5 Hz (gas refresh time of 0.2 sec) – providing speed and sensitivity unmatched by any other analyzer.



The new MultiGas™ 2030 1065-Ready FTIR gas cell with custom heaters and new improved insulation.

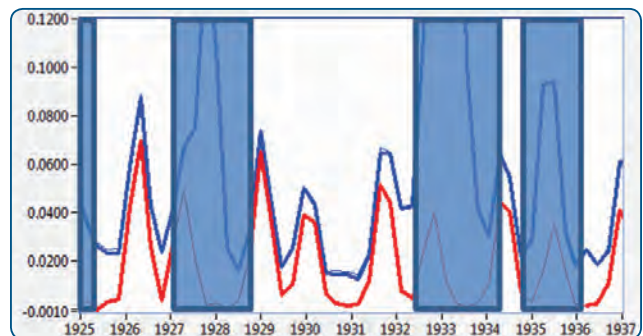
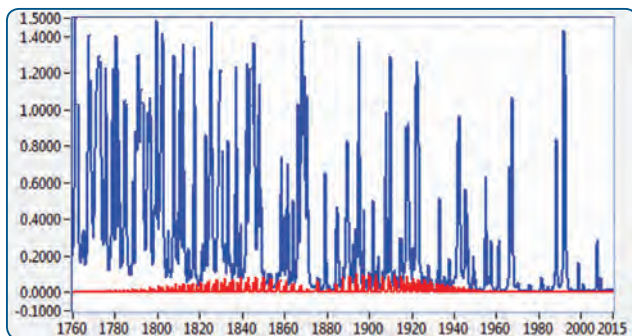


The resolution of gas profiles of the MultiGas 2030 1065-Ready has indeed been observed to exceed that of instruments running at 10 Hz and has been attributed to differences in flow rates where the 10 Hz analyzers are suffering from under sampling (low flow rate).



Timelines of combustion gases during a 10 sec window, showing multiple component changes during the emissions test cycle. Note the different concentration profiles for each component, demonstrating the high time resolution of the analyzer.

The MultiGas 2030 1065-Ready not only operates at a high sampling and acquisition rate but does so without sacrificing resolution. The analyzer maintains its excellent performance capabilities using high resolution (0.5 cm^{-1}) spectra for optimum quantification of components that have high interference with water and CO_2 . The figure below illustrates the interference effect by showing the severe overlap between NO and H_2O peaks. However, due to the high resolution of the spectrum, the NO peaks can be clearly separated from the H_2O peaks, which allow accurate NO quantification.



A section of the mid-IR combustion gas spectrum in the NO absorbance region is shown in the graph to the left with the gas sample spectrum in blue and NO reference spectrum in red. A narrower wavenumber region is displayed in the graph to the right, showing the sample spectrum (thick blue line), an overall spectral fit (thin blue line), as well as the sample NO absorbance (thick red line) showing an excellent match with the fitted NO spectrum (thin red line). The large peaks are water peaks which can be separated from NO peaks because of the high 0.5 cm^{-1} resolution, and are excluded from the analysis using masking (shaded regions in blue). As a result, only the spectrum regions where high NO signal and low H_2O interference are used to extract the readings.



Using the Engine and Vehicle Application Package, over twenty gases can be quantified simultaneously at 5 Hz with detection limits of 1 ppm or less for most components. The Application Package features multi-point calibration curves that provide large dynamic measurement ranges from low ppm to % level. This ready-to-use method offers the ability to perform analysis when CO₂ and H₂O levels up to 20% with no user input required. The Application Package includes 1065-compliant calibrations for many species such as N₂O, NH₃, CH₄ and others, and is applicable for many different fuels. The Engine and Vehicle Application Package is for gas samples running at 1 atm pressure and 191°C and new 113°C calibrations are also available for use in worldwide markets.

The calibrations included in the Engine and Vehicle Application Package are applicable to all MultiGas 2030 1065-Ready analyzers because each instrument is tuned to extremely tight specifications, which allows a calibration generated on one instrument to be used on any other instrument without modification. A one-time or a regular span can however also be used for the highest accuracy requirements.

Specifications

Analyzer

Measurement Technique	FTIR Spectrometry
Gases and Vapors Measurable	Most molecules except for N ₂ , H ₂ , and O ₂
Analytical Ranges	Dependent upon gas, from ppm to %. Refer to Engine and Vehicle Application Package.
1065-Ready Calibrations	Instrument independent calibrations fulfill the 1065 requirements for a large number of gases
Factory Calibration	≤2% of Reference Value
Accuracy	≤2% of Reference Value
Repeatability	≤1% of Reference Value
Noise	≤1% of Analytical Range
Drift	≤2% of Analytical Range
Measurement Acquisition Rate	5 scans/sec (5 Hz)
Measurement Time	0.2 sec or longer
Flow Rate	0.5 LPM up to 100 LPM
Sampling Acquisition Rate	Dependent upon flow rate, 5 Hz @ 100 LPM
Laser Safety	Class 1 laser product contains a Class 3R laser with continuous wave output at 633 nm

FTIR

FTIR Spectrometer	2102 Process FTIR, with spectral resolution 0.5 cm ⁻¹
Infrared Source	Silicon Carbide
Reference Laser	Helium Neon
Detector	LN ₂ -cooled MCT, 500-5000 cm ⁻¹ (TE-cooled MCT versions available for PEMS)
Purge Pressure	20 psig (1.5 bar) max.
Spectrometer and Optics Purge Flow	0.2 LPM of dry nitrogen or CO ₂ free clean dry air with dewpoints below -70°C
Pressure Transducer	MKS Baratron® (0-1000 Torr)
Purge Connection	Swagelok® quick connect
Sample Gas Inlet/Outlet Connection	Swagelok 3/8" threaded
Computer (Optional)	High speed Xeon® processor
Communications	RJ-45 cross-over Ethernet
Output Options	AK, Modbus, OPC, XML, analog (please inquire)
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, 3 amps
Weight	110 lbs. (50 kg)



Specifications and Ordering Information

Sampling Parameters

Sample Temperature	191°C (113°C available as well)
Sample Flow	0.5 - 100 L/min
Sample Pressure	0.0 – 1.3 atm (calibration pressure dependent) 0.95 - 1.05 atm (recommended)

Gas Cell

Pathlength and Volume	5.11m, 200 cc
Construction	316 stainless steel, Dursan coating
Fittings	3/8" threaded Swagelok
Tubing	Heated 3/8" stainless steel inserted into compression fitting welded to gas cell
Mirrors	Nickel plated aluminum substrate, with rugged gold coating with MgF ₂ coating
Windows	ZnSe (other window material available)
O-rings	Kalrez® (others available)

Detection Limits

Low-level detection limits for the MultiGas 2030 1065-Ready FTIR analyzer combined with the new Engine and Vehicle Application Package for typical gases in a matrix of 10% H₂O and CO₂ are as follows:

Name	Formula	Minimum Detectable Limit at 5 Hz (in 10% H ₂ O and CO ₂)
Ammonia	NH ₃	0.5 ppm
Nitrous Oxide	N ₂ O	0.75 ppm
Nitrogen Dioxide	NO ₂	0.5 ppm
Nitric Oxide	NO	1.0 ppm
Carbon Dioxide	CO ₂	1.0 ppm
Carbon Monoxide	CO	1.0 ppm
Formaldehyde	H ₂ CO	1.5 ppm
Methane	CH ₄	1.0 ppm
Sulfur Dioxide	SO ₂	4.0 ppm

Ordering Information

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



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