



# MATRIX-MG Series

- Automated High-Performance Gas Analyzers



The MATRIX-MG Series comprises three 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.

#### Key Features

- Fast, continuous and fully automated identification and quantification of gas compositions
- Outstanding sensitivity, allowing to detect traces of gas compounds from a few parts per billion up to one hundred percent
- Easy-to-use & flexible software package OPUS GA
- No calibration to the target gas necessary
- Easy operation and maintenance
- Compensation of atmospheric gases and interferences
- Embedded in a compact and rugged housing
- Based on the RockSolid™ interferometer featuring permanently aligned optics and insensitivity to vibrations
- Temperature-controlled gas cell (up to 191 °C)
- Accounts for variable pressure and temperature of the gas by included sensors inside the gas cell
- Output of measurement results to industrial communication interfaces

# • MATRIX-MG Series



MATRIX-MG01



MATRIX-MG2



MATRIX-MG5

## High Dynamic Range

The gas analyzers of the MATRIX-MG Series are ideally suited for the automated fast and continuous quantification of gas compositions. Equipped with a gas cell featuring an optical path length of either 0.1 m (MG01), 2 m (MG2) or 5 m (MG5) the gas analyzers of the MATRIX-MG Series can detect and quantify gas components that occur in concentrations from only a few parts per billion (ppb) up to one hundred percent.

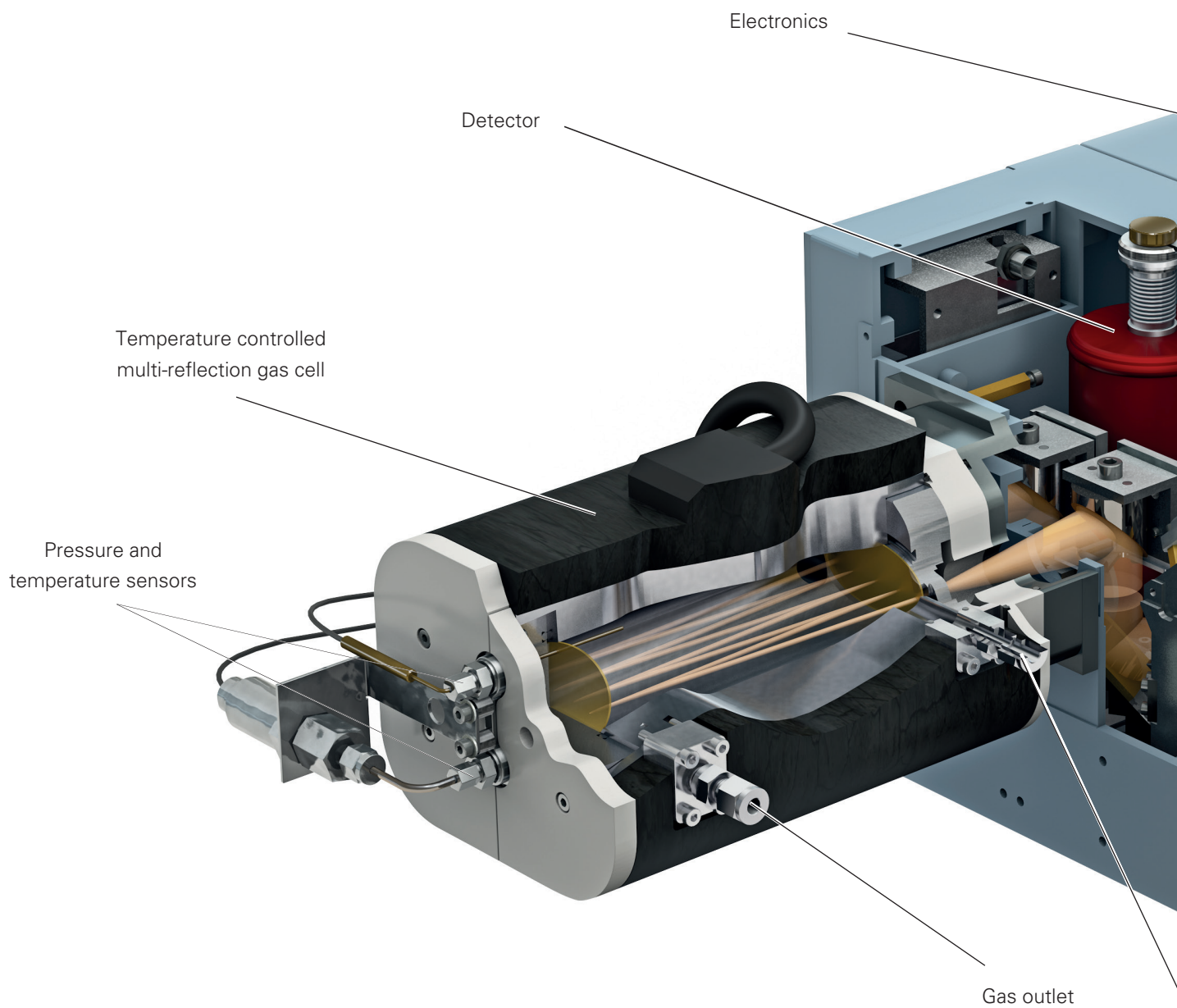
## Fully Automated Identification and Quantification in Real-Time

The MATRIX-MG spectrometers can measure up to 5 infrared spectra per second at highest spectral resolution of  $0.5 \text{ cm}^{-1}$  and up to 30 spectra per second at  $4 \text{ cm}^{-1}$  spectral resolution. From the measured spectra, the gas concentrations are retrieved automatically and in real-time by a nonlinear fitting procedure within the comprehensive software package OPUS GA, without the need for gas calibrations. The influence of interfering gases as well as of varying gas temperatures and pressures is considered by the analysis routine.

## High Versatility

Due to the vast range of gases that can be quantified (> 300 compounds are available), the MATRIX-MG Series can be used in a wide range of process applications. The comprehensive accessories allow to measure gases in a broad pressure and temperature range.

# • MATRIX-MG5





All gas analyzers of the MATRIX-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-MG5 gas analyzer allows for a high optical throughput. With its nickel-plated interior surface and its gold 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-MG Series can be easily integrated in many industrial, scientific and even mobile applications.

# • OPUS GA

- **Automatic identification and quantification of the target gas**
- **Automatic compensation of interfering compounds**
- **No calibration for target gas necessary**
- **Quantitative library with more than 300 compounds available**

## **EASY-TO-USE.**

The standalone comprehensive software package OPUS GA (OPUS Gas Analysis) establishes an easy-to-use graphical user interface to control MATRIX-MG. OPUS GA allows for the fast, continuous and fully-automated identification and quantification of gas compositions, without requiring expert knowledge.

## **FLEXIBLE.**

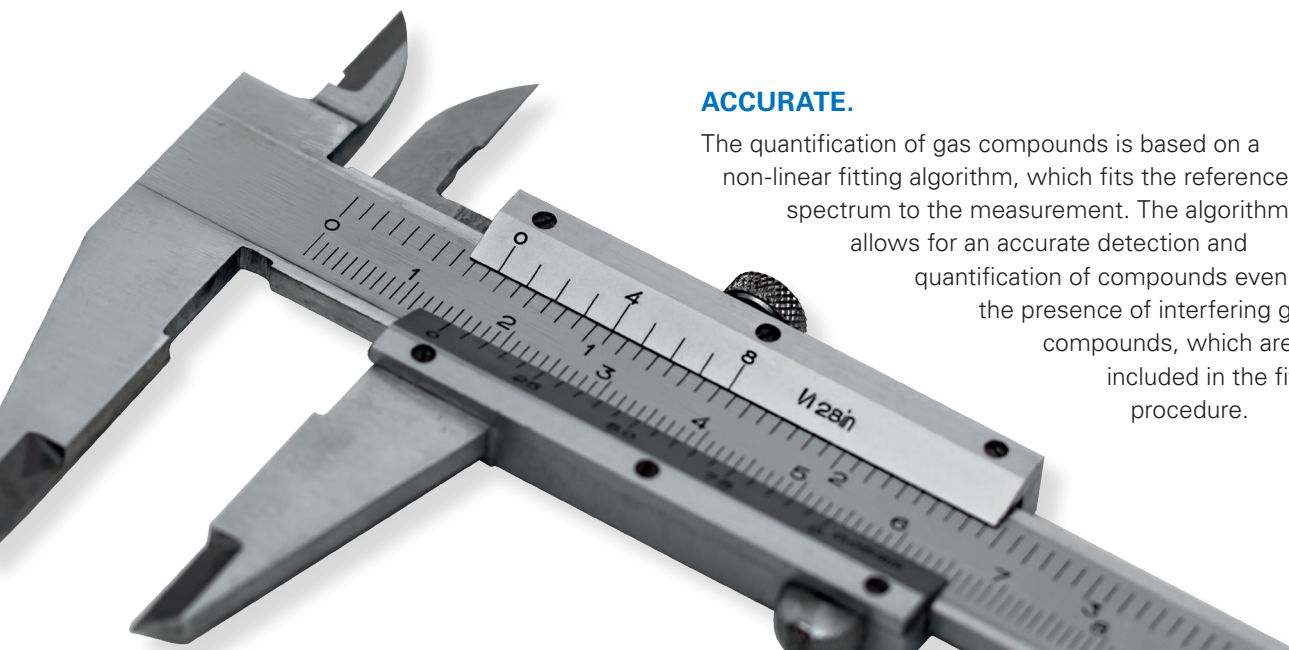
With our quantitative gas library, OPUS GA allows for the identification and quantification of more than 300 gas compounds without the need for calibration. Beyond that, OPUS GA provides an interface to measure individual reference spectra and add these to the existing library.

At any time, existing measurements can be analyzed based on an updated library of reference spectra without the need to rerun the measurement. For the expert user, the measured gas spectra can be investigated in detail within OPUS GA.



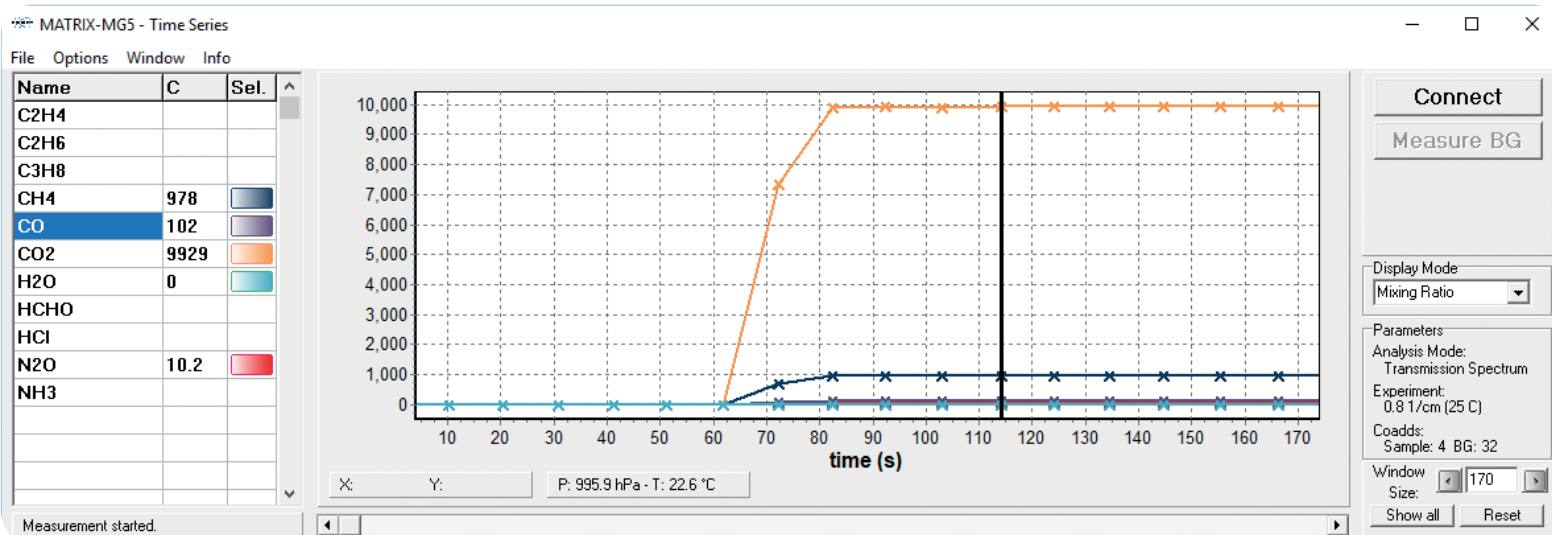
## **ACCURATE.**

The quantification of gas compounds is based on a non-linear fitting algorithm, which fits the reference spectrum to the measurement. The algorithm allows for an accurate detection and quantification of compounds even in the presence of interfering gas compounds, which are included in the fitting procedure.

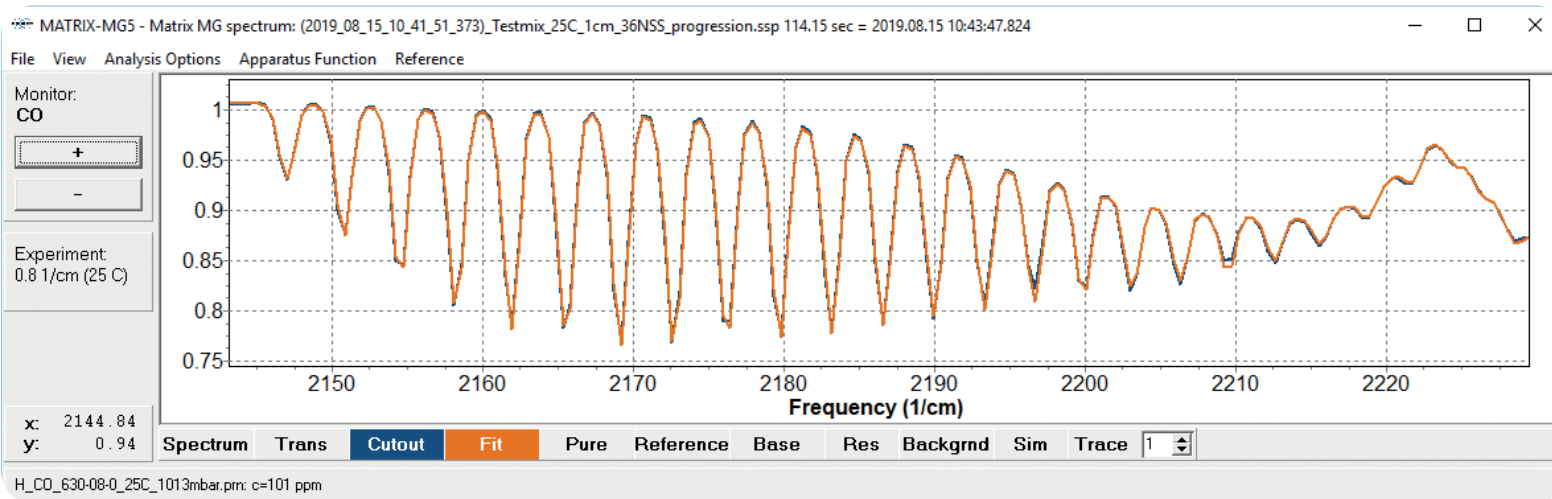


## PREDICTIVE.

OPUS GA allows the user to simulate spectra based on high-resolution reference spectra of any gas compound existing in the spectral library. The spectra are simulated under real environmental conditions, like temperature, pressure and the spectral resolution of the spectrometer. The simulation module facilitates to identify unknown compounds in a gas mixture.



Software package OPUS GA for automated identification and quantification of gas compounds. The time series window displays the concentration of selected gas compounds in a gas mixture as a function of time.



Measurement (blue) and fit (orange) to quantify the amount of carbon monoxide. Also, the contributions of the interfering carbon dioxide and nitrous oxide are considered in the fitting routine such that the measurement and the result of the fitting procedure show an excellent agreement.

# • Applications

Due to the vast range of detectable gas components (> 300 compounds are available without the need to perform calibration measurements), the MATRIX-MG can be used in a very broad field of applications. Among these are for example:





# Options

To meet the specific requirements for a very broad range of applications, we offer several different options for the MATRIX-MG Series:

## ▪ Option for Fast Gas Exchange

The Fast Gas Exchange option features a gas cell and external tubing to enable a very fast gas exchange to analyze dynamic processes with fast variability of the gas mixture, such as the exhaust gases of car engines.

## ▪ High-Resolution Option

The High-Resolution option allows to measure with a spectral resolution better than  $0.5\text{ cm}^{-1}$  (standard: better than  $1\text{ cm}^{-1}$ ) and enables the identification and quantification of gas compounds, even with highest degree of overlapping infrared signals.

## ▪ High-Pressure Option

The High-Pressure option allows the ability to measure gases at a pressure of up to 15 bar (for temperatures up to  $30^{\circ}\text{C}$ , standard: up to 2 bar). It is especially suited to detect very low gas concentrations, such as impurities in gas products, and for industrial online measurements of gases under elevated pressure.



MATRIX-MG5 with fast gas exchange option.

**A variety of accessories is available to ease the integration into dedicated applications and processes, such as pumps, heated filters, sample probes and transfer lines.**



To protect the user against hot surfaces, the MATRIX-MG gas analyzers are supplied with a protective housing around the gas cell.



To be able to reach lowest detection limits, a 26 m multi-reflection gas cell is available upon request.

# • Specifications

	<b>MG01</b>	<b>MG2</b>	<b>MG5</b>
▪ Optical path length in gas cell	0.1 m	2 m	5 m
▪ Maximum gas cell temperature	191° C	191° C	191° C
▪ Dimensions	~ 527 x 378 x 243 mm <sup>3</sup> with protective housing	~ 640 x 450 x 258 mm <sup>3</sup> with protective housing	~ 640 x 450 x 258 mm <sup>3</sup> with protective housing
▪ Mass	~ 27 kg	~ 27 kg	~ 29 kg
▪ Transmission of measurement values to industrial interfaces (such as 4-20 mA analog) available			

## Performance

- Spectral range: 4800 - 720 cm<sup>-1</sup> (other ranges optional)
- Detector: Liquid nitrogen cooled MCT, other detectors optional, e.g. DTGS, cryocooled or thermoelectrically cooled MCT
- Interferometer: Rocksolid™, permanently aligned
- Spectral resolution: Better than 1 cm<sup>-1</sup> (apodized),  
Option: better than 0.5 cm<sup>-1</sup>
- Spectral rate: 4 spectra/s at 4 cm<sup>-1</sup> spectral resolution,  
1 spectrum/s at 0.5 cm<sup>-1</sup> spectral resolution  
Option: 30 spectra/s at 4 cm<sup>-1</sup> spectral resolution,  
5 spectra/s at 0.5 cm<sup>-1</sup> spectral resolution
- Wavenumber accuracy: Better than 0.05 cm<sup>-1</sup>



### **Know How meets Service**

Bruker Optics is the leading manufacturer and worldwide supplier of Fourier Transform Infrared, Near Infrared and Raman spectrometers for various industries and applications. For years, we set new standards on the market when it comes to precision and efficiency, ergonomics and ease of operation, consulting and services.

### **Highest Quality from a Renowned Company: Always more than you expect**

We are never satisfied with the common market standards. This is where our own research and development departments play a major role: here new ideas are turned into innovative products - in more precision, advanced user comfort and unrivalled reliability. To us, it is obvious that these highest demands are also valid for our production process. High quality materials, careful workmanship and, if necessary, especially developed production processes and test routines ensure the quality that is common to all Bruker Optics spectrometers. No matter which new products we design, we place the very highest demands on them all.

### **Worldwide on-site: We are there where you need us.**

Bruker's competence is there where our customers need it - from the very first contact. Our application specialists are scientists and engineers who know infrared spectroscopy and spectrometers as well as the customers applications. With service centers all over Europe, North and South America, Asia and Oceania an efficient global technical support is guaranteed. This includes professional instructions regarding your application as well as qualified and fast after sales service and, if desired remote diagnostics.



Plenty of time for personal consultation and customer service guarantee a sustainable and efficient solution.

# Bruker

Our success stems from our commitment and dedication to provide you the proper analytical tool you require to solve a demanding research problem or run daily quality control routine procedures.

## Related Bruker Optics Instrumentation

### OMEGA 5 Gas Analyzer

OMEGA 5 is a versatile FT-IR gas analysis system in a 19 inch rackmount box equipped with a 5 m multi-reflection gas cell for the measurement of industrial gases. It is designed for automated, high-precision and real-time monitoring of gas concentrations in many different applications. Overall cost of operation and maintenance is low due to the durability of the various components such as the interferometer, IR-source and diode laser.



### OPS Open Path Air Monitoring System

The open path air monitoring system allows identification and quantification of airborne pollutants and atmospheric gases. Infrared radiation is modulated by an interferometer and transmitted to an array of retroreflectors positioned at a distance of typically several hundred meters. Typical applications include air monitoring at industrial, construction or municipal sites and high-precision quantification of atmospheric gases.

### EM 27 Remote Sensing FT-IR

The EM 27 is a ruggedized remote sensing system providing high performance Spectroscopy in the field. The EM 27 can easily be deployed in the field for various air monitoring applications. Emissions from smoke stacks, waste disposal and hazardous emissions from chemical accidents can be observed with an operating range of typically several kilometers.



### SIGIS 2 Scanning Imaging Remote Sensing System

SIGIS 2 is a scanning imaging remote sensing system that allows rapid identification, quantification and visualization of gas clouds from long distances. The system maps a predefined area and results of the analysis are visualized by a video image, overlaid by a chemical image. SIGIS systems are applied in environmental applications, atmospheric research, volcanology, and industrial facility surveillance and are part of the equipment of emergency response forces around the world.

### HI90 Hyperspectral Imaging System

The HI 90 is a high performance imaging Fourier transform spectrometer based on a focal plane array detector that allows for real-time identification, quantification and visualization of gas clouds from long distances. Each pixel of the array records an interferogram from the corresponding field of view. A spectrum is obtained by Fourier transformation and contains the infrared signature of the scene.



**Bruker Optics is ISO 9001 and ISO 13485 certified.**

Laser class 1

Technologies used are protected by one or more of the following patents:  
DE 102010051928; US 9279721

[www.bruker.com/optics](http://www.bruker.com/optics)

● **Bruker Optics Inc.**

Billerica, MA · USA  
Phone +1 (978) 439-9899  
Fax +1 (978) 663-9177  
info.bopt.us@bruker.com

**Bruker Optik GmbH**

Ettlingen · Germany  
Phone +49 (7243) 504-2000  
Fax +49 (7243) 504-2050  
info.bopt.de@bruker.com

**Bruker Shanghai Ltd.**

Shanghai · China  
Phone +86 21 51720-890  
Fax +86 21 51720-899  
info.bopt.cn@bruker.com