FT-IR GAS ANALYZERS

MATRIX II-MG Series

Configurable High Performance for Gas Analysis.

Innovation with Integrity

Gas Analysis.

Real-Time. Quantitative. Calibration-Free.

The MATRIX II-MG Series comprises four high-performance FT-IR gas analyzers in a compact and rugged housing. They are designed for the automated, high precision and real-time monitoring of gas concentrations in many different applications. This includes for example:

ANALYSIS OF INDUSTRIAL GASES AND PROCESS CONTROL

The gas analyzers are suited for industrial applications due to the easy-to-use software OPUS GA and operational simplicity. Continuous data acquisition is enabled through detector types that do not require liquid nitrogen. Retrieved analysis results can be transferred and it is possible to control the gas analysis software OPUS GA via various interfaces.

EMISSION MONITORING AND QUANTIFICATION OF GREEN-HOUSE GASES

The spectral resolution of 1.0 cm^{-1} (OMEGA 5) or 0.5 cm^{-1} (MATRIX II-MG) makes unambiguous identification of gas species even in complex gas mixtures possible, for instance when monitoring exhaust gas emissions (e.g., analysis of NOx in H_2O) or when investigating gas mixtures with highly potent greenhouse gases such as SF_6.

SCIENTIFIC RESEARCH

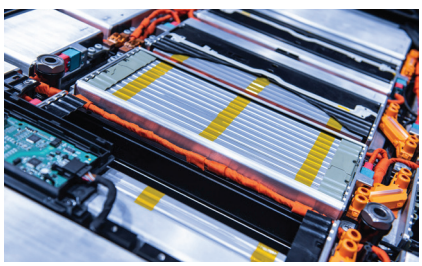
The gas analyzers are perfectly suited for the analysis of varying gas compositions, i.e., in scientific research or for the investigation of catalytic reactions, since no calibration measurements are required to define quantification methods. If an additional compound needs to be analyzed, the corresponding quantification method is added by a few clicks in OPUS GA.

TRACE GAS ANALYSIS AND PURITY CONTROL

Reference spectra of excellent quality, high wavenumber accuracy, outstanding sensitivity, gas cells with high optical throughput, and efficient consideration of spectral interference, allow the analysis of trace gases and purity control even of IR-active matrix gases.

ANALYSIS OF BATTERY GASES

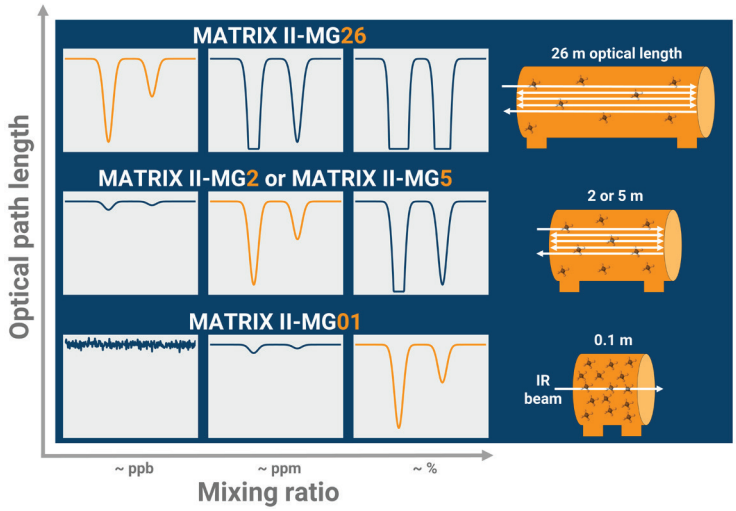
The analysis of battery gases is achieved through high-quality reference spectra, the flexible gas analysis software OPUS GA and the spectral resolution of 1.0 cm^{-1} or 0.5 cm^{-1}.



MATRIX II-MG Series

Optimized Gas Cell for Your Gas.

Gas cells with different optical path lengths, ranging from 10 cm to 26 m, are available to accurately determine mixing ratios across a wide concentration range, from percentage levels down to parts per billion (ppb). The selection of the optimal optical path length involves a careful balance between minimizing noise levels and optimizing the transmission of infrared light. This approach ensures that oversaturated infrared spectra, even when dealing with gas mixtures with IR active compounds in concentrations in the percentage range, are circumvented. Furthermore, to prevent condensation, the gas cells with an optical path length of up to 5 m can be heated to a temperature above 180 °C.



The MATRIX II-MG Series offers gas cells with different optical path lengths dedicated for your needs.

PICK YOUR DETECTOR

A variety of different detector types are available for your needs: detectors with exceptional sensitivity (liquid-nitrogen- or Stirling-cooled MCT, detectors with extended spectral range (DLaTGS) or detectors when liquid nitrogen is unavailable but low detection limits are yet required (TE-MCT).

HIGH SPECTRAL RESOLUTION AND FAST ANALYSIS

The superior spectral resolution, surpassing 1.0 cm^{-1} (with an optional capability of exceeding 0.5 cm^{-1}), facilitates the analysis of complex gas mixtures characterized by numerous overlapping infrared signatures. Furthermore, the high scan rate of up to 5 Hz at a resolution of 0.5 cm^{-1}, in conjunction with the fast gas exchange option, enables the exploration of rapid processes such as catalytic reactions.

CALIBRATION-FREE QUANTIFICATION

The MATRIX II-MG Series is operated by the gas analysis software OPUS GA. This software enables the quantification of over 350 compounds without the need for calibration measurements. For an accurate quantification, the pressure and temperature of the gas are constantly recorded throughout the analysis process.

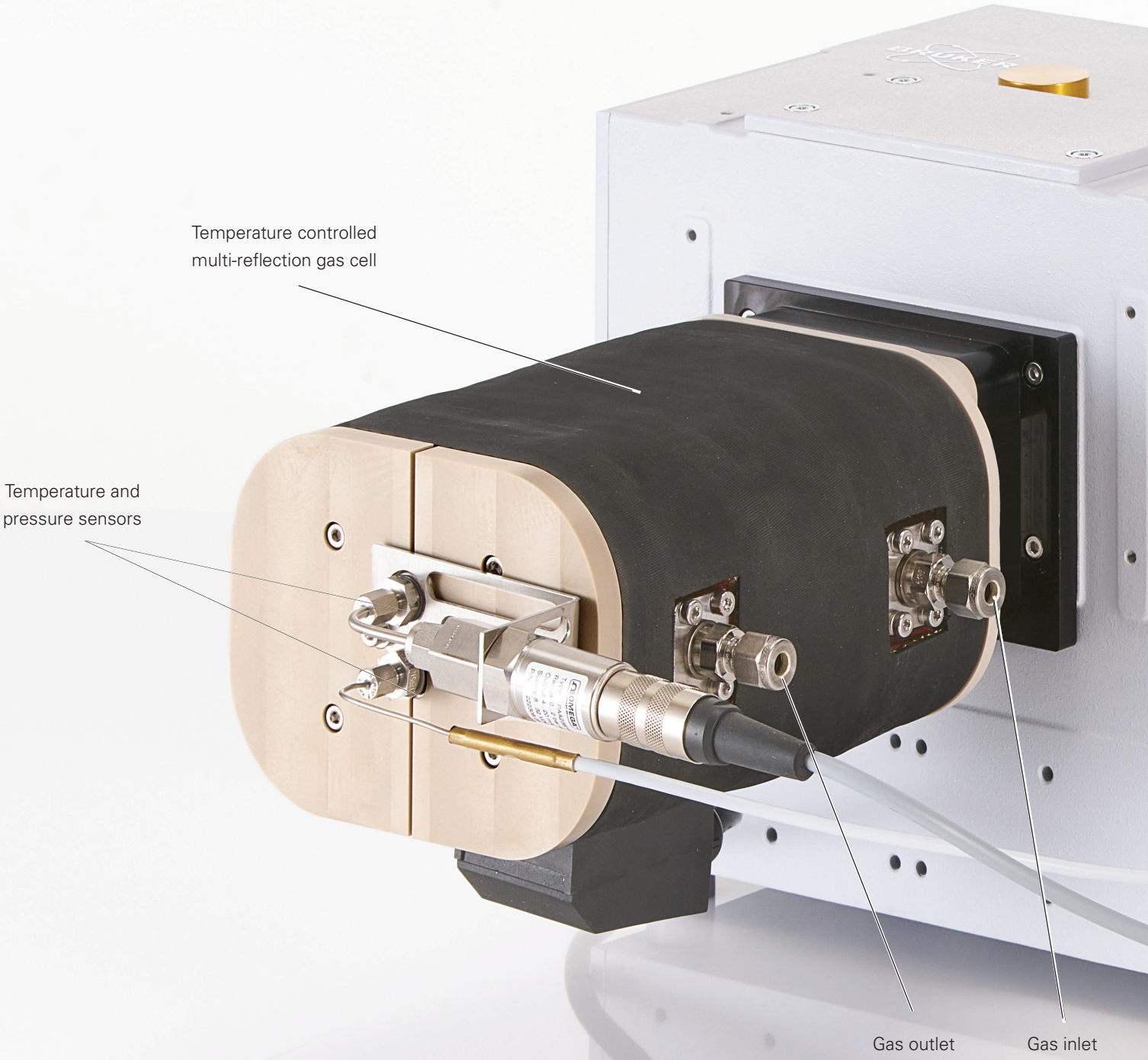
HIGH PRESSURE

The high-pressure option provides the capability to conduct gas measurements at pressures of up to 15 bar absolute (standard: up to 2 bar absolute for temperatures up to 30 °C. This option is particularly well-suited for the detection of extremely low gas concentrations, such as impurities, as well as for performing industrial online measurements of gases under elevated pressure conditions.

ROBUSTNESS

The permanently aligned RockSolid™ interferometer exhibits remarkable resilience to vibrations. The mirrors within the multi-path gas cells are gold coated for high corrosion resistance. Especially highly concentrated corrosive gases can be analyzed by the MATRIX II-MG01 due to its PTFE-coated gas cell with 10 cm optical path length which does not require any mirrors inside the cell.

Highest Performance



All gas analyzers of the MATRIX II-MG Series are based on the industry-grade IR Cube with its proven RockSolid™ interferometer. The 5 m multi-reflection gas cell of the MATRIX II-MG5 gas analyzer allows for a high optical throughput, to achieve lowest detection limits. With its nickel-plated interior surface and its gold-coated mirrors, the gas cell features a high robustness, even in presence of corrosive gases. Internal pressure and temperature sensors enable online, in-situ measurements of the gas pressure and temperature for high-precision quantification results. Due to their compact and rugged design, the gas analyzers of the MATRIX II-MG Series can be easily integrated in many industrial, scientific and even mobile applications.

Optics compartment with IR source and RockSolid™ interferometer

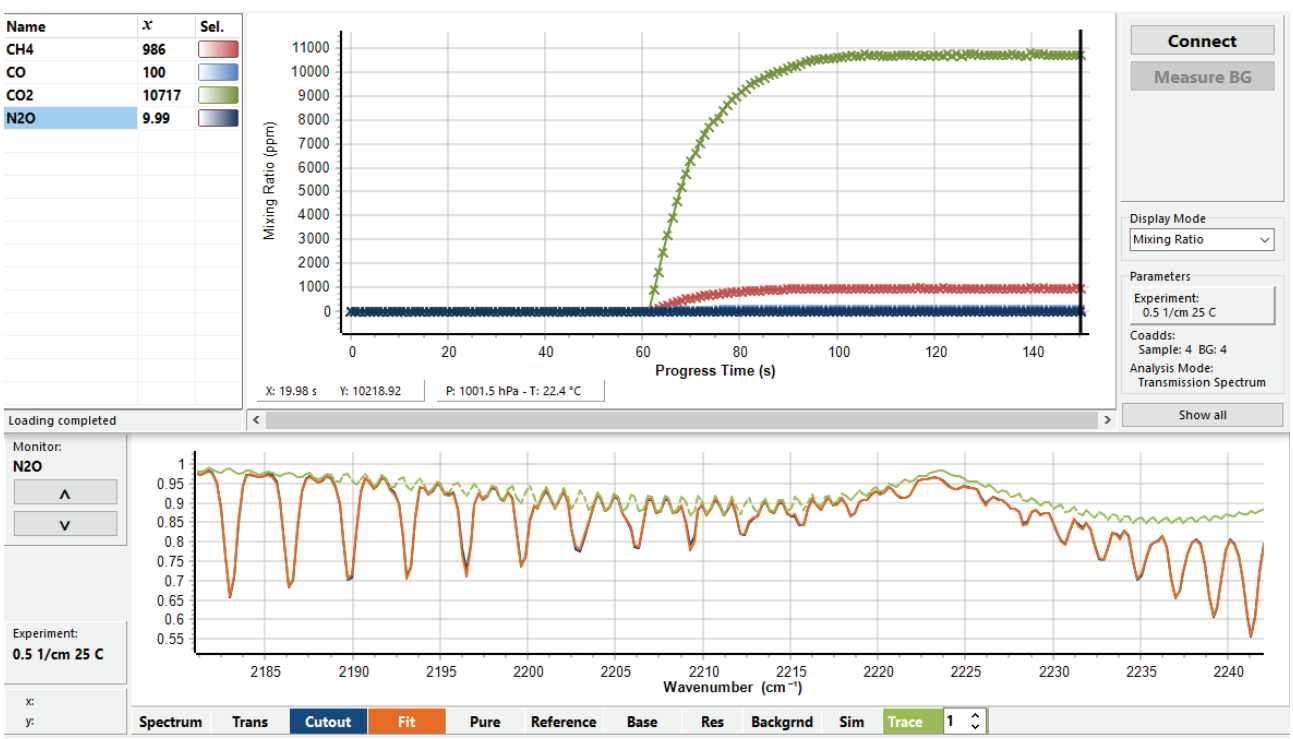
OPUS GA

Gas Analysis as Easy as can be.

The comprehensive Gas Analysis software OPUS GA allows the continuous and fully automated quantification of gas compounds without the need for calibration measurements or expert knowledge.

EASY-TO-USE.

OPUS GA establishes an easy-to-use graphical user interface to control MATRIX II-MG and OMEGA 5 gas analyzers. The user can conduct a fast, continuous and fully automated identification and quantification of gas compositions with minimum training effort. Expert knowledge in spectroscopy is not required.



OPUS GA user interface: The time series window (top) displays the concentration of selected gas compounds as a function of time. In the Spectral Analysis window (bottom), the measured spectra can be investigated in detail. The measured spectrum (blue), the fit (orange) and the contribution of the target gas N_2O (green) to the overall spectrum are shown in a selected spectral region. An excellent agreement between measured spectrum and fit is obtained.

ACCURATE.

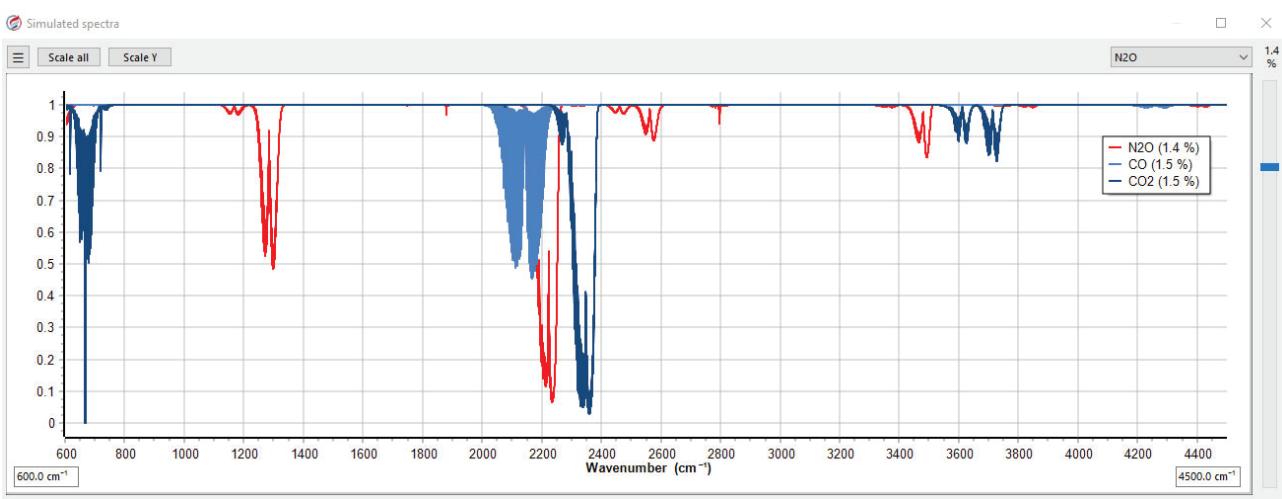
The quantification of gas compounds is based on a unique non-linear fitting algorithm which fits a reference spectrum of the target compound to the measured spectrum. The algorithm allows for an accurate detection and quantification of compounds even in the presence of high concentrations of interfering gas compounds, which are also considered in the fitting procedure. The influence of varying gas temperature and pressure is considered by the analysis routine.

FLEXIBLE.

With the available quantitative gas library, OPUS GA allows for the identification and quantification of more than 350 gas compounds without the need for calibration measurements. Adding a new quantification method for an additional compound just takes a few clicks in OPUS GA. Beyond that, individual reference spectra can be measured and added to the existing library. At any time, existing measurements can be re-analyzed based on an updated library or modified quantification methods without rerunning the measurement.

PREDICTIVE.

The sophisticated simulation tool within the OPUS GA software allows detailed simulations of the resulting spectra of gas mixtures considering variable gas concentrations. The spectra are simulated under real environmental conditions, by taking into account temperature, pressure, and the spectral resolution. Quantification methods can easily be defined through these simulations as the spectra of the analyte and of the interfering compounds are shown. As the quantification is based on a non-linear fitting algorithm, possible unexpected gas species are directly visible in the evaluated spectra.



The simulation tool can be used to visualize IR spectra of gas mixtures in order to define or modify quantification methods. The spectra of all compounds that are part of the spectral database (more than 350) can be simulated considering concentration, temperature, pressure and spectral resolution.

INTEGRATABLE.

OPUS GA can be integrated into a process control system by means of the Modbus TCP/RTU module. Additionally, analog output and a web interface for the transmission of analysis results and the measurement status can be offered. Data from external devices, such as O_2 or H_2 sensors, can be displayed in OPUS GA via analog inputs.

Specifications

	MATRIX II-MG01	MATRIX II-MG2	MATRIX II-MG 5	MATRIX II-MG26
Optical path length in gas cell	0.1 m	2 m	5 m	26 m
Maximum gas cell temperature	180 °C	191 °C	191 °C	50 °C (operation temperature)
Dimensions (depth x width x height)	~ 440 x 380 x 250 mm^3 (with protective housing)	~ 610 x 450 x 260 mm^3 (with protective housing)	~ 610 x 450 x 260 mm^3 (with protective housing)	~ 800 x 370 x 250 mm^3
Mass	~ 27 kg	~ 27 kg	~ 29 kg	~ 30 kg
Data Output	MODBUS TCP/RTU, 4-20 mA analog, integrated webserver available			
Spectral range	4800 - 720 cm^{-1} (other ranges optional)			
Detector	Liquid nitrogen cooled MCT, other detectors optional, e.g. TE-MCT, cryocooled MCT or DTGS			
Interferometer	Rocksolid™, permanently aligned			
Spectral resolution	Better than 1 cm^{-1} (apodized) Option: Better than 0.5 cm^{-1}			
Spectral rate	4 spectra/s at 4 cm^{-1} spectral resolution, 1 spectrum/s at 0.5 cm^{-1} spectral resolution Option: 30 spectra/s at 4 cm^{-1} spectral resolution, 5 spectra/s at 0.5 cm^{-1} spectral resolution			
Wavenumber accuracy	Better than 0.05 cm^{-1}			

Bruker Optics is continually improving its products and reserves the right to change specifications without notice.
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