MultiGas™ 2030 1065-Ready HiSens

GAS ANALYZER FOR PPB LEVEL N_2O VEHICLE AND ENGINE EMISSIONS CERTIFICATION TESTING

The new MultiGas™ 1065-Ready HiSens analyzer is an FTIR-based multiple gas analyzer designed to meet the extremely low detection limits and strict analysis criteria for certifying N_2O emissions in both light duty (LD) and heavy duty (HD) vehicle and engine testing. This same system can also be easily deployed in the field for ambient air monitoring. The analyzer was tested and validated for use in EPA 40 CFR Part 1065 and 1066 as well as Euro VI certification testing on diluted gas streams for both modal and static bag emissions. The MultiGas 1065-Ready HiSens analyzer has proven to be the most accurate and stable analyzer on the market even when going head to head with state-of-the-art, laser-based systems like QCL and TLD analyzers.

Features & Benefits

- Single digit ppb detection of N_2O per EPA 40 CFR Parts 1065 and 1066
- High sensitivity detector with no liquid nitrogen cooling required
- Continuous measurement at 5 Hz or 1 Hz in dilute vehicle and engine emissions stream for rapid detection of changes in effluent composition
- Capable of measuring several target emissions at low ppb levels, including N_2O, CH_4, CO_2, CO, H_2O, formaldehyde and other oxygenated hydrocarbons
- High N_2O Selectivity and Sensitivity - No bias or sensitivity to CO, CO_2 , or H_2O
- Direct analysis in effluent streams that contain up to 4% water and CO_2, without the use of chillers or driers
- Rise and Fall times of less than 2 seconds
- Flow rates ranging from 0.5 lpm up to 30 lpm
- Complete, integration-ready analyzer reduces complexity and ensures fast install time for a fully compliant N_2O system
- Integrated gas cell heater and pressure transducer with automatic compensation for accurate analysis
- Patented, linearized detector ensures all instruments maintain the same calibration
- Frequency and resolution diagnostics ensure calibration is maintained for improved accuracy
- Low cost of ownership, easy to install with user-friendly software and methods as well as very easy to maintain

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Description

The MultiGas 1065-Ready HiSens analyzer is extremely sensitive to N_2O and has no cross sensitivity to 4% moisture and CO_2, up to 2000 ppm CO, or other components present in gaseous fuel emissions. A recent Light Duty vehicle round robin test sponsored by the Coordinating Research Council (CRC E-103)[1] performed a series of validation tests on commercially available N_2O emissions analyzers (FTIR, TDL and QCL-based) which showed that the MKS FTIR was the only analyzer that was not only within 10% of the GC-ECD reference method for all tests but also showed no bias in the readings from any other component.

The MultiGas 1065-Ready HiSens is an extremely sensitive and stable analyzer based upon the MultiGas 2030 *HS* High Speed analyzer. Capable of 5 Hz data acquisition at high resolution, the 2030 *HS* analyzer incorporates a new high-optical-throughput sampling cell with low overall volume and Dursan™ coating to minimize analyte retention. The FTIR incorporates an MCT detector that does not use liquid nitrogen (LN_2) for cooling, but instead deploys a thermoelectric cooler (TEC) to give fast response and high sensitivity without the inconvenience and cost of LN_2. This analyzer configuration, along with the software analysis package, allows for the accurate measurement not only of N_2O but also several gases found in emission streams - all at the same time - including formaldehyde, acetaldehyde, ethanol, methanol, methane, CO_2 and CO, without removal of moisture.

[1] *"CRC-103: Evaluation of N_2O Measurement Instruments with Light-Duty Vehicles", by Eugene Jimenez, Janet Buckingham, Shirish Shrimpi, Donald Nagy presented at the Coordinating Research Council Real World Emissions Workshop on March 31, 2014.*

Performance

The new MKS MultiGas 1065-Ready HiSens analyzer outperformed many of the QCL and TDL laser based analyzers during recent EPA 40 CFR Part 1065 and 1066 testing and was the best overall system for the LD Vehicle N_2O analyzer tests. The detection limits (2 sigma basis) are shown in Table 1, for the N_2O response in 4% water and CO_2 for a typical scan time of 1 Hz for dilute continuous (modal) gas analysis as well as a scan time of 30 seconds for the dilute bag (static) analysis. Bag analysis can also be performed using a faster 5 Hz or 1 Hz acquisition time, along with a 30 second run time average for better detection limits while still allowing the ability to see step function changes during the Bag tests. Table 2 shows the estimated 1 Hz scan time detection limits (based upon 2 sigma) for other components that can be monitored with the 1065-Ready HiSens analyzer along with N_2O.

TABLE 1

Component	Scan Time	Detection Limit	Analytical Range
N_2O (1 Hz)	1 second	25 ppb	0 - 30 ppm
N_2O (30 sec)	30 seconds	3 ppb	0 - 20 ppm

Table 1 - Detection limits for N_2O at 1 Hz and 30 second data acquisition rates in 4% CO_2 and H_2O.

TABLE 2

Component	Detection Limit	Current Range
Formaldehyde	90 ppb	0 - 70 ppm
Acetaldehyde	250 ppb	0 - 150 ppm
Methanol	250 ppb	0 - 200 ppm
Ethanol	900 ppb	0 - 200 ppm
Methane	150 ppb	0 - 250 ppm
Ethane	150 ppb	0 - 150 ppm
Carbon Monoxide	70 ppb	0 - 2000 ppm

Table 2 - Estimated detection limits for expandable components at 1 Hz data acquisition rates in 4% CO_2 and H_2O

Specifications

Analyzer

Gases and Vapors Measurable	N_2O, CH_4, CO, CO_2, Formaldehyde, Acetaldehyde, Methanol, Ethanol, Methane, Ethane, Diesel
N_2O Range	Dilute Continuous 0 - 30 ppm Dilute Bag Analysis 0 - 20 ppm
Spectral Resolution	0.58 – 128 cm^{-1}
Scan Speed	5 scans/sec @ 0.58 cm^{-1}
Scan Time	0.2 sec or longer
Detector	5 micron TE–cooled MCT (no liquid nitrogen)
Purge Pressure	20 psig (1.5 bar) max.
Spectrometer Purge Flow	0.2 L/min of dry nitrogen or CO_2 free clean dry air with dewpoint below -70°C
Optics Purge Flow	0.2 L/min of dry nitrogen or CO_2 free clean dry air with dewpoint below -70°C
Pressure Transducer	MKS Baratron® capacitance manometer
Purge Connection	Swagelok® quick connect
Computer	High speed computer with Xeon® processor supplied with analyzer (system can also be configured without computer)
Communications	RJ-45 cross-over Ethernet
Output Options	XML, analog, AK, OPC, Modbus
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)
Laser Safety	Class 1 laser product contains a Class 3R laser with continuous wave output at 633 nm

Sampling Parameters

Sample Temperature	35˚C calibration temperature (can operate up to 191˚C)
Sample Flow	0.5 - 30 L/min
Sample Pressure	0.95 - 1.05 atm (nominal)

Gas Cell

Construction	Dursan coated stainless steel construction
Effective Path Length	5.11m
Volume	200mL
Mirrors	Nickel plated aluminum substrate, rugged gold coating with MgF_2 coating
Fittings	3/8" Swagelok®
Tubing	Heated 3/8" stainless steel
Windows	Corrosion resistant CaF_2
O-rings	Kalrez®

Ordering Information

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

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