Bruker –
the performance leader
in life science and
analytical systems.

Right from the beginning, which is now more than fifty years ago, Bruker has been driven by a single idea: to provide the best technological solution for each analytical task.

Today, worldwide, more than 5,400 employees in over 70 locations on all continents are focusing their efforts on this permanent challenge. Bruker systems cover a broad spectrum of applications in all fields of research and development and are used in all industrial production processes for the purpose of ensuring quality and process reliability. Bruker continues to build upon its extensive range of products and solutions, expand its broad base of installed systems and maintain a strong reputation amongst its customers. As one of the world’s leading analytical instrumentation companies, Bruker remains focused on developing state-of-the-art technologies and innovative solutions for today’s ever complex analytical questions.

Bruker – Innovation with Integrity
X-Ray and Elemental Analysis
- X-Ray Fluorescence (XRF)
- X-Ray Diffraction (XRD)
- Crystallography
- Energy Dispersive X-Ray Spectroscopy (EDS)
- Optical Emission Spectroscopy (OES)
- CS/ONH Analysis

Magnetic Resonance
- Nuclear Magnetic Resonance (NMR)
- Magnetic Resonance Imaging (MRI)
- Electron Paramagnetic Resonance (EPR)

Mass Spectrometry and Chemical Analysis
- FT-Mass Spectrometry (FTMS)
- MALDI
- Liquid Chromatography – Mass-Spectrometry (LC-MS)
- Inductively Coupled Plasma – Mass-Spectrometry (ICP-MS)
- Gas Chromatography – Mass Spectrometry (GC-MS)
- CBRNE Detection

Optical Vibrational Spectroscopy
- FT-Infrared Spectroscopy (FT-IR)
- Raman Spectroscopy
- Near Infrared Spectroscopy (NIR)

Microanalysis
- Atomic Force Microscopy (AFM)
- Scanning Probe Microscopy (SPM)
- Stylus and Optical Metrology
- Tribology
Bruker Corporation

The Bruker name has become synonymous with the excellence, innovation and quality that characterizes our comprehensive range of scientific instrumentation. Our trusted solutions encompass a wide number of analytical techniques ranging from Magnetic Resonance to Mass Spectrometry and Gas Chromatography, to Microanalysis, Optical, and X-Ray Spectroscopy. These market- and technology-leading products are driving and facilitating many key application areas such as life science research, pharmaceutical analysis, applied analytical chemistry applications, materials research and nanotechnology, clinical research, molecular diagnostics and homeland defense. Visit our website to discover more about our technologies and solutions.

www.bruker.com
Bruker – analytical excellence, acknowledged expertise and global presence.
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Nuclear Magnetic Resonance

Solutions for Life Science and Analytical Research

Innovation with Integrity
Fourier brings NMR within everyone’s reach. It delivers powerful performance at extremely compact size, low weight and most importantly, minimal cost. With its new Fourier probe technology and a unique push-button, power on/off concept, ease of siting and handling is guaranteed. Designed and built by the world’s NMR market leader, Fourier unique qualities include the industry standard operating software, TopSpin™. TopSpin’s various tools for exploring the world of NMR make Fourier the ideal solution for chemistry education and routine analysis. Researchers have access to numerous pre-defined 1D and 2D experiments and interactive, automated processing tools help to transfer spectroscopic data into a corresponding report.

Benefits
- Affordable NMR spectrometer for chemistry education and small molecule analysis
- Industry standard TopSpin software
- High throughput SampleXpress Lite 16 position sample changer
- Proven IconNMR software for automation control
- New robust Fourier NMR probe for easy handling
- 1D/2D proton and carbon NMR for every chemist
The AVANCE™ III HD is the ultimate NMR platform for life-sciences and materials research. Robust, automated and easy-to-use, it is the ideal NMR analysis system for the pharmaceutical, biotech, and chemical industries, for metabolomics, materials science, molecular diagnostics, and much more.

The AVANCE III HD is the newest generation in the very successful AVANCE series, which has established Bruker as the clear technological and market leader in NMR and pre-clinical MRI worldwide. The AVANCE III HD spectrometer architecture is designed around an advanced digital concept which provides an optimized pathway for high-speed RF generation and data acquisition with highly modular and scalable transmitters and multiple receiver channels.

The AVANCE III HD spectrometer benefits from a new RF synthesizer with significantly increased digital integration, incorporating a lower phase noise local oscillator (LO) and a high speed DA converter running at 960 MHz. This enables extended digital RF power settings up to NMR frequencies of 1.2 GHz. Together with the new high dynamic range and high sensitivity preamplifiers, the AVANCE III HD demonstrates improved artefacts, fully exploits the increased sensitivity of the latest NMR probe technology and delivers sensitivity improvements of up to 30% for the most demanding of applications.

Benefits
- NMR Thermometer™
- Minimum event time: 25 ns
- High-speed RF generation and data acquisition
- Scalable transmitters and multiple receiver channels
- High-dynamic range and digital resolution
- Large-bandwidth digital filtering

Ultra-High Field AVANCE III 850 MHz NMR system
AVANCE III HD NanoBay

The most fully integrated state-of-the-art NMR spectrometer ever

The AVANCE™ III HD NanoBay is the most comprehensively integrated, state-of-the-art NMR spectrometer ever produced. The NanoBay’s bold, innovative design manages to reconstruct Bruker’s high-performance AVANCE III HD NMR spectrometer technology within an exceptionally compact enclosure.

It delivers high-productivity with highest quality NMR information for pharmaceutical and industrial chemists, as well as food analysis, diagnostics research and other small molecule applications.

AMIX™ provides a collection of powerful tools that enable statistical and spectroscopic analyses of your NMR data, and delivers increased productivity for a wide variety of applications, such as metabolomics, small molecules research and mixture analysis.

IconNMR™ is the graphical user interface for fully automated acquisition and processing. This productivity tool excels whenever large numbers of samples accrue, or where multiple users access your spectrometer.

Benefits

- Ultra compact, innovative high-end NMR spectrometer
- Available at 300 and 400 MHz
- Full HD NMR electronics
- Broadband / Full automation
- Built-in ‘CryoProbe ready’ preamplifiers
- Easy siting in small analytical laboratories
- TopSpin™ - intuitive routine user interface
- NMR Thermometer™ ready
- High-fidelity NMR information for a wide range of chemical applications

AVANCE III HD NanoBay 400 MHz spectrometer
AVANCE 1000

Bruker is proud to provide the world’s highest field NMR system of highest sensitivity and dispersion to the scientific research community. The AVANCE 1000 pushes biochemistry, structural biology and molecular research to new frontiers.

The first AVANCE 1000 NMR system equipped with a CryoProbe has been installed at the new ‘Centre de RMN à Très Haut Champs’ in Lyon, France.

- 1 GHz NMR system with 23.5 T persistent superconducting magnet
- Standard bore, 54 mm diameter
- UltraStabilized™ sub-cooling technology, achieving the highest field and most compact magnet coil at this field strength
- Proprietary jointing technology enabling high current and high-field joints with minimum resistance for maximum field stability
- 5-mm triple-resonance CryoProbe, enabling unique 1 GHz NMR applications
- 1.3-mm, 2.5-mm & 3.2-mm double and triple resonance MAS probes, enabling unique 1 GHz NMR solids applications

NMR structure determination of the conserved secondary structural motif of 23S rRNAs by John King, Christos Shammas and Vasudevan Ramesh, (University of Manchester).

RNA, 3D NOESY-(13C)-HSQC at 1 GHz with CryoProbe

Solid State NMR 15N-13C correlations at 1 GHz

Comparison of 13C planes of the 1 GHz and 800 MHz 3D NOESY-(13C)-HSQC spectra. (A) (139.29ppm) (A27) (B) (138.96 ppm) arising from G20 HB proton and the NOEs observed thereof to G19.

Acknowledgements:
Dr. Moreno Lelli, Dr. Józef Lewandowski, Dr. Guido Pintacuda, Dr. Anne Lesage, Dr. Benedicte Elena, and Prof. Lyndon Emsley with CRMN, Lyon, France.
Dynamic Nuclear Polarization (DNP) experiments transfer polarization from electron to nuclear spins, enhancing sensitivity and dramatically reducing signal averaging time. Bruker AVANCE DNP-NMR spectrometers are designed specifically for solid-state NMR, delivering unsurpassed sensitivity for exciting new applications.

### Benefits
- DNP-enhanced solid-state NMR experiments at high field
- Polarization enhancement yields up to a factor of 80 gain in sensitivity, to date
- Unique high power 263 GHz micro-wave source with easy-to-use software-controlled high-power gyrotron (9.7 T)
- Microwave transmission line designed for optimum beam propagation to the sample
- Low-temperature MAS probe technology with cold spinning gas supply and built-in wave guide
- 395 GHz (600 MHz 1H) and 528 GHz (800 MHz 1H) spectrometers in development

DNP experiments on membrane-associated HIV gp41 protein with uniform 13C,15N labeling at Ala-6 and Gly-10. (a) 13C CPMAS spectra with and without μwaves showing a factor of 22 DNP signal enhancement at 100 K, 8 kHz MAS, 32 scans, 5 s recycle delay. (b) DNP-enhanced DARR 13C-13C correlation experiment with 15 ms mixing time, 32 scans, 8 kHz MAS, and 200 points in f1.

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**DNP CPMAS of 13C-Proline**

13C CPMAS spectra with and without microwaves irradiation of a micro-crystalline yeast Triose Phosphate Isomerase (TIM) frozen solution with 20 mM TOTAPOL. 32 scans, 2 s recycle delay, 9 kHz MAS, 100 K sample temperature, 400 MHz 1H frequency.

**DNP on membrane proteins**

Courtesy of Prof. David Weliky, Michigan State University
Metabolic profiling and fingerprinting is a key process in the pharmaceutical industry for studying drug efficacy or toxicology. In clinical research, metabolic profiling helps to identify biomarker compounds for early disease detection and monitoring, and enables researchers to study the effects of drugs in biological systems in a rapid and robust method.

**Integrated Analysis**
The Metabolic Profiler™ is a dedicated, integrated LC-NMR/MS solution for metabolic analysis featuring an AVANCE NMR spectrometer and a micrOTOF-Q II™. This system provides a simple, easy-to-use and inexpensive base for acquiring the spectroscopic data needed for basic metabolic profiling. The system delivers the integration of automated sample handling, acquisition, collection and archiving of your data, and enables the comparative and statistical analysis needed for your research.

**Data Management**
SampleTrack™ is an Oracle®-based information system that utilizes SQL tools for organizing, searching and archiving sample information, which can simplify experimental control of large sample sets.

**Statistical Analysis**
The AMIX program provides a comprehensive range of powerful tools that enable statistical and spectroscopic analyses of both your NMR and MS data. AMIX features Pattern Match - which can define spectral patterns in multiple ways and project these to spectra. In addition, the Multi-Integration features can be used to identify and quantify metabolites in complex mixtures.

**Reference Compound Spectral Database**
The most complete metabolite NMR spectral database available which contains over 17,000 spectra of the most common endogenous metabolites. By taking into account the effects of pH, field strength and by using one as well as two dimensional NMR data, the database enables the assignment of metabolites in biofluids, cell extracts and tissues in a unique and unambiguous way. Linking the database to AMIX enables automatic investigations, such as matching to mixture spectra. Direct integration into statistical data evaluation is also possible.

**Analysis with AMIX**
AMIX™ analyzes data and is linked to the Spectral Database for further comparative analysis.
Bruker has specialized in the design and production of magnets and cryogenic systems for a wide range of applications, becoming the world’s largest manufacturer of superconducting magnets for NMR. Bruker is engaged in every aspect of the magnet business including research and development, production and testing, individual site planning, as well as service and support.

**UltraStabilized**

UltraStabilized™ is our innovative magnet technology for Ultra-High Field NMR up to 1000 MHz. This proprietary technology provides reliable, stable operation at reduced helium bath temperature and ambient pressure.

**US²**

The US² represents the efficient combination of Bruker’s renowned magnet technologies (UltraStabilized™ and UltraShield™) for enhanced system performance and siting flexibility at Ultra-High Field strength.

**Ascend**

This new magnet line at 400 to 850 MHz incorporates the key technologies of the well-established UltraShield™ Plus magnets, with new innovations for superior performance. The Ascend™ magnet design features advanced superconductor technology, enabling the design of smaller magnet coils, resulting in a significant reduction in the size of the cryostat. Ascend magnets are therefore easier to site, safer to run and have lower operational costs. These high-performance systems are ideal for structural biology research and materials research applications.
Room Temperature Probes

**X Observe Probes**
These probes are optimized for observation of X-nuclei. They are available in selective or broadbanded versions for double, triple and quadruple resonance experiments, including automated tuning and matching.

**1H Inverse Probes**
The inner coil of these versatile probes, in multinuclear or selective configuration, is fully optimized for 1H observation at highest sensitivity with optimal line-shape. The available configurations and choices of X-nuclei are identical to those for X Observe Probes.

**Inverse MicroProbes**
For highest 1H sensitivity per mole of substance, e.g. in natural products applications, Bruker offers 1- and 1.7-mm 1H/13C/15N fixed-frequency probes.

**SmartProbe**
The SmartProbe™ delivers highest sensitivity on both the multinuclear and proton channel. The SmartProbe design exclusively features a broadband frequency channel enabling fully automated applications on protons and the widest range of X-nuclei. This unique probe technology enables fluorine applications including 19F observe with 1H decoupling and vice versa.

**SmartProbe Applications with X-nuclei**
Comparison of the 19F, 1H HOESY and HMBC experiment. While the HOESY spectrum has a correlation to the proton of the heterocycle, the HMBC shows a correlation to the NH protons.
CryoProbes & Prodigy

CryoProbe™ technology has delivered the single largest increase in detection sensitivity ever achieved in the evolution of NMR equipment. The factor 3-4 jump in sensitivity enables the use of correspondingly smaller sample quantities that are impractical with conventional probes, or enables the user to increase sample throughput up to 16-fold.

Product Lines

Bruker offers the largest range of CryoProbe configurations from 400 MHz to 1000 MHz, including proton optimized probes such as our 1.7- and 5-mm inverse triple-resonance probes, as well as 10-mm dual 13C observe probes.

The 1.7-mm Micro-CryoProbe offers an increase in sensitivity per mole of more than an order of magnitude compared to a conventional 5-mm probe. For optimal X-nucleus detection we offer the 5-mm Quad CryoProbe in 13C/15N/19F/1H and 15N/13C/31P/1H versions. All high-resolution CryoProbes are equipped with a 2H lock and a Z-gradient. A 1H micro-imaging CryoProbe is also offered to enhance the study of sample structure and properties in the micrometer range.

Prodigy

CryoProbe Prodigy is a new, revolutionary CryoProbe that delivers tremendous boosts in sensitivity at an affordable price. Costing significantly less than a conventional CryoProbe, the broadband CryoProbe Prodigy uses nitrogen-cooled RF coils and preamplifiers to deliver a sensitivity enhancement over room temperature (RT) probes of a factor of 2 to 3 for X-nuclei from 15N to 31P. The sensitivity gain on the proton channel exceeds standard probe performance by a factor of 2 or more.

The CryoProbe Prodigy is now also available as triple resonance inverse probe (TCI).
Solids Probes

Our comprehensive range of the most advanced solids probes is ideal for inorganic and biological samples using experiments such as CP, d.CP, MQMAS, or REDOR.

Maximal spinning rates are 70 kHz for the ultra-high speed 1.3-mm MAS probe for materials science, 30 kHz for the 3.2-mm triple-resonance Efree MAS probe for protein research, and 15 kHz for the 4-mm HR-MAS probe with Z gradient for metabolomics studies.

Our BioSolids probes are based on one of two technologies, TL₂ or Efree. For optimum performance these probes are configured as fixed frequency triple-resonance probes, most often requested for proton, carbon and nitrogen. TL₂ probes yield the best overall sensitivity with high ¹H sensitivity for inverse detection experiments.

TL₂ technology is the choice when high-decoupling fields are needed for optimum decoupling in J-coupling based experiments and when sample heating is not an issue. TL₂ probes are best used for dry and non-salty samples, or samples that are kept in a frozen state.

Efree probes are specifically designed to minimize RF heating. The two coil configuration provides enhanced sensitivity for ¹³C and ¹⁵N and the highest tuning and matching stability for safe, long term experiments. Minimized RF heating ensures the integrity of your protein, even while operating at room temperature.

1.3-mm MAS

The 1.3-mm probe product line provides the highest spinning speeds coupled with high-sensitivity and RF fields. Where sample heating might become an issue, convenient low power decoupling can be employed.

1.9-mm MAS

The new 1.9-mm MAS probe now enables fast spinning of nuclei less sensitive than ¹⁹F and ¹H, offering 42 kHz spinning frequency at 10 μL active sample volume.

NMR using fast magic angle spinning

700 MHz 2D FSLG-HETCOR of L-tyrosine-HCl. Spinning frequency was 42 kHz, RF field for FSLG was 140 kHz. Projections are 1D ¹³C CP/ MAS and ¹H wPMLG-5 spectra, respectively. Note that only directly bonded ¹H–¹³C correlations are visible.

NCO PAIN CP with ultrafast sample rotation. Spectra with 3 ms (red) and 6ms (blue) mixing time for long distance contacts in GB1 at 60 kHz rotation, 5°C with 75–80 kHz, ¹³C, ¹⁵N and 15 kHz on ¹H. (Lewandowski et al. JACS 129, 728 (2007))
Ideal for first-time spectrometer users as well as routine users, TopSpin’s different acquisition tools make it easy for both beginner and expert to find their way to an NMR spectrum.

TopSpin provides a wealth of data processing visualization and administration features, including:
- Comprehensive functionalities for dealing with 1D to 5D data including automatic forward/backward or delayed linear prediction
- Inverse Fourier transform processing of rows, columns, planes and sub-cubes of nD datasets
- Interactive and automatic multi-dimensional peak picking and integration.

**Features**
- PC-standard user interface offers easy accessibility for Windows® and Linux® users
- Comprehensive functionalities for processing, displaying and analyzing single and multi-dimensional spectra
- Intuitive acquisition
- Non-uniform sampling
- Small molecule characterization
- BioTools™ - Biomolecular NMR made easy
- Method development environment
- Result publishing, predefined and user-defined layouts
- Lineshape analysis for solid-state NMR, including dynamic NMR
- Regulatory compliance support tools (audit trailing, electronic signature, autoarchiving)
- Special licenses for students and universities

**TopSpin for Mac OS X**

Entirely programmed in the native Apple Mac OS X environment, the new TopSpin software caters to MAC users’ familiarity with the unique and intuitive characteristics of that operating system, while maintaining the proven capabilities, look and feel of TopSpin. Incorporating a comprehensive range of NMR data analysis, processing and simulation features, TopSpin includes modules for efficient small molecule characterization and structural biology research.
AVANCE™ NMR systems meet the most demanding automation needs by streamlining every aspect of NMR analysis, including sample submission, sample preparation, automatic probe tuning, data acquisition, processing, data distribution and archiving. Depending on the laboratory’s needs or goals, automation may involve high-throughput screening, overnight automation or multi-user open access.

**IconNMR**
This productivity tool excels whenever large numbers of samples are submitted for standardized experiments, or when many users access the spectrometer. IconNMR™ supports sample changers and sample preparation robots. The user can set up or supervise measurements remotely via a Web browser from a desktop or pocket PC.

**SampleJet**
SampleJet™ changer for 300-700 MHz NMR systems offers both high-throughput as well as individual sample capabilities in a single NMR sample changer. Its versatile design can accept samples from five 96-position racks, allowing batch analysis of up to 480 tubes. In addition, the SampleJet easily accepts single tube samples via a separate carousel that can hold up to forty-seven 1-, 1.7-, 3- and 5-mm tubes.

**SampleCase**
SampleCase™ is the first NMR automation solution that provides easy, safe and convenient access to fully-fledged NMR automation at user height. Ensuring simple random access automation without the need for steps or ladders, it also enables manual insertion and ejection of samples with the simple push of a button. The user-friendly system can be fitted to almost any Bruker NMR magnet.

**SampleXpress**
Bruker’s easy-to-use, cost-effective solution for medium-throughput automation in NMR routine and research applications. Its compact, exceptionally integrated design drastically reduces sample exchange times to just a few seconds, making SampleXpress™ ideal for optimizing throughput in standard NMR service laboratories running 30-100 samples per day. In addition, efficiency is maximised thanks to interchangeable, easy-fill cassette modules that can be loaded off-system and in parallel with current experiments. The system is also equipped with integrated bar code reader for automatic sample identification.
Complete Molecular Confidence (CMC™)

CMC-i: Structure Consistency Analysis

Only complete computational NMR spectral analysis provides a safe assessment of the consistency between a given structure and its 1H NMR spectrum. Finally those tedious manual procedures have been overcome. Fully automated optimization of predicted spectral parameters to match experimental data using iterative spectral analysis is now a reality.

- Complete NMR spectral analysis yielding fully assigned spectra and highly accurate spectral parameters extracted from data, even for overlapping signals and strongly coupled spin systems
- Benefits from PERCH’s highly sophisticated algorithms for predicting chemical shifts and couplings and optimizing them to match the experimental data using iterative quantum mechanical spectral analysis
- Extremely safe assessment of the consistency between a given structure and its 1H NMR spectrum data based upon the quality of the fit and the similarity between predicted and actual spectral parameters, with optional use of HSQC information
- Highly reliable estimation of sample purity

CMC-q: Absolute Quantification

Complete Molecular Confidence for quantification (CMC-q) is a complete workflow solution that facilitates automatic NMR-based quality assurance in batches.

- CMC-q provides quick access to automated NMR quality assurance and quantification of larger batches of samples. Delivering accurate, precise information on sample concentration and water content in typical screening samples, CMC-q also marks questionable structures and provides a suggestion for spectral assignment. This is ideally complemented with LC-MS information such as that derived from Bruker’s SmartFormula program.
- Operating on a file-in, file-out basis, the user supplies an input file describing the samples to be measured, and receives an output file of results.
- The spectra interpretation function can also analyze individual datasets and prepare spectra for publication or for further analysis.
CMC-se is an NMR software package for simple and efficient structure elucidation of small molecules. With its innovative approach, CMC-se accelerates the spectroscopist’s workflow during the elucidation process by automating many of the key analysis and interpretation steps. In combination with Bruker's Avance™ NMR spectrometer product line, CMC-se is the only elucidation tool that integrates high-quality NMR data acquisition with sophisticated software analysis. CMC-se is available for the major operating systems: Windows®, Linux® and Mac OS® X.

CMC-assist is the most powerful software tool for interactive, assisted NMR data analysis is now available. Designed for NMR end-users, CMC-assist efficiently extracts information from complex NMR data, conducts assessments and generates detailed reports for direct transfer to publications, patents and lab journals. CMC-assist not only excels as an off-line analysis interface but its automated NMR interpretation power can also be used to generate results directly at any Bruker NMR instrument equipped with the latest control software, making it the most efficient and streamlined NMR workflow on the market.

- Seamless integration with Bruker spectrometers
- State-of-the-art analysis engine, powered by modern human logic emulation algorithms
- Automatic results may be refined manually

CMC-assist: Data Interpretation and Workflow Streamlining

The most powerful software tool for interactive, assisted NMR data analysis is now available. Designed for NMR end-users, CMC-assist efficiently extracts information from complex NMR data, conducts assessments and generates detailed reports for direct transfer to publications, patents and lab journals. CMC-assist not only excels as an off-line analysis interface but its automated NMR interpretation power can also be used to generate results directly at any Bruker NMR instrument equipped with the latest control software, making it the most efficient and streamlined NMR workflow on the market.

- Seamless integration with Bruker spectrometers
- State-of-the-art analysis engine, powered by modern human logic emulation algorithms
- Automatic results may be refined manually

CMC-assist User Interface

CMC-assist & CMC-se

- Autofocus data analysis includes:
  - Integration and $^1$H number determination
  - Multiplet analysis
  - Structural assignment
  - Consistency statement
  - Concentration
- Reports include detailed PDF and multiplet string in different journal formats
- Windows, Linux or Mac operation systems are fully supported

CMC-se: Structure Elucidation

CMC-se is an NMR software package for simple and efficient structure elucidation of small molecules. With its innovative approach, CMC-se accelerates the spectroscopist’s workflow during the elucidation process by automating many of the key analysis and interpretation steps. In combination with Bruker’s Avance™ NMR spectrometer product line, CMC-se is the only elucidation tool that integrates high-quality NMR data acquisition with sophisticated software analysis. CMC-se is available for the major operating systems: Windows®, Linux® and Mac OS® X.

- Simple and efficient structure elucidation of small molecules in drug discovery and natural products research
- Automates many of the necessary analysis and interpretation steps
- Seamless integration of NMR acquisition and sophisticated software analysis
- Enables both accomplished researchers and beginners to expedite the elucidation of unknown substances in diverse pharmaceutical and chemical applications
- Organizes the data for a molecule into a single project, and provides unique graphical tools for data visualization and interpretation
Assure

Assure RMS-Raw Material Screening

Impurities and adulterants in starting materials pose potential health threats when present in the manufacturing of pharmaceutical APIs and drug products. These same impurities and adulterants may also result in lower production yields and increased product purification. Screening starting materials by NMR using Assure - Raw Material Screening identifies problem samples prior to use and prevents costly manufacturing mistakes. Designed for GMP and GLP environments, Assure - Raw Material Screening provides a traceable record of sample analysis and results. Applications include pharmaceutical and chemical production and analytical reference standards.

Features
- System suitability test for GMP/GLP labs
- Automated data acquisition
- Automated quantitative and qualitative analysis
- Automated report generation
- QC report - a ‘pass’ or ‘fail’ report
- Detailed expert report - total analysis
- Lock-out mode for access-limited users
- Convenience features
- Sample SBASE/KBASE
- Customizable

Quantification results of main components and impurities are reported in a simple to read format with a user defined ‘pass/fail’ threshold.

Assure SST - System Suitability

Assure-System Suitability Test (SST) is the ideal tool for any NMR spectroscopy laboratory. In full automation, the NMR spectrometer is validated regularly for instrument performance and optimized before you run your samples. Choose from a list of available individual tests to perform lineshape and sensitivity measurements on your liquid-state NMR spectrometer that will run at a time convenient for your facility.

Probe-specific parameter settings enable use on practically any liquid-state NMR probe. Assure-SST’s Temperature Calibration feature calibrates AND adjusts the temperature of the sample to the actual desired value. Accuracy in temperature provides optimal results for spectral reproducibility from instrument to instrument.

- Fully automated performance validation
- Instrument optimization
- Monitors performance of ‘walk-up’ instruments
- Enables NMR specialist to produce more results
- Improves data quality
- Meets GLP requirements
JuiceScreener

The JuiceScreener™, combined with its SGF Profiling™ technique, delivers huge amounts of information from one single experiment, instead of multiple individual analysis steps. This provides higher throughput and reliability than conventional techniques, leading to a significant reduction in cost per sample. This enables up to 5 times more sample investigations with no change in budget, resulting in an improved and more comprehensive quality control screening program.

Push-Button Routine
SGF Profiling is a fully automated push-button routine that needs no interaction from the operator. From sample bar code registration, preparation and handling, to data acquisition and statistical evaluation, all steps are under the control of SampleTrack™, Bruker’s laboratory information system.

Spectroscopic Database
Screening is based on a constantly updated, extensive spectroscopic database that includes thousands of NMR spectra from mainly authentic juices. Currently the database includes about 40 different fruit types from more than 50 production sites worldwide. In addition, the database also provides access to hundreds of small molecule compounds for further analysis of unknown ingredients.

Features
- Fully automated push-button NMR solution including evaluation and reporting
- Simultaneous absolute quantification of all relevant organic ingredients for juice assessment
- High-throughput with minimal sample preparation
- Reduced cost per sample
- Reliable screening method providing targeted and non-targeted multi-marker analyses
- Enables the detection of unexpected fraud
- Screening is based on an extensive NMR spectroscopic database of more than 8000 reference juices, obtained from production sites all over the world
- Complex statistical models enable the analysis of: origin authenticity, species purity, fruit content, false labeling, production process control and sample similarity

Origin Authentication of Orange Juice
Major tools for small molecule research and mixture analysis include HPLC, SPE, NMR and MS. Bruker offers hyphenated systems to meet various research needs. While NMR can be used to investigate the complete mixture, LC-NMR can analyze the individual compounds separated by the chromatography. An LC-NMR interface can easily be added to any NMR system from Bruker thereby also enabling hyphenated LC-(SPE)-NMR/(MS) applications. By combining the structural resolving power of NMR for the separated compounds with the mass accuracy of the microTOF, we can offer the most complete system for structural analysis available today.

**LC-(SPE)-NMR**

Two different methods for coupling are possible: either by coupling the chromatography system directly to the NMR spectrometer, or by the intermediate collection of the samples. Direct coupling can be performed as stopflow or on-flow analysis. For intermediate collection loop-storage or collection on solid phase extraction (SPE)-cartridges is possible.

The use of SPE provides an efficient interface between chromatography and NMR even enabling the analysis of low level metabolites.

**LC-SPE-NMR-MS Results**

LC-(SPE)-NMR-MS of Apple Juice high resolution mass spectra from m/z 355.1034 (upper part) of chlorogenic acid and the comparison with ion trap library (lower part) $^1$H NMR spectrum of chlorogenic acid and the comparison with reference compound commercially available.
Immediate Access to Latest Technologies

Contract Bruker Analytical Services

Everyone can now benefit from Bruker’s latest technologies, instrumentation, and unmatched experience in analytical applications. We offer supporting services that include advanced high-resolution NMR and mass spectrometry applications. Our customers can benefit from access to the latest developments in the field through Bruker’s cooperations with academic and industrial research labs. Our experts can also assist you with special customized projects.

Benefits

- Short and long term support increases project handling capacity
- Latest, most advanced Bruker technologies
- Unique analytical expertise and knowledge
- Method development and feasibility studies

Advanced NMR Services

- Structure verification and elucidation
- Reaction and purity control
- Quantitative analysis
- Variable temperature experiments
- Screening methods for pharmaceutical and clinical research
- Food quality control
- Juice analysis using SGF-profiling
- Metabonomics studies
- Natural product analysis

Additional Analytical Services

- Mass Spectrometry & Imaging
- EPR (ESR) Spectroscopy
- TD (Time Domain) NMR Spectroscopy
- X-ray Diffraction, Crystallography & Fluorescence
- FT-IR Spectroscopy & Microscopy
- Raman Spectroscopy & Microscopy
- LC-(SPE)-NMR/MS

Customized Projects

When additional measures are needed, our technical experts will discuss the range of special capabilities available to you. Whether it is a short term project where specialized equipment is a necessity, method development is required or feasibility studies are needed, we can help you with our extensive resources.
High-Performance Power Supplies

High-Voltage Power Supplies
Bruker high-voltage power supplies find their main applications in IOT- and Klystron-based RF transmitters in Particle Physics. Our power supplies provide high-voltages of up to 50 kV at broad range, from 1 kW up to several Megawatts. The compact solid-state design is based either on the latest switch mode technique or, in the case of highest power applications, based on SCR (Thyristor) control.

High-Current Power Supplies
Bruker high-current power supplies are employed in industry and particle physics research worldwide. Our high-current power supplies, available for pulsed or DC, monopolar, bipolar or four-quadrant operation, deliver high-currents of up to 30,000 A. Based on the latest switch mode technology they ensure optimum efficiency and enable stand-alone, fail-safe operation. The option of linear mode regulation provides maximum stability and minimum noise and fluctuations from 1% to better than 1 ppm (part per million).

For high-power applications our high-current power supplies benefit from SCR (Thyristor) control. We offer single- and multi-channel supplies starting in the 100 Watt range going up to several Megawatts.
RF Transmitters

Bruker Radio Frequency Transmitters are established in nuclear physics applications all over the world. Our high-voltage power supplies, capable of emitting power from 100 Watt up to 300 kW and more, benefit from modern switch mode design for optimum efficiency and feature SCR (Thyristor) control to handle the highest power applications.

Choose from single or stacked solid-state amplifiers, whilst IOT amplifiers deliver optimum peak power conversion efficiency.

For arc protection our emitter tubes operate with defined stored energy, with optional solid-state crowbar circuits to protect the sensitive elements.

Start-up and operating procedures are handled automatically ensuring stand-alone, fail-safe operation, while a solid-state safety system ensures maximum protection for the transmitter elements and the user applications.

RF IOT high-power transmitter at ELBE FZD Rossendorf, Dresden, Germany.
Content:

**TD-NMR Products**

30 minispec mq Series
31 minispec one Series
32 minispec LF Series
    minispec ProFiler
33 HyperQuant
Time Domain NMR

Time Domain Benchtop NMR Analyzers
The minispec benchtop product lines utilize Time-Domain (TD-NMR) spectroscopy, a method related to High-Resolution NMR and Magnetic Resonance Imaging MRI. Unique permanent magnet and radio frequency (RF) technologies are applied to investigate the sample as a whole, non-destructive and non-invasive.

The minispec mq Series
The award winning mq series covers a wide range of applications for both R&D and routine quality control and offers multiple expansion capabilities. With the addition of innovative accessories and readily exchangeable probe assemblies, the mq Series is suited for a full range of time domain NMR measurements. Typical applications are:

**Food Industry**
- Solid Fat Content in fat compositions (AOCS Cd 16b-93, ISO 8292 & IUPAC 2.150 methods)
- Oil and moisture in seeds and oil seed residues (AOCS Ak4-95, ISO 10565 & 10632 methods, USDA GIPSA approved)
- Solid Fat Content as well as total fat content in chocolate and chocolate related products
- Droplet size analysis in O/W and W/O emulsions Oil, water and protein in dry and wet food and feed

**Textile Industry**
- Spin Finish on Fibres (OPU)
- Coatings on Polymers

**Polymer Industry**
- Xylene soluble content in polypropylene
- Density and crystallinity in polyethylene
- Rubber content in polymers like ABS or polystyrene
- Cross-link density of elastomers

**Petrochemical Industry**
- Hydrogen content in hydrocarbons (ASTM D 7171 method)
- Oil content in paraffin and wax

**Pharmaceutical Industry**
- Fat and lean in live mice and rats
- Contactless weight determination
- Moisture and solvents in powders and tablets
- Contrast agent investigations near MRI fields: 0.25 T, 0.5 T, 0.75 T, 1.0 T and 1.5 T

**Healthcare Industry**
- Fluorine content in toothpaste
- Melting properties of cosmetics

**R&D and Academics**
- All types of temperature dependent relaxation time studies
- Diffusion experiments
- Single-Sided NMR
Dedicated Solutions for Industrial Quality Control

The mq̕one Analyzer is not just an analytical device. It offers a dedicated solution for the analytical task of daily quality control (QC) in the industry. The simple calibration, the intuitive workflow and the multilingual software allow the operation of the mq̕one Analyzer by everybody. The three user levels and compliance to 21CFR part 11 lead to safe and fully traceable data. The high performance of the mq̕one Analyzer guarantees high result quality and the well known Bruker quality ensures a long lifetime of your mq̕one Analyzer.

the minispec mq̕one Series

the minispec mq̕one Analyzers

- mq̕one SFC Analyzer
  - Solid-Fat Content (ISO, AOCS)
- mq̕one Seed Analyzer and
- mq̕one Seed Analyzer XL
  - Oil and Moisture in Seeds, press cake, residues (ISO, IUPAC, AOCS)
- mq̕one Hydrogen Analyzer
  - Hydrogen in Fuels (ASTM)
- mq̕one Spin Finish Analyzer
  - Finish on Fibre, Oil-Pick-Up (OPU)
- mq̕one Polymer Analyzer
  - Xylene-soluble content in PP
- mq̕one Total Fat Analyzer
  - Total Fat Content determination in Food and Feed
the minispec LF Series

the minispec LF series

Bruker’s minispec LF Series of whole Body Composition Analyzers provides a precise method for measurement of Lean Tissue, Fat, Free Fluid and Total Body Fluid in live mice and rats. Longitudinal studies are possible as the animal is carefully handled without the need of anaesthesia. Measurements with the LF Series are done in minutes without the need for any sample preparation. With the new minispec LF110 also rats with mass $\geq$ 1kg can be analysed.

typical applications of the mq-ProFiler are:

- Cross link density, filler materials, aging in tires (even with steel bars) and other polymers
- In-package food analysis: Fat content extent of gel formation, etc.
- Moisture content, porosity, and effect of hydrophobic treatments in building materials
- Fast monitoring of Fat content in high moisture foods like fresh salmon fish
- Porosity, separation of oil from water signal and drainage/absorption/drying study in rocks and other porous materials
- Contamination (oil) in moisture-free soil
- Skin hydration study

the mq-ProFiler

The mq-ProFiler is a compact NMR analyzer equipped with a single-sided magnet and RF probes capable of performing $^1$H-NMR experiments on the surface or surface near volume elements. This device is a portable TD-NMR analyzer without any sample size restriction for industrial process/quality control and research.
HyperQuant

HyperQuant™ is a benchtop time-domain NMR reader that precisely and quantitatively delivers both the magnetic hyperpolarization and thermal polarization status of a sample. This proprietary solution applies a unique permanent 0.94 Tesla magnet system combined with an innovative MR probe design and novel NMR pulse sequence capabilities. This unique combination enables quantification of the thermal polarization level of $^{13}$C-labeled samples using volumes as low as 1 ml. The hyperpolarization enhancement factors can be obtained directly on the sample of interest, without the need for a separate calibration reference.

Features
- Direct quantification of magnetic hyperpolarization and thermal polarization levels
- Calibration-free technology based on direct comparison of hyperpolarized and thermally polarized state
- Turn-key $^{13}$C application
- Proven bench-top TD-NMR design
- Unique 0.94 T permanent magnet system
- Only 1 ml of sample volume required
- Tracing of the $^{13}$C hyperpolarization decay
- Thermal signal determination with 99% accuracy
- Quantifying concentrations of fully labeled $^{13}$C samples
- External trigger interface to HyperSense™
- Applicable to all hyperpolarization methods including DNP and Para-Hydrogen
Content:

**MRI Products**

36  BioSpec
38  ClinScan
40  PharmaScan
41  ICON
42  BGA-S Gradient Series
43  USR Magnets
44  MRI CryoProbe
45  Micro-imaging
46  ParaVision
47  Beyond Standard BioSpecs
Magnetic Resonance Imaging

Solutions for Molecular Imaging and Preclinical Research

Innovation with Integrity
BioSpec

The BioSpec® series is designed for the emerging market of preclinical and molecular MRI. State-of-the-art MRI CryoProbe™ technology together with ultra-high field USR magnets deliver high spatial resolution in vivo enabling customers to come closer to the molecular and cellular level. Thanks to its innovative modular concept, virtually any small animal MR imaging application in life science, biomedical and preclinical research can be conducted. Whatever your application is, the BioSpec series will deliver the optimum solution, will perfectly equip you for the most demanding tasks and challenges.

Standard and optional Product Features

- High-end UltraShield™ Refrigerated (USR) magnets from 4.7 up to 15.2 Tesla
- A wide range of bore sizes (11 to 40 cm) for investigations on any kind of animals
- Helium zero-boil-off and nitrogen free magnets for reduced service costs
- Scalable Avance III architecture with up to 16 receiver and 6 transmitter channels
- Parallel imaging (GRAPPA) for almost all applications including EPI
- Multiple transmit imaging applications
- BGA-S gradients with highest amplitudes, slew rates, shim strengths, and duty cycles
- Motorized animal positioning for increased throughput
- IntraGate™ - Self gated steady-state cardiac imaging (no external triggering devices)
- Phased-array RF coil technology for maximum sensitivity and minimum scan times
- MRI CryoProbe™ delivers an exceptional increase in sensitivity to 250 %
- ParaVision® - Intuitive software package, for multi-dimensional MRI/MRS data acquisition, reconstruction, analysis and visualization
Innovative Animal MRI Solutions for Molecular and Preclinical Imaging

BioSpec benefits from the excellence of Bruker BioSpin, the global market and technology leader in analytical magnetic resonance instruments including NMR, preclinical MRI and EPR. With an install base of over 500 MRI systems worldwide and more than 40 local Bruker offices on all continents, you can rely on our long term expertise and dedicated after sales support.

**DTI of the Song Control System (SCS) of Starlings**

DTI is used to quantify seasonal changes in the SCS. The density of axonal connections changes under hormonal influences.

*Courtesy: De Groof, A. Van der Linden, RUCA, Antwerp, Belgium.*

**Mouse Abdomen**

T2 RARE abdominal mouse imaging with excellent contrast.

*Courtesy: D. Elverfeldt, B. Kreher, J. Hennig et al., University Hospital Freiburg, Germany.*

**Cardiac Angiography**

Visualization of coronary arteries *in vivo* (mice) using IntraGate.
With the ClinScan® you enter the field of translational research and molecular imaging. The ClinScan, a 7 T animal MRI and MRS scanner is designed to further facilitate translational research from 'mice to men' in the field of pre-clinical and molecular imaging.

ClinScan is Bruker BioSpin’s solution for an emerging market of research MRI systems that allows a direct and fast transfer of preclinical studies on animal models to clinical studies on humans.

By virtue of the strategic alliance with Siemens Medical Solutions on human high-field MR systems, ClinScan uses the clinical user interface syngo® MR. Its operation is identical to that of Siemens Magnetom TIM systems.

**Product Description**

- 7 T Bruker USR magnet (Ultra Shielded Refrigerated, bore size 20 cm or 30 cm)
- Bruker gradient and shim coil (gradient strength of 290 mT/m or 630 mT/m, slew rate of 1160 T/m/s or 6300 T/m/s)
- Bruker RF array coil technology in combination with numerous animal handling accessories
- Siemens Magnetom Avanto technology with up to 32 receive channels
- Clinical routine user interface syngo MR to enable efficient workflow and highly automated state-of-the-art MRI and MRS applications on small animals

**Multi Modality Imaging - MRI/PET**

Simultaneous in vivo imaging of a F-18-FDG labeled mouse heart at 7 T. PET and MRI acquisition was done in parallel without interference between the two modalities.

Diffusion imaging (DTI)

![Diffusion imaging (DTI)](image)

Courtesy: B. Pichler, H. Wehrl, M. Judenhofer et al., Laboratory for Preclinical Imaging University Tübingen, Germany.

ClinScan systems are designed for translational molecular MRI and provide the clinical routine user interface syngo MR that facilitates straightforward transfer of protocols from benchtop to bedside and vice-versa.
Application Packages

Application packages for animal MRI resemble the application packages you already know from clinical MRI. Sequences and protocols are optimized for the specific needs in animal MRI.

Standard Imaging
The application suite is a full set of programs and protocols optimized for a wide range of high-field applications.

Parallel Imaging
- iPAT (integrated parallel Imaging) techniques including GRAPPA & mSENSE
- Higher speed and temporal resolution

Diffusion and Perfusion Imaging

Echo Planar Imaging (EPI)
- Multi directional diffusion weighting
- Tensor calculation including tractography
- Perfusion applications including processing

Cardiac Imaging
- True FISP & 2D/3D FLASH segmented
- Prospective triggering & retrospective gating
- Retrospectively gated cine imaging BOLD Imaging
- Single Shot EPI with PACE for BOLD-Imaging
- Automatic image reconstruction as well as on-the-fly t-test calculation in real-time for variable paradigms

Spectroscopic Imaging & Spectroscopy
- Spin Echo & STEAM, PRESS and CSI
- Hybrid CSI technique including volume selection and FoV encoding
- Multi-nuclei option
PharmaScan

Dedicated MR Scanner for Pharmaceutical, Biomedical and Molecular Imaging Research

The PharmaScan® is a high-field, easy-to-use and at the same time easy-to-install and very cost-effective MR-system. It is designed for MRI applications on small animals such as mice and rats in the field of routine pharmaceutical, biomedical and molecular imaging research. With the integrated automatic image acquisition and analysis, fast and reliable results can be obtained by simple operation of the system by non-academic personnel, without compromising full flexibility for the MR expert.

Mouse Lung Imaging using Ultra Short TE (UTE) Imaging

Radial scan with ultra short TE enables the visualization of detailed lung structures without using expensive hyperpolarized helium techniques.

High-Resolution DTI

Coronal map of the major principle diffusion direction of a rat brain. The diffusion tensor imaging, with 30 diffusion directions, is acquired by the segmented echo planar imaging technique.

Standard and optional Product Features

- ¹H MRI and MRS routine system, optimized for small rodents (such as rats, mice, gerbils)
- Actively shielded magnets at 4.7 T and 7 T allows easy and cost-efficient siting
- 16 cm clear bore size with 72 mm free access for the animal
- Parallel imaging (GRAPPA)
- High-performance BGA-9 or BGA-9S (as an option) gradients with highest amplitude, slew rates, shim strengths, and duty cycles optimized for small animal imaging
- No Faraday cage required
- 25 m² floor space required
- Scalable Avance III architecture incorporates up to 4 receivers
- AutoPac™ - Motorized, positioning system for routine animal handling and increased animal throughput
- IntraGate™ - Self gated steady-state cardiac imaging requiring no external trigger devices
- Phased-array RF coil technology for increased sensitivity and reduced scan times
- MRI CryoProbe™ - Sensitivity increase up to a factor of 2.5
- ParaVision® - Fully intuitive software package for multi-dimensional MRI/MRS data acquisition, reconstruction, analysis and visualization
Icon™ is a compact and easy-to-use 1 T permanent magnet high-performance MRI desktop system for preclinical and molecular imaging in biomedical and pharmaceutical research.

Designed and built by the world’s preclinical MRI market leader, Icon’s unique qualities include the industry standard MRI software ParaVision.

ParaVision® offers a workflow-oriented routine user interface, enabling a wide range of small rodent and material science MRI applications.

Operators and researchers have access to numerous optimized measurement protocols and powerful interactive processing and analysis tools to deliver immediate results. Optional software packages enable Icon to perform the latest MRI applications, such as pulsed arterial spin tagging, fast echo-planar image read-out, or ultra-short echo time techniques. The optional DataManager facilitates efficient data management and archiving.

As an education tool, students will find the ParaVision software intuitive, whether it is used to perform research imaging protocols, or to learn programming of new MRI methods.
BGA-S Gradient Series

Maximum Gradient and Shim Performance in Animal MRI

The Bruker gradient series BGA-S™ delivers unsurpassed performance for the whole range of animal MRI applications. The unique design provides highest gradient strengths and slew rates required for high-field animal imaging. The high cooling efficiency results in unmatched duty cycles and as a consequence of it, modern imaging sequences with minimum field of view and a high number of slices for long experiment times can easily be performed. The integrated shim coils add up to ultra-strong shim capabilities. The BGA-S gradients can be operated as inserts and are easily exchangeable for maximum flexibility.

Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>BGA-6S</th>
<th>BGA-9S</th>
<th>BGA-12S</th>
<th>BGA-20S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter [mm]</td>
<td>113</td>
<td>150</td>
<td>198</td>
<td>303</td>
</tr>
<tr>
<td>Inner diameter [mm]</td>
<td>60</td>
<td>90</td>
<td>114</td>
<td>200</td>
</tr>
<tr>
<td>Strength* [mT/m] at I_{max}</td>
<td>1000</td>
<td>760</td>
<td>660</td>
<td>300</td>
</tr>
<tr>
<td>Slew rate* [T/m/s] at U_{max}</td>
<td>11250</td>
<td>6840</td>
<td>4570</td>
<td>1100</td>
</tr>
<tr>
<td>Gradient linearity/DSV [% / mm]</td>
<td>±5 / 35</td>
<td>±5 / 60</td>
<td>±4 / 80</td>
<td>±3 / 130</td>
</tr>
<tr>
<td>Number of RT Shims</td>
<td>9</td>
<td>11</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Max. cont. gradient all axis [mT/m each axis]</td>
<td>500</td>
<td>190</td>
<td>330</td>
<td>87</td>
</tr>
<tr>
<td>Max. continuous gradient one axis [mT/m]</td>
<td>350</td>
<td>130</td>
<td>220</td>
<td>60</td>
</tr>
<tr>
<td>U_{max} [V]/I_{max} [A]</td>
<td>300/100</td>
<td>300/200</td>
<td>500/300</td>
<td>500/300</td>
</tr>
</tbody>
</table>

* Output values have been measured on MRI system

Product Description

- Highest gradient strengths up to 1000 mT/m
- Highest slew rates
- Excellent duty cycle specifications
- Very high gradient linearity
- Optimal gradient shielding
- Maximum shim performance
**USR Magnets**

**Combining High-Field Magnet Performance with Easy Handling and Siting**

The UltraShielded Refrigerated (USR) horizontal bore magnet product line features ultra-high magnetic fields and variable bore sizes in combination with easy handling and siting. Field strengths offered from 4.7 up to 11.7 T deliver optimum sensitivity for high-resolution MRI and MRS. The various bore diameters from 11 to 40 cm ensure optimal experimental performance on a wide range of animal MRI applications. Active shielding based on our well-proven UltraShield™ technology provides minimum stray fields. For ease of operation all USR™ magnets are nitrogen-free and include helium refrigeration for zero boil-off and minimum service intervals.

**Features**
- Ultra-high magnetic fields
- Variable bore sizes
- Highest field homogeneity
- Compact magnet design
- Excellent field stability
- Optimum external disturbance suppression
- Minimum stray fields
- Easy and cost efficient siting
- Nitrogen free
- Helium refrigeration (zero boil-off)
- Longer service intervals (two years)
- Cold delivery and fast installation
- Over 180 USR installations worldwide

**USR Magnet Product Line for a wide range of applications**

<table>
<thead>
<tr>
<th></th>
<th>47/40 USR</th>
<th>70/20 USR</th>
<th>70/30 USR</th>
<th>94/20 USR</th>
<th>94/30 USR</th>
<th>117/16 USR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1H Frequency (MHz)</strong></td>
<td>200</td>
<td>300</td>
<td>300</td>
<td>400</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>Field Strength (T)</td>
<td>4.7</td>
<td>7.0</td>
<td>7.0</td>
<td>9.4</td>
<td>9.4</td>
<td>11.7</td>
</tr>
<tr>
<td>Bore Diameter (cm)</td>
<td>40</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>30</td>
<td>16</td>
</tr>
<tr>
<td>Length (m)</td>
<td>1.49</td>
<td>1.31</td>
<td>1.49</td>
<td>1.49</td>
<td>2.01</td>
<td>1.46</td>
</tr>
<tr>
<td>Width (m)</td>
<td>1.65</td>
<td>1.12</td>
<td>1.65</td>
<td>1.65</td>
<td>1.71</td>
<td>1.65</td>
</tr>
<tr>
<td>Ceiling height (m)</td>
<td>2.85</td>
<td>2.60</td>
<td>2.85</td>
<td>2.85</td>
<td>2.90</td>
<td>2.85</td>
</tr>
<tr>
<td>Field Drift (ppm/h)</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>4.700</td>
<td>2.500</td>
<td>5.000</td>
<td>5.500</td>
<td>11.500</td>
<td>7.000</td>
</tr>
<tr>
<td>Stray Field (radial x axial) (m x m)</td>
<td>2 x 3</td>
<td>1.5 x 1.5</td>
<td>2 x 3</td>
<td>2.0 x 3.0</td>
<td>2.3 x 3.3</td>
<td>1.7 x 2.8</td>
</tr>
<tr>
<td>Service Interval (year)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Zero Boil-off</td>
<td>Yes¹</td>
<td>Yes¹</td>
<td>Yes¹</td>
<td>Yes¹</td>
<td>Yes¹</td>
<td>Yes¹</td>
</tr>
</tbody>
</table>

USR systems are available with field strengths ranging from 4.7 to 11.7 T and bore sizes of 16, 20, 30 or 40 cm as shown in the table.

¹With a valid service contract
MRI CryoProbe

New Signal-to-Noise Horizons in Small Animal MRI

Bruker now offers a new series of MRI CryoProbes for MRI systems. They feature very low temperature, closed cycle cooled RF-coils and preamplifiers offering an increase in signal-to-noise ratio (SNR) to a factor of 2.5 over standard room temperature RF-coils in routine MRI applications. The use of the MRI CryoProbe™ in routine imaging of the mouse brain in vivo at 9.4 T delivers outstanding image quality. The increased signal-to-noise ratio enables one to acquire high-resolution images of the microscopic structures in the mouse brain down to the cellular level.

**Product Features**
- Increase in sensitivity to more than 250 %
- Flexible design for easy siting
- Standardized interface allowing different MRI CryoProbes to be used with one cooling system
- Efficient design allows minimal distances between RF-coil and object
- Carefully controlled thermal environment with no cold surfaces in contact with animal
- Cooling down outside the magnet possible

**Comparison with Nissle staining**

Comparison of micro-structures in the mouse cerebellum with histological Nissle staining (left). Identification of anatomical structures like white matter, granular layers, molecular layers and Purkinje cell layers are possible.

Courtesy: Rudin M., Baltes C. et al., ETH Zurich, Switzerland

**MRI CryoProbe™ at 11.7 T**

Ultra-high resolution (35 x 35 x 200) μm³ mouse brain imaging in vivo acquired in 20 minutes.

Courtesy: V. Rasche
University of Ulm, Germany
Micro-imaging

CryoProbe for Micro-imaging

The extension of Bruker’s cryogenic NMR probe expertise into the field of MRI microscopy leads to new and exciting opportunities. Micro-imaging techniques for small samples with diameters up to 5 mm benefit from CryoProbe™ technology and a factor 4 improvement in sensitivity. The result is improved image quality, increased spatial resolution and/or reduced scan times. The MIC CryoProbes for 1H at 400-600 MHz offer variable temperature operation over the range from 0 to 80 °C and are used with a Bruker BioSpin Micro2.5 gradient system in vertical wide-bore magnets with bore sizes of 89 mm or larger. The newly developed dual 1H/13C micro-imaging CryoProbe is also available.

13C Chemical Shift Imaging

Detection of sugar transport. An Angiocanthos plant was fed with 13C labelled glucose. The C1-13C bound protons (coloured) overlayed to a proton image of the system cross-section C1 α-Glucose (93 ppm (13C), 5.42 ppm (1H)), system field strength 9.4 T, cyclic J cross polarization method in-plane resolution of 13C image: 156 x 156 µm²; slice thickness: 5 mm total scan time 4:00 h.

Courtesy of M. Wenzler, Max Planck Institut für chemische Ökologie, Jena, Germany

Research Possibilities

- Investigations on plants, insects and other small animals, embryos, or histological tissue samples.
- Studies of porous and inhomogeneous objects at intermediate field strengths with minimum susceptibility distortions and highest sensitivity.
- Studies of fast dynamic processes.
- Microliter spectroscopy.

Diffusion Tensor Imaging on excised human nerve cord

Sample provided by
Dr. med. Ralph König, Neurochirurgische Klinik University Ulm, BKH Günzburg, Germany
ParaVision 5.1

Ultimate MR-Acquisition and Processing in Preclinical Research and Life Science

ParaVision® is Bruker’s software package for multi-dimensional MRI/MRS data acquisition, reconstruction, analysis and visualization for its BioSpec®, PharmaScan® and Micro-imaging product lines. It offers an intuitive routine user interface and cutting-edge techniques for animal MR imaging and spectroscopy - including a rich palette of powerful image evaluation and visualization tools.

Product Description
- Intuitive routine workflow
- Application-oriented, ready-to-use protocols
- Self-acting, method-specific scanner adjustments
- Automatic instrumentation recognition
- Parallel imaging option for all suitable acquisition techniques with automatic generation of composed images/spectra
- Half-Fourier (Partial-Fourier) encoding
- Real-time display of acquired and reconstructed data
- Data archiving including DICOM export
- Development environment with powerful tools for rapid prototyping of user-defined experiments and professional method implementation

New Reconstruction and Processing Features
- Push-button GRAPPA reconstruction
- Sum of squares and phase-sensitive phased-array reconstruction
- Phased-array spectroscopy reconstruction
- Partial Fourier reconstruction
- EPI reconstruction with efficient ghost suppression
- Navigator techniques to reduce motion artifacts in EPI and SPIRAL
- 2D and 3D region growing
- Display and analysis of time-course data with the fitting tool “ISA”
- Frame-selective loading of image sequences for display, e.g. either timecourse frames or slices for a multi-slice movie dataset
- 3D visualization with surface rendering
- Image mask inversion
Beyond Standard BioSpecs

Vertical BioSpec
The vertical BioSpec® has been engineered for MR research investigations of non-human primates. It enables specifically fMRI studies on monkeys as they are particularly receptive to behavioral conditioning while sitting in upright position. The vertical BioSpecs are offered with two different magnet types operating at 4.7 T and 7 T which both have a high-magnetic field stability and excellent homogeneity. The actively shielded gradient coil with integrated shims is especially designed for a vertically oriented magnet.

Ultra-High Field MRI
Bruker is offering up to 17 T horizontal MRI BioSpec, enabling high-resolution in vivo preclinical MRI on small animals at a microscopic scale. The magnet with a bore size of 25 cm is based on Bruker’s UltraStabilized™ subcooling technology offering excellent field homogeneity and stability.

A new BGA-S™ gradient coil with unsurpassed specifications regarding gradient field strength, gradient slew rate, and gradient duty cycle provides best MRI performance.

These innovations will push the current limits of animal MR imaging towards higher spatial and spectral resolution, enabling new applications in the field of molecular imaging and preclinical research.

FLASH imaging on BioSpec 170/25, in-plane resolution: (80 x 80) μm²
Courtesy: D. Le Bihan, NeuroSpin, Paris, France
Content:

**EPR Products**

50  ELEXSYS-II E780
51  ELEXSYS-II E500 CW-EPR
52  ELEXSYS-II E580 FT/CW
53  ELEXSYS-II Imaging Unit
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Solutions for Life Science and Analytical Research
ELEXYS-II E780

The World’s First Commercial mm-wave 263 GHz EPR Spectrometer

Bruker has pioneered the world’s first commercial mm-wave 263 GHz EPR spectrometer, ELEXYS-II E780, representing a first step for Bruker’s EPR division into quasi-optical microwave technology. It incorporates a unique cryo-free superconducting magnet that can be ramped up to 12 T and is combined with new probe technology for optimum sensitivity, even on large samples up to 5 mm. Based on the well-proven Bruker ELEXYS concept it provides multiple turn-key operation modes including, CW-, Pulse-EPR, ENDOR and ELDOR, thus enabling research groups for the first time, to routinely use very high-frequency EPR technology.

Features

- Enables mm-wave very high-field EPR at 263 GHz
- Quasi optical front-end featuring reflection and induction detection
- Cryogen free superconducting EPR magnet incorporating 12 T main coil and 0.2 T high-resolution sweep coil
- Multiple turn-key operation modes including CW-, Pulse-EPR, ENDOR and ELDOR
- High-sensitivity single mode resonator
- Non-resonant probe for samples up to 5 mm
- Variable sample temperature from 4 to 300 K
- Safe and robust operation
- Runs routine software package Xepr

High-Field ENDOR

Multinuclear pulsed ENDOR

High-Field EPR

TEMPOL Echo Detected Field Swept at 50K

Non-Resonant Probe

Single Mode Resonator TE011
ELEXSYS-II E500 CW-EPR

Redefining research level EPR

Introduced in 1997 the ELEXSYS has become the renowned research platform for modern EPR. Over the years a constant technical evolution has assured to keep track with new emerging demands of the EPR society. The second generation of the pulse devices SpecJet-II and PatternJet-II have been launched in 2006 and just recently DICE-II has become available.

Yet another major development step has now created ELEXSYS-II. The OS9 acquisition server has been replaced and the SuperX microwave bridge has been redesigned with improved specifications. The new multi-purpose signal processing unit (SPU) plays a central role in the expanded capabilities of the ELEXSYS-II, replacing the signal channel, fast digitizer, and rapid scan with a single integrated unit offering unprecedented performance and specifications.

**E500 Highlights**
- SuperX microwave units of world record sensitivity weak-pitch signal-to-noise of 3000:1
- rapid scan module
- stationary and time resolved experiments
- multi purpose signal processing unit
- reference free spin counting

**E500 Accessories**
- Teslamer
- Field-Frequency lock
- \( \text{N}_2 \) and Helium VT systems
- automated goniometer
- DICE-II ENDOR system
- microwave frequencies from L- to W-Band
- numerous dedicated probeheads
- large selection of magnet systems

**ELEXSYS-II:**
The only commercial spectrometer series which covers all EPR techniques

Standard super-high-Q cavity for ELEXSYS Systems

Cu\(^{2+}\) histidine at 20 K and 20 dB power
With the recent introduction of the second generation pulse programmer and transient recorder, PatternJet-II and SpecJet-II, improvements in digital resolution and averaging capabilities have again pushed up the performance level of the E580.

- zero overhead for 1D phase cycling
- zero overhead for 2D blocks
- zero overhead for time evolution averaging (e.g. ESEEM)

**PatternJet-II**

Virtually no experimental limits are imposed by the PatternJet Series of pulse programmers. Designed for the needs of EPR this pulse programmer features a dynamic range of $10^9$, i.e. ns resolution over a time scale of up to one second. The well established concept of our first generation PatternJet has been technically enhanced and carried on to the second generation PatternJet-II with a 1 GHz clock.

**SpecJet II**

With the first generation of SpecJet a dramatic improvement in pulse-EPR sensitivity could be achieved by high-speed signal averaging. The SpecJet-II with 1 GHz sampling rate now further enhances the abilities to capture fast and short lived transient signals. The real time display of the averaged echo/FID can now be toggled between time and FT mode and greatly facilitate spectrometer handling and signal optimization.

The extended memory of PatternJet-II and SpecJet-II allow now overhead free direct phase cycling even for 2D data acquisition. A considerable measuring time saving is achieved with this new feature.
ELEXSYS-II Imaging Unit

Biomedical research and material science applications by EPR imaging is a rapidly growing field. Bruker’s response to this development is the E540 imaging accessory. Based on the proven ELEXSYS architecture, this instrument operates at L- or X-Band and provides the seamless integration of imaging techniques into EPR spectroscopy. The imaging accessory comprises 2D or 3D water cooled gradient coils, power supplies, gradient controller, acquisition and processing software for up to 4D imaging.

**Imaging accessory for biomedical application E540GCL**
3D gradients with 40 G/cm for imaging in L- and X-Band

**E540R36 and E540R23**
the 36-mm and 23-mm access L-Band probes for animal research

**E540SC**
the surface coil L-Band probe for animal research

**High-power gradient accessory for X-Band imaging**

E540GCX2
- 2D gradients with 200 G/cm
- Compatible with ER 073 magnet
- 25 mm air gap
- ER4108TMHS resonator
- Compatible with ER 4112HV Helium system

Image of two DPPH crystals with 25 µm pixel resolution

Sensitivity profile of L-Band surface coil

ER4108TMHS

E540R36
Multi-frequency EPR is commonly understood in terms of its relation to CW-EPR spectroscopy. Bruker’s commercial Multi-frequency/Multi-resonance EPR covers both, CW-EPR and FT-EPR as well as Pulse-ENDOR and Pulse-ELDOR at a multitude of microwave frequencies. Thanks to the ELEXSYS platform design and the advantageous intermediate frequency (IF) concept, every ELEXSYS spectrometer can be expanded for state-of-the-art multi-frequency experiments; now and in the future. All features of the X-Band CW/FT microwave bridge are transferred to the new operating frequency. For each frequency band a dedicated probe provides a maximum of sensitivity and ease of use.

**High-Frequency/High-Field EPR and ENDOR at 94 GHz**

The ELEXSYS family of EPR spectrometers includes two W-band systems, the E600 and E680. The former is optimized for CW-EPR experiments at 94 GHz, while the E680 operates in both CW and FT-mode. The instrument is equipped with a 6 T super conduction magnet featuring an additional high-resolution sweep coil with 2 kG range.

**Multi Frequency Options**

The Bruker IF Concept allows to add a second or third microwave frequency to the X-band E 580 instrument. These upgrades are available for Q-Band (34 GHz), S-Band (3.4 – 3.8 GHz) and L-Band (0.8 – 1.4 GHz). The upgrade comprises the microwave unit and a dedicated probe for variable temperature operation.

**Multi Resonance Options**

Electron-Nuclear Double Resonance (ENDOR) accessories are available for the EMX-series in CW mode and for the ELEXSYS series in CW and pulse mode. The frequency range is 1 – 100 MHz for the EMX and 1 – 650 MHz for ELEXSYS. Dedicated ENDOR resonators for CW and pulse operation at variable temperature complete the ENDOR accessory.

Electron-Electron Double Resonance (ELDOR) is a pulse technique and can be added to all pulse spectrometers of the ELEXSYS line. The most popular distance measurement technique is supported by specialized probes of the Flexline series.

**ESEEM Application**

S-Band HYSCORE of BDPA

Flexline Pulse-ENDOR Resonator EN4118X-MD4

**Distance Measurements**

Q-Band HYSCORE

Q-Band 4 Pulse - DEER

**Q-Band HYSCORE**

$^1$H Q-Band single crystal HYSCORE
The foundation of EPR
The EMXplus is the next generation of Bruker’s successful EMX spectrometer line, well-known for its premium performance in CW-EPR research. The design of the EMXplus reflects its dedication to the heart of the matter: rapid and high-quality data. Simply power-on the EMXplus and start your EPR journey. Following self-validation procedures, the EMXplus is ready to use via Bruker’s WIN-ACQ software.

The Perfect Duo I
The Signal Channel and Field Controller work together seamlessly to provide practically unlimited resolution on both axes: field and signal intensity.

The Perfect Duo II
The EMXplus Signal Channel now offers two detection channels in one. Simultaneous quadrature and 1st & 2nd harmonic detection schemes are just a mouse click away.

Accessories & Options
- The PremiumX microwave package for enhanced sensitivity
- The Variable Temperature Controller can be incorporated into the EMXplus console
- The ER036TM Teslameter ensures precise g-factor determination in combination with the integrated microwave counter
- The EMX-ENDOR package allows CW-ENDOR experiments to be performed on EMXplus Systems
- The full range of microwave frequencies from L- to Q-Band

Ultra-high-resolution over large sweep

Oxygen in air

The spectra show oxygen in air at ambient pressure (top) and reduced pressure (middle) measured at Q-Band. A sweep range of 14 kG was recorded with 180000 points, resulting in a resolution of 80 mG, sufficient for the line width of 300 mG at reduced pressure.
EMXmicro

The EMXmicro completes the EMX family and features an electronics cabinet with the footprint of a PC tower. The instruments micro cabinet can be combined with all electromagnets and microwave bridges from L- to Q-Band.

The standard software of the EMX series for data acquisition and processing is provided by WinACQ and WinEPR.

Xenon

This new software package is an option for the EMXmicro/plus series. It features a Linux® front end PC with a new graphical user interface integrating acquisition and processing in an user friendly environment. Xenon features numerous novel tools for data acquisition and processing, e.g. the direct spin counting method without reference sample.
Bruker’s e-scan product line of table-top EPR (ESR) readers offer dedicated and tailored turn-key systems for specific Quality Control applications as well as systems for medical and pharmaceutical R&D applications of Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS). All e-scan systems have been designed for and have proven rock-solid in 24/7 operation with the best possible price-performance ratio available today.

**A few example application fields for e-scan:**
- Irradiation Dosimetry with Alanine Dosimeters (ISO/ASTM method)
- Food Irradiation Control (EU standard methods)
- Beer Shelf Life: flavour stability and antioxidant stability (patented application)
- Biomedical EPR research: ROS and RNS detection and quantification

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e-scan food control inserts (left) and the cavity template. (right).

EPR spectrum of an irradiated chicken bone recorded with the e-scan Food Analyzer.
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For research use only.
Not for use in diagnostic procedures.
GC/LC and MS-Systems

Research and Analytical System Solutions
Bruker’s FLEX Series of MALDI based mass spectrometers are industry leaders whose performance level can be easily matched to almost any application need. Composed of three increasingly powerful systems; microflex™, autoflex speed™ and ultrafleXtreme™, these flexible, powerful, and reliable systems can deliver answers for a wide range of applications such as the MALDI Biotyper solution used in clinical biology to identify microorganisms through characteristic peak patterns; their unique molecular fingerprints.

Capable of utilizing a number of intuitive software packages, the FLEX Series brings the power of MALDI mass spectrometry to any level of user.

**ultrafleXtreme**

The pinnacle of the FLEX series, the ultrafleXtreme is built to deliver the highest levels of performance in sensitivity, resolution, and mass accuracy for a MALDI instrument. Highly flexible, the ultrafleXtreme is especially effective in proteomics, molecular imaging and protein analysis settings as it can utilize the full power of patented 1 kHz smartbeam™ laser technology.

Other cutting edge MALDI technology enhancements such as PAN™ resolution for broad mass range measurements and LIFT™ technology to enhance sensitivity, allow the use of the ultrafleXtreme in top-down or bottom-up protein analysis utilizing gel or LC-based workflows. Outstanding in both quantitative and qualitative applications, the ultrafleXtreme represents the ultimate in MALDI instrument design and performance capabilities.
autoflex speed

The workhorse of the FLEX Series, the autoflex speed has a number of exciting hardware options to deliver a very powerful, yet easy to master, platform for many MALDI based applications. Incorporating proprietary smartbeam 1kHz laser technology, the autoflex speed delivers unrivalled speed, sensitivity, and resolution for an instrument in its class. Hardware options include either MALDI-TOF or MALDI TOF/TOF configurations. The autoflex speed can also be equipped with a number of specially designed software packages to create a customized instrument for key applications like molecular imaging or protein sequencing and analysis.

microflex LT/microflex

The entry level member of the FLEX product family is the microflex series. However, there’s nothing minimal about the performance of these instruments. Designed to be compact, affordable, and easy-to-use, the microflex series packs a lot of power into its excellent design. Fully capable of providing answers to a wide range of analytical challenges with its 15k resolution, the microflex series can be scaled to fit many needs with either linear or reflectron based options. The innovative microflex series can bring the value and performance of MALDI mass spectrometry to any laboratory, including those who may have thought mass spectrometry was out of reach.
Bruker's novel amaZon Ion Trap family of mass spectrometers utilize a unique spherical ion trap architecture that delivers exceptional performance for many analytical tasks. This design, in combination with an ingenious detector and dual ion funnel transfer technology, offers:

- dramatically improved sensitivity (by a factor of 10x),
- speed up to 52,000 u/sec
- dynamic range over 4 orders of magnitude
- mass resolution up to 30,000
- high mass range of 50-3,000 m/z

ProteinScape 3.0 bioinformatics database system

amaZon Ion Trap for analytical power and utility

Support of all widely used HPLC, CapLC, nanoLC, and UHPLC systems

Fully automated screening for toxins/drugs based on MS/MS library search. Push button solution in open access environment.
Ion Trap Mass Spectrometers

The amaZon series of Ion Traps are equipped with instantaneous polarity switching capabilities for dealing with a variety of analytes. Capable of MS^n analysis, ion traps provide the analytical power necessary for very complex samples.

Some members of the amaZon Ion Trap instrument family can utilize ancillary chemistries and techniques ETD (Electron Transfer Dissociation) and PTR (Proton Transfer Reaction) to aid in the analysis of proteins and their posttranslational modifications. Bruker’s family of Ion Trap instruments is represented by the amaZon speed, amaZon speed ETD, and amaZon SL instruments.

**amaZon SL**

A solid, robust, high value platform for fast LC/MS^n applications, the amaZon SL is designed to increase productivity for routine analyses such as chemistry support, quality and process control, and other small molecule analysis applications.

The amaZon SL comes equipped with the SmartLine software suite which provides particularly quick and easy access to analytical workflows to help generate reliable results. The amaZon SL is designed for reliable 24/7 operation, even in an open access environment.

**amaZon speed**

Representing the latest developments in ion trap technology, the amaZon speed provides most of the capabilities of the amaZon family. With greatly enhanced sensitivity, MS/MS speed and “Zero-Delay Alternating” polarity switching, the amaZon speed is an excellent choice for the analysis of complex samples when more in depth and detailed analysis of molecular structure is needed. Supported by spectral MS^n libraries, the amaZon speed is the ultimate mass spectrometer for MS/MS based multi-compound screening.

**amaZon speed ETD**

Designed especially for the analysis of proteins and their post-translational modifications (phosphorylation, glycosylation, etc.), the amaZon speed ETD is the latest generation instrument for the analysis of post translational modifications (PTMs) and proteomics. Incorporating ETD and PTR molecular fragmentation technologies, the amaZon speed ETD system provides extremely valuable information about the location and nature of various PTMs, as well as very useful de novo sequencing power leading e.g. to full coverage of the protein N- and C-terminal sequence.
Bruker’s TOF and quadrupole TOF mass spectrometers feature some of the very latest developments in o-TOF technology to provide maximum confidence for accurate mass molecular formula determination.

Capable of delivering hyper-accurate results, Bruker’s o-TOF platforms combine numerous hardware innovations with unique software packages that deliver industry leading sensitivity, 5 orders of magnitude dynamic range, ppm or better mass accuracy and up to 60,000 resolution for the analysis of small molecules and many types of biomolecules.

**micrOTOF focus II**

An outstanding high performance system, the micrOTOF II benefits from years of experience in LCMS design, and features an excellent combination of resolution and mass accuracy to deliver outstanding results.

The perfect choice for straight forward molecular formula determination of small molecules, proteins, or small molecule metabolites, the micrOTOF II can help solve some very tough analytical challenges.
micrOTOF-Q II

A high performance hybrid mass spectrometry system, the micrOTOF-Q II combines the very latest in ESI-qTOF technology in MS and MS/MS modes to enable very high levels of confidence in many applications.

Whether used with direct infusion or with UHPLC, Fast Chromatography, or other separation techniques, the micrOTOF-Q II delivers some of the best results in molecular formula determination available on the market today. When exact molecular formula determination is the goal, the micrOTOF-Q II is the answer.
UHR-TOF Mass Spectrometers

maXis impact

There is no need to make compromises in mass spectrometry anymore. The maXis impact™ sets a new technology standard where industry leading performance values are all simultaneously available in a single acquisition at full sensitivity.

Powered by a series of patented technology innovations, the maXis impact simply provides the very best results without compromise in a cost effective, benchtop format.

maXis 4G

The maXis 4G, with Full Sensitivity Resolution, continues to advance the performance level and capabilities of this revolutionary series of instruments. With significant enhancements in mass accuracy and resolution, and unparalleled sensitivity and speed, the maXis 4G offers the confidence to measure and identify small molecules, proteins and intact large molecules, such as antibodies, with unprecedented levels of certainty in both MS and MS/MS modes.

Compound identification and structure confirmation

[Graph showing mass spectra with m/z values and intensities]
solariX, the next-generation hybrid Qq-FTMS, is an easy to use, high performing system that is equipped to address the most challenging proteomics and complex mixture applications.

The broad-band, ultra high resolving power (> 1,000,000 @ m/z 400, 7 T) is essential for tackling complex mixtures, especially those that are not amenable to on-line separation techniques such as; hydrocarbon related analysis ("petroleomics"), environmental analysis, and metabolomics.

For applications that require high performance LC-MS or LC-MS/MS, the solariX is ideally suited. New functionality provides more resolution when it is needed most and with optional, faster acquisitions for MS/MS data.

Added top-down versatility is provided with fully enabled Electron Transfer Dissociation (ETD). This exciting new technique, combined with FTMS performance, is superb for the comprehensive analysis of proteins and peptides and their subtle, posttranslational modifications.

The solariX can be configured with Dual ESI/MALDI (based on advanced ion funnel technology) and a range of API source options (APCI, GC-APCI, APPI). Low maintenance, refrigerated magnets are standard with solariX and can be configured with one of several magnetic field options (7T, 9.4T, 12T and 15T).
Ion Sources

**CaptiveSpray**

Nanoflow LC-MS in daily laboratory work is still one of the bigger challenges in proteomics. The Bruker CaptiveSpray source is a revolutionary ion source with a patented design that provides easier operation than even standard electro spray. CaptiveSpray delivers nanospray sensitivity, resists plugging, and provides reproducible uninterrupted flow for even the most complex proteomics samples.

The CaptiveSpray can be used also at low μL flow rates to allow the use of larger ID columns. It fits all current Bruker ESI-MS systems.

**DirectProbe DIP: Instant answers from solid samples with APCI or APPI**

The DirectProbe (DIP) add-on for the Bruker APCI II and APPI II ion source allows direct analysis of liquid and solid samples without tedious sample preparation. In routine organic synthesis analyses, it simplifies identification and characterization of chemical reaction products without compromising sensitivity.

Vortex around spray concentrates and focuses spray into the MS source

CaptiveSpray LC-MS source

DirectProbe
Software & Application Directed Solutions

Compass & Bioinformatics

Bruker software solutions are designed to provide maximum information with minimal effort. Highly intuitive and extremely user friendly, our software solutions are all designed and delivered with the user and their application in mind:

- Compass™: Bruker’s unified software environment for intuitive mass spectrometric instrument control and data processing.
- Compass OpenAccess™: Automated walk-up LC/MS chemical formula generation
- Compass Security Pack
- ProteinScape™ – the bioinformatics platform for ID and quantitation
- BioTools™: Interactive protein analysis
- flexImaging™: Comprehensive and powerful MALDI Imaging
- MALDI Biotyper™: The easy software for microbial ID
- GenoTools™: Software solution for the analysis of genomics data
- MetaboliteTools™: Identification and confirmation of metabolites
- ProfileAnalysis™: Comprehensive statistical evaluation of LC-MS data
- TargetAnalysis™: Unambiguous molecular formula identification
- PolyTools™: Interpretation of MALDI polymer spectra

HPLC Vendors supported by Bruker Compass with full software plug-ins are: Dionex, Waters, Agilent, Hitachi, Thermo/Proxeon, CTC/PAL Autosamplers, Shimadzu and Eksigent.

Applications Software

Bruker offers dedicated software packages and solutions for various application areas:

- Life Science Research and Clinical Application Solutions
  - PRIME: Proteomics through Integrated MALDI and ESI
  - MALDI Molecular Imaging
  - Identification of Microorganisms
  - Lipidomics
  - Nucleic Acid Analysis
  - LC-MS based Metabolomics
  - Metabolite Profiling with LC-MS and NMR

- Pharmaceutical and Applied Analytical Application Solutions
  - Identification of Unknowns
  - Pesticide, Toxin, and Pollutant Screening
  - Drug Metabolite Identification
  - Open Access Chemistry Support
  - Petroleomics
  - Polymer Analysis

Your choice of HPLC

Bruker supports all major vendor HPLC systems for LC-MS applications. Our flexible software plug-in architecture allows for fully integrated HPLC support and method development. Other HPLC systems can be integrated with a simple contact closure.
ICP-MS

**Bruker innovation, making ICP-MS easier**

If you’ve ever wished that ICP-MS could be simpler, wish no more. The aurora M90 makes light work of it. No matter what your requirements, with a Bruker ICP-MS, you can tackle any application with ease. The aurora M90 delivers industry leading detection limit performance. Collision/reaction interface (CRI) technology makes setup of complex cell systems a thing of the past. Simply turn on the gas flow to remove interferences. It’s that simple.

**Let Bruker Quantum work for you**

If your goal is to spend less time creating methods and optimising conditions, and more time running samples, Bruker’s Quantum software delivers. Enjoy accurate results in less time with an intuitive yet flexible user interface that takes the hard work out of ICP-MS.

The CRI injects helium (He) and hydrogen (H2) collision and reaction gasses directly into the plasma as it passes through the orifice of the skimmer cone. This innovative approach suppresses interferences before the analytes are extracted into the ion optics.
Gas Chromatograph Mass Spectrometers

**Scion SQ**
Bruker’s long traditions of innovation and product reliability have combined to create a new industry standard for gas chromatography single quadrupole mass detection—the SCION SQ. By understanding, and then designing to exceed the most critical performance and reliability needs of GC users, Bruker has delivered a system that is especially for, and all about, the ultimate success of the GC user. The SCION SQ detector is designed to meet many important user specified requirements – reliable performance, ease of use and simple maintenance—all in a small instrument footprint that saves valuable bench space.

**Scion TQ**
The SCION triple quadrupole (TQ) detector is a comprehensive solution for your most demanding gas chromatography applications. It delivers unrivaled bench-space savings, the result of an innovative ‘lens-free’, elliptical ion-path design that delivers ultra-high sensitivity and chemical noise reduction - performance you would expect when innovation merges with a legacy of reliability.
Laboratory gas chromatography systems (GC)

The 400 Series consists of two gas chromatographs and an associated range of analyzers and solutions designed for leading applications. These systems allow chemists and engineers to employ standard methods and/or high quality trace sample analysis, in the petrochemical, agrochemical and environmental industries.

The 450-GC is a highly affordable and powerful analytical instrument that offers robust operation in an easy-to-use package. The system gives users a broad choice of injectors, detectors, switching and sampling valves up to three channels. The high resolution color touch screen is intuitive and supports local languages. The Bruker 430-GC offers the same outstanding performance as the 450-GC but in a compact, single channel package that occupies about half the bench space of conventional multi-channel GC.
Gas Chromatograph Accessories

Injector, Autosampler and Detector Options

Bruker 400-GC Series GC Accessories represent significant value and upgrade instrument performance and efficiency. The 400-GC Series has been designed to allow the incorporation of a wide range of options to expand the performance and enhance the capabilities of the system. These options include:

**Autosamplers (CP-8400, CP-8410)**

The CP-8400 range of AutoSamplers combines unattended system operation features with high throughput and sample capacity, virtually without sample carry over. These systems can be configured for:

- High sample throughput with dual and duplicate modes of injection
- Automatic access to two injectors with a single tower to double analysis output
- Liquid, ambient headspace, and SPME sampling
- Pre-programmed injection modes to minimize method development time and guesswork

Combi PAL/CTC

For Laboratories requiring even greater sample throughput or more extensive sample preparation automation options, Bruker offers the Combi PAL/CTC.

To suit your number of samples, the CP-8400 AutoSampler and CP-8410 AutoInjector deliver accurate, precise injections of small or large samples with virtually no sample carry over.
Gas Chromatograph Consumables

Bruker’s commitment to providing the very best in analytical systems extends beyond providing great instrumentation. In most cases, a good analytical system encompasses instrument, software and high quality consumables. Bruker applies the same demanding standards of quality to its wide range of GC consumables. From septa, ferrules and injector liners to vials and tools, we have the parts and consumables to complete the analytical solution. Our latest and newly launched comprehensive range of GC columns and Super Clean™ Gas filters shows our commitment to providing the latest and best in technology.

A Selection of GC Columns to Meet Your Needs

Bruker GC columns span a broad range of column diameters, stationary phases, and capillary column materials: Fused Silica (FS) and Inert Steel (IS). Ideal for either routine or research type analyses. Bruker GC column offerings bridge across many important applications and include a number of offerings such as:

- Standard WCOT (Wall Coated Open Tubular)
- Small Internal diameter
- Solid stationary phase PLOT (Porous Layer Open Tubular)
- Inert steel micro-packed and packed columns

Super Clean™ Gas Filters

Innovative design with product reliability has produced an extensive range of gas filters configured for the most demanding applications. Bruker Gas Purification Systems have the range to satisfy your needs from individual to combination filters, from Ultra purity combined with Ultra capacity, to all in one solution kits. Innovative features designed into the product yield extensive benefits to the user.

- Ultra-high capacity for long life, less change and improved productivity
- High-purity output ensures 99.9999% Pure Gas
- “Quick connect” fittings for easy, leak-tight filter changes
- Glass internals prevent diffusion; plastic externally for safety
- Easy-to-read indicators for planned maintenance and improved up-time
MALDI Biotyper Consumables

Added Convenience Enhances Assay Productivity
To make it easier and cost effective to routinely use the MALDI Biotyper, Bruker offers a number of kits and accessories designed and tested to maximize the performance and productivity of the MALDI Biotyper system.

Bacterial Test Standard
The Bacterial Test Standard is a typical E.coli extract, containing some additional proteins which can be used for instrument mass calibration as well as a performance verification standard.

HCCA (alpha-Cyano-4-hydroxycinnamic acid) Matrix
The matrix is supplied as solid and should be rehydrated using organic solvent ‘OS’ solution. Typically 1 ul of matrix is added to each sample prior to analysis.

MALDI Sepsityper™ Kit 50
The MALDI Sepsityper Kit is for the analysis of microorganisms from positive blood cultures. The process typically takes no longer than 20 minutes.

MALDI Biotyper Targets
Bruker offers the widest range of MALDI targets available, including reusable and disposable targets with and without barcodes.

Reusable Polished Steel Targets - 96 Positions
This most common and widely used Assay target provides excellent performance for all sample types. These targets can be cleaned and re-used literally thousands of times.

Disposable Biotargets - 48 Positions
The disposable Biotargets are supplied individually bar-coded in boxes of 25 each. Each target contains 48 positions and 5 additional calibration positions. The silicon-based Biotarget can be reanalyzed as often as necessary until all 48 spots have been used.

BigAnchorChip™ Targets
The Bruker patented BigAnchorChip targets are especially designed for handling liquid samples. They are specially prepared with a hydrophobic coating which surrounds hydrophilic sample positions.
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**CBRN Products**

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CBRNE

Chemical, Biological, Radiological, Nuclear and Explosives Detection
Prepared for a changing World of Threats

Bruker Daltonics – since 30 years a trusted manufacturer of CBRNE detection equipment – offers and constantly improves their sophisticated CBRNE product line and this way tries to help counter chemical, biological, radiological, nuclear and explosive threats. State-of-the-art technology, ruggedized design and modular accessories allow flexible and extensive applications.

The complete product line for CBRNE detection

CBRNE technology has always been the core competence of Bruker Daltonics. We were the first supplier who covered the complete range of chemical, biological and nuclear detection. Bruker is specialized in development, engineering and manufacturing of military hardened and easy-to-use analytical systems and is ISO9001 certified. The product line supports all possible use cases for the detection of various threats.

Systems for CBRNE Defence

Bruker solutions includes personal and handheld point detectors as well as detection systems for reconnaissance vehicles, battle tanks, shipboard or stationary use. Bruker provides sophisticated CBRNE software solutions for instrument control and systems integration.

Safety & Security

Bruker equipment supports not only the response teams from Fire Departments, Police, Customs and Civil Defence in addition, major events such as summits, concerts, parades and sporting events can be targets for terrorist attacks. Harbours, ports, airports and public buildings are also sensitive to the release of hazardous agents. Bruker detection equipment can be integrated into monitoring systems for these critical infrastructures using combinations of both static and mobile detection systems.

Bruker offers a wide product range including

- Mobile Mass Spectrometers
- Ion Mobility Spectrometers
- Stand-off detectors based on passiv FTIR
- FTIR ATR ruggedized Spectrometers
- Radiation Meters
- Neutron Induced Gamma Spectrometry
- Generic Biological Aerosol detectors
- PCR and ELISA based biological identifiers

Bruker CBRNE equipment is in service with armed and naval forces, civil defence and first responders worldwide. Our instruments are part of major reconnaissance vehicles in the world like the CBRNRS Fox or the Korean K-216 and part of the chemical and/or radiological detection system of ships like the German frigate F123/124 and the MEKO 100. The systems are also an integrated part of the protection system within German and Swedish Coast Guard ships.
Chemical Hazardous Agent Detection

RAID series

A series of chemical monitors, covering multiple tasks including monitoring of collective protection facilities and CBRN filter stations, as well as handheld or personal point detection for protection purposes. Based on the well-established Ion Mobility Spectrometry, all important CWA and Toxic Industrial Chemicals (TIC) can be monitored in real-time.

The μRAID; the first personal chemical agent detector based on Bruker's field proven IMS technology; provides unmatched overall sensitivity in this class of instruments. The expandable TIC capability is organised into five libraries that can be tailored with the relevant instrument dataset to meet your specific requirement.

The innovative RAID-XP combines chemical and radiological detection into one system.

The RAID-M 100 is distinguished by its flexible and easy use for portable and hand-held deployment. It is designed for fast and sensitive detection and identification of CWA and TICs.

The RAID-S2 is specially designed for long term operations. The instrument can either be operated separately, or several instruments can be connected in networks.

RAID-AFM can be deployed for stationary chemical detection in vulnerable areas such as air and sea ports and public facilities such as sports arenas. The innovations of a non-radioactive ionisation source or a gamma radiation detector option makes it the most flexible stationary solution in the world.
Chemical & Radiation Detection

**Stand-off detector for atmospheric pollutants**

A compact, mobile infrared detector for real-time remote sensing of chemical agent clouds. All known CWA and important Toxic Industrial Chemicals (TICs) can be automatically identified and monitored over a distance of several kilometres – either stationary or on the move. Latest developments have resulted in linking two or more RAPID’s to setup a triangulation system and allowing tomographic reconstruction of chemical clouds.

**MM2**

The MM2 sets a milestone in GC/MS technology with a volume of 43 litres and a weight of 35 kg. Equipped with improved Gas Chromatography/ Mass Spectrometry technique it represents the new generation of quadrupole mass spectrometers. The MM2 is optimized for long-term chemical reconnaissance in various armoured vehicles, as well as for mobile chemical agent inspection and detection missions.

**SVG 2**

Hand-held, hardened radiation detector, based on state-of-the-art semiconductor technology. Equipped with integrated sensors for gamma and neutron radiation detection, and an external α/β/γ-probe.

Monitoring of public events with stand off detection of chemical clouds.
**Biological Detection**

VeroTect a generic detector for biological aerosol uses the combination of fluorescence and aerosol shape and size sensors for the detection of biological aerosol clouds.

pTD is a fully automated ELISA based on-site identifier for toxins using the unique electrical biochip technology in a disposable consumable.

M-BL, the mobile biological lab, offers PCR based detection of pathogens with integrated sample preparation in a ruggedized, easy to use format.

**MALDI Biotyper**

The MALDI Biotyper allows fast and reliable identification and classification of microorganisms, such as bacteria, archaea, yeasts or fungi. There is neither a need for any prior PCR amplification, nor for the usage of selective growth media nor for any other pre-assumptions, which may influence the outcome of the analysis. The MALDI Biotyper software identifies microorganisms by the species-specific signal patterns contained in their respective molecular profiles.

For research use only. Not for use in diagnostic procedures.
First Responders & Environmental Protection

**E²M**

The enhanced environmental mass spectrometer E²M is a mobile, compact and lightweight GC/MS system for fast, reliable onsite identification of organic chemicals from any medium (soil, water, air) within 20 minutes via complementary sampling techniques. Typical fields of application are environmental protection, mobile on-site analysis and event monitoring. The E²M fully supports First Responders and Homeland Security detection and identification activities. The instrument has been developed in close co-operation with German Fire Brigades and Disaster Management Authorities.

**Mobile-IR**

Most chemical substances have their own infrared signature; just like a fingerprint. With the new Mobile-IR, it is easy to identify unknown chemicals in just a few seconds, by comparing the fingerprint of the substance with included data bases. Unlike other portable instruments, the Bruker Mobile-IR is designed to be used under adverse conditions. It is waterproof to IP67 standards, and offers a high degree of shock protection.

**RAID-M 100**

The RAID-M 100 is outside the military used by civil defense forces, first responders and fire fighters to challenge the threat of toxic industrial compounds.

**DE-tector**

The third generation of IMS based trace detectors is formed with the Drugs Explosive detector of Bruker. The twin-tube IMS design means no split of the sample before it will be ionised with a non radioactive source. CHIRP and IMS-Profiler gives unmatched sensitivity and false alarm suppression.

**NIGAS**

System for automated, non-invasive detection of chemical warfare agents in ammunition, using Neutron Activation Analysis with a non-radioactive source. The instrument is transportable and can be used even under field conditions.
Software Solutions

System Integration
Our CBRNE detectors can be easily integrated into any kind of CBRN detection platform. The systems are deployed under various environmental conditions. Ruggedised design and sophisticated accessories allow flexible and extensive applications for the detection of hazardous compounds by mounting the systems on vehicles, ships, helicopters, shelters or by hand-held use under field conditions. Sophisticated software supports the integration of our CBRNE detectors. Bruker has over thirty years of experience in systems integration.

Analytical support tool XIMS NT
Bruker offers analytical software packages to support the use of their hand-held and personal detection equipment in order to get deeper insight into the threat situation and to tailor the instruments to customer specific needs.

CPS- Cloud positioning system
CPS collects data from two or more RAPID systems. It offers triangulation and tomographic reconstruction of detected chemical clouds.

Bruker XIMS software family are control and data systems for the Bruker Ion Mobility Spectrometers (IMS). They are assigned for instrument control of the detector, for data acquisition and analysis of two- and three-dimensional IMS spectra on a PC.
Infrared and Raman Spectroscopy

Advanced Research and QA/QC Solutions Based on Infrared and Raman Spectroscopy

Innovation with Integrity
Bruker Optics has the industry’s most comprehensive FT-IR product-line; from the very compact FT-IR spectrometer to the world’s highest resolution.

**ALPHA**

About the size of a lab book, the very compact FT-IR spectrometer Alpha will play a big part in your daily routine. Plug & play set-up, easy-to-use software, combined with QuickSnap™ sampling modules assure powerful and reliable FT-IR analysis you expect from Bruker. Alpha is ideal for academic teaching and routine industrial applications.

**Mobile-IR Portable FT-IR**

Material Identification Anywhere! Bruker’s Mobile-IR is a self-contained, rugged portable FT-IR spectrometer that provides benchtop performance, wider spectral coverage and higher spectral resolution. It’s ideal for crime scene investigation, environmental monitoring and hazardous material identification applications.

**TENSOR Series**

If you need a FT-IR spectrometer that can rapidly identify, quantify and verify your routine samples, Tensor is the right tool for your laboratory. It combines the highest performance and outstanding flexibility with ease of use. A full line of sample compartment and external FT-IR accessories enable it to be used for various challenging applications.
Most Comprehensive FT-IR Product Line; from the Smallest in Size to the Highest in Resolution

**VERTEX Series**

The VERTEX Series is built on a fully upgradeable optics platform that is designed with the utmost flexibility in mind. Multiple input and exit ports allows users to connect various external and internal accessories and components to customize the instrument based on applications. Vertex spectrometers share a wide range of features and utilize patented RockSolid™ and Ultra-Scan™ interferometer designs.

**Vacuum Optics**

With the vacuum models, peak sensitivity in the mid-, near- and far IR regions is obtained without the fear of masking very weak spectral features by air water vapor absorptions. For the VERTEX 80v vacuum spectrometer a unique option is available: The new automatic beamsplitter exchange unit BMS-c for automatic spectral range selection without the need of venting the spectrometer vacuum optics.

**IFS 125 Series**

The IFS 125 is built for performance with each instrument component optimized to approach the theoretical limit of sensitivity. It offers the highest spectral resolution available down to 0.001 cm⁻¹, a resolving power of up to 10⁶ and the wide wavelength range from 5 cm⁻¹ in the far-IR/THz to 50,000 cm⁻¹ in the UV. The mobile IFS 125/M is dedicated to gas phase absorption studies, frequently applicable to atmospheric research.
Remote Sensing

**HI 90 Hyperspectral Imaging System**
Atmospheric, environmental research, volcanology, industrial surveillance and homeland security outline the wide range of applications of the new HI 90, Hyperspectral Imaging system. The HI 90 is ideally suited for real-time identification, quantification, and visualization of gas clouds. In addition, algorithms based on a combination of image processing and spectral analysis can be applied allowing for the system to be used in a range of imaging applications for solids and liquids.

**SIGIS 2 Scanning Imaging Remote Sensing System**
SIGIS 2 is a remote sensing system that allows identification, quantification, and visualization of gas clouds from long distances. The system maps a predefined area and results of the analysis are visualized by the video image, overlaid by a chemical image.

The SIGIS 2 can be used for environmental applications, atmospheric research, volcanology, and industrial facility surveillance. The SIGIS 2 is currently being deployed by emergency response forces in Austria, Denmark, Germany, and Italy.

**EM 27 Remote Sensing FT-IR**
Providing laboratory grade performance, the EM27 remote sensing FT-IR can easily be deployed in the field for various environmental air monitoring applications. Emissions from smoke stacks and waste disposals, hazardous emissions from chemical accidents can be observed with an operating range of up to several kilometers.
FT-Raman

The Raman effect is based on the inelastic scattering of monochromatic light with matter. As the complementary vibrational technique of IR spectroscopy, Raman provides detailed molecular structure information.

MultiRam
The MultiRAM is a stand-alone high-performance FT-Raman spectrometer. It has a large sample compartment to utilize an extensive range of pre-aligned sampling accessories.

RAM II FT-Raman Module
Designed as an add-on module, Bruker’s RAM II is a dual-channel FT-Raman unit that can be coupled to the VERTEX series multi range FT-IR spectrometers.

Low Temperature Silicon QC
The CryoSAS is a high-sensitivity system for the quality control of solar and electronic grade silicon material according to international standards. Although sample cooling to very low temperatures is required, the fully automated system is easy to operate, and does not require cryogenic liquids.
FT-IR & Raman Microscopy

Infrared and Raman spectroscopy are versatile and powerful analytical techniques that can be applied to micro-analysis. Bruker’s FT-IR and Raman microscopes are built on state-of-the-art optical microscopy platforms that provide optimal sample visualization combined with high sensitive and highly resolving spectroscopic analysis. Areas of applications include material science, forensics, mineralogy, failure analysis, content uniformity, sample homogeneity and quality control.

**LUMOS**

The LUMOS is fully automated stand-alone FT-IR microscope. It combines best performance for visual inspection and infrared spectral analysis with highest comfort of use.

**HYPERION Series**

Featuring infrared FT-IR-chemical imaging, crystal-clear sample viewing and a wide variety of IR and visible objectives, the HYPERION™ is designed for the most demanding micro-analysis. The HYPERION™ 3000 incorporates state-of-the-art focal plane array (FPA) detectors for collecting high-resolution chemical images in a matter of seconds.

**SENTERRA**

Bruker’s SENTERRA is an easy to use Raman microscope with patented features like SureCal permanent calibration. With its wide variety of excitation lasers, it is ready to challenge any microanalysis research applications.

**RamanScopeIII**

When sample fluorescence is a problem, FT-Raman microscopy with near infrared 1064 nm excitation is frequently the only solution. RamanScopeIII can be coupled to Bruker’s FT-Raman spectrometers, and be combined with the SENTERRA dispersive Raman microscope as a hybrid solution.
Discover the flexibility of Near Infrared Spectroscopy

NIR spectroscopy has largely replaced a number of wet chemical analysis methods. With the fiber optics and the integrating sphere sampling techniques, NIR spectroscopy does not require any sampling preparation. It is a fast and precise tool for the nondestructive analysis of liquids, solids and paste-like materials, saving costs by reducing time and reagent use.

TANGO

Faster, simpler, more secure - with TANGO your NIR analysis speeds up. The new TANGO from Bruker has exactly what users require of an FT-NIR spectrometer suitable for food analysis: Robustness, high precision and straightforward operator guidance. The proven FT-NIR technology by Bruker was combined with an easy-to-use touch screen operation and a small footprint, perfect for those laboratories with limited space.

MPA Multi Purpose Analyzer

Bruker’s dedicated FT-NIR spectrometer MPA offers everything you need for the analysis of liquids, solids, powders and tablets. Selection of the different measurement accessories is completely software controlled and validated, without the need for any manual exchange.

MATRIX Series

The award winning MATRIX™ series process-ready FT-NIR Spectrometers incorporate state-of-the-art optics for outstanding sensitivity and stability. Available configurations include fiber optic coupling up-to 6 probes and integrating sphere.
Today, many companies are not only striving to manufacture high-quality products, but also increase production efficiency by installing the analytical systems directly into their production plants. This improves process verifiability and gives the company the opportunity to optimize material use.

Bruker’s technology base includes FT-IR, FT-NIR, dispersive NIR and Raman Spectroscopy. This allows us to offer a choice of analytical solutions based on applications or sampling points. The robust design of our spectrometers enable use in tough conditions in the production plant.

**MATRIX-F FT-NIR Spectrometers**

The award winning MATRIX-F FT-NIR spectrometers allow the direct measurement in process reactors and pipelines, leading to a better understanding and control of the process. Its innovative design provides consistent high-quality results, less downtime and direct method transfer. ATEX II 2G EEx p II T6 version available.

**MATRIX-MF FT-IR Spectrometers**

Utilizing the information rich mid-IR region for use in both laboratory and process environments, the MATRIX-MF is a process ready spectrometer that is ideal for real-time monitoring and analysis of chemical and biological reactions. ATEX II 2G Ex px II T6 version available.

**FT-NIR measurement heads and probes**

A wide range of fiber optic probes is available for the MATRIX-F series – from immersion probes for liquids to reflection probes for solid materials. For contactless measurements, Bruker offers emission heads which collect the reflected light from the sample, also as fully ATEX certified version for gas and dust Ex-zones.
OPUS – Spectroscopy Software

“All-in-one” IR and Raman spectroscopy software consisting of a suite of software packages that cover both standard and specialized applications.

Features
- Running under Windows XP and Windows 7 operating system
- Supporting the demands of 21 CFR Part 11 “Electronic Records, Electronic Signatures”
- Manipulating multiple spectra and 3D files at the same time
- Providing comprehensive spectra processing routines e.g. integration and baseline correction
- Providing easy to use, intuitive application-specific software interfaces for complete routine analysis tasks

Display and Processing of 3D files

OPUS-VIDEO
- Wizard guides the operator through the full procedure of data acquisition
- Powerful autofocus functionality
- Acquisition of spectral data up to 10 Giga Byte

OPUS-3D
- IR and Raman images may be combined with high-resolution visible images and shown as 2D contour plots or as 3D topography plots
- Multiple data analysis functions from simple “Integration” to “Cluster Analysis”, “Spectral Similarity” or “Factorization”

Quantitative Analysis and Quality Control, Process Control

QUANT
- PLS tools box to setup quantitative analytical methods
- Automatic method development and optimization
- Automatic outlier recognition and removal

IDENTIFICATION
- Complete tools box of algorithms for substance identifications
- PCA including visualization by 2D and 3D score plots
- Hierarchical multi-level libraries to separate even similar substances
- Validation with independent samples: positive and negative samples

PROCESS and REACTION MONITORING
- Real time evaluation using multivariate methods and on-line trending
- Communication protocols to DCS (OPC, Profibus DP, Modbus, 4-20 mA, …)
- Interactive setup of integration methods during reaction monitoring
- Automatic end point detection based on PCA or integration results
Content:

**X-RAY, XRF, SC-XRD, AFM, OIM, MA, OES, CS/ONH, Tribology and Micro-CT**

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Advanced Analytical Solutions

XRD, XRF, SC-XRD, AFM, OIM, MA, OES, CS/ONH, Tribology and Micro-CT

Innovation with Integrity
We Exceed Your Expectations

Professional Competence

Bruker is a worldwide market leader in providing advanced X-ray and optical emission systems and complete solutions for structure and elemental analysis using X-ray diffraction (XRD), X-ray fluorescence (XRF/OES) and crystallographic diffraction techniques. We also offer the world’s largest selection of AFMs, stylus profilers, and 3D optical microscopes to enable nano- to macro-scale surface measurements for the widest range of scientific and industrial applications. Our microtomography desktop instruments even enable you to non-destructively acquire 3D images of your sample’s morphology and internal microstructure with resolution down to the sub-micron level.

Our products fit the analytical requirements of customers in materials research, life science, quality control, and process analysis. They provide essential information about the molecular structure, material and structural parameters of thin film and bulk material as well as elemental composition of solids and liquids.

High Performance

Bruker X-ray systems emphasize modularity and flexibility, enabling an entry-level system to be reconfigured or upgraded to meet changing requirements. We offer the widest available variety of X-ray sources, optics, sample environments and detectors, along with expert advice on configuring the optimal system. All of our systems and solutions are easy to operate, robust and compact, with degrees of automation ranging from none to one-button operation. Professional training and worldwide service is in place to support the customer.

A History of Innovation Leadership

Bruker is constantly redefining the performance and quality standards in X-ray analysis. Breakthrough innovations and continual improvements upon established techniques provide our customers with analytical possibilities that were considered beyond reach only a short while ago. Examples include our revolutionary detection technologies, multilayer X-ray optics, and ability to perform XRF analysis of light or trace elements. Further accomplishments are highlighted at the bottom of this and the following pages.

SUPER SPEED SOLUTIONS

Bruker breaks all records. The SUPER SPEED components ensure breathtaking speed at high-sensitivity resolution – without sacrificing reliability and flexibility. The X-ray diffraction SUPER SPEED SOLUTIONS enable an unprecedented throughput in research and development.

- High-brilliance TURBO X-RAY SOURCE
- VÄNTEC-1 detector – instant diffraction snapshots
- LYNXEYE™ – rapid powder diffraction
- VÄNTEC-500 detector – the extra dimension of XRD
- VÄNTEC-2000 detector – ultra size XRD

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X-ray Powder Diffraction (XRPD)

X-ray diffraction expands analytical capabilities down to the nanometer range. Our highly accurate, reliable and fast diffraction solutions are accompanied by an intuitive and clearly laid-out user interface, easy handling, and individual data presentation, as well as perfect integration and communication capabilities.

Applications
- Crystalline phase identification
- Crystalline phase quantification
- % crystallinity
- Crystallite size determination
- Crystal structure analysis
- Crystal orientation
- Texture and preferred orientation
- Microstrain
- Residual stress
- Depth profiling
- Polymorph screening
- High temperature
- Low temperature
- Humidity
- Phase transition
- Nanoparticles

DAVINCI design
The D8 ADVANCE with DAVINCI design facilitates a pioneering diffractometer concept, which eliminates the problems of awkward configuration and adjustments once and for all. It is extremely easy to exchange all components and geometries, thanks to the multi-level design:

- DAVINCI.SNAP-LOCK: alignment- and tool-free optics change
- DAVINCI.MODE: real-time component recognition, configuration and conflict detection
- DIFFRACT.DAVINCI: graphical representation of the actual goniometer showing all beam path components including their status, enabling immediate measurements as well as the creation of measurement methods.
Quick-Change Artists without Limits

The capabilities provided by the D8 DISCOVER, laboratory X-ray diffraction enters new frontiers in the nano-world and materials research so that synchrotron measurement campaigns become obsolete in many cases.

Applications

- Crystalline phase identification
- Crystalline phase quantification
- % crystallinity
- Crystallite size determination
- Crystal structure analysis
- Texture and preferred orientation
- Microstrain and relaxation
- Residual stress
- Layer thickness
- Layer roughness
- Lattice parameter
- Chemical composition
- Lateral structures
- Defects
- Depth profiling
- Real space mapping
- Microdiffraction
- Polymorph screening
- High temperature
- Low temperature
- Humidity
- Phase transition
- Nanoparticles

The D8 FABLNE is the only X-ray metrology instrument with various combined applications:

- High-Resolution X-Ray Diffraction (HRXRD)
- X-ray Reflectivity (XRR)
- Grazing Incidence Diffraction (GID)
- Micro-X-ray Fluorescence (μXRF)
- Grazing Incidence X-ray Fluorescence (GIXRF)

High-Throughput Applications

Screening a large number of samples quickly and completely requires dedicated instrumentation and extensive knowledge of the analytical process. Extremely large amounts of data need to be handled, especially in catalyst development and pharmaceutical research. Unique applications from Bruker extract authoritative results from the most varied of sample characteristics, parameters and correlations, e.g.:

- Laser/Video system for precisely focused, automated alignment
- Eulerian cradles, 2D detectors, robotic wafer handling
- Powerful X-ray sources, innovative detectors
- Integrated Analytical Intelligence with POLYSNAP software
Nanostructure Analysis

Enter the universe of nanostructure Analysis

The innovative Small Angle X-ray Scattering (SAXS) systems NANOSTAR and MICROpix are ideal tools for the non-destructive characterization of nanostructures on the order of 10 to 1000 Ångstrom, such as precipitates in bulk materials, proteins in solution, nanoparticles attached to a surface.

The unique MICROcalix combines SAXS with micro-calorimetry to extract nanostructure information at any temperature in a calorimetric scan, from one and the same sample.

Applications
- Small Angle X-ray Scattering (SAXS)
- Wide Angle X-ray Scattering (WAXS)
- BioSAXS
- Grazing Incidence Small Angle X-ray Scattering (GISAXS)
- Nanography
- Particle size and shape
- Particle size distribution
- Orientation distribution
- Particle distances
- High and low temperature
- Micro-calorimetry

Göbel and MONTEL Mirror

The highest performance can only be achieved with the most modern instruments. With the invention of the Göbel Mirror, Bruker raised the standards for diffraction and SAXS. Göbel Mirrors are X-ray optics with incomparable precision. In particular in combination with high-brilliance micro focus X-ray sources (μS) or rotating anode sources (TXS) a beam with high-flux on a small spot is generated.

- Maximum flux
- Perfect beam homogeneity
- Highest spectral purity
- Bragg-Brentano, parallel beam, or focusing geometries
- High-flux densities for μXRD applications
X-ray Fluorescence Analysis (XRF)

Defining the World of Elements in Seconds

X-ray fluorescence spectrometry is the most effective way to perform multi-elemental analysis determining concentrations in all forms of samples: solids, powders and liquids. Based on the renowned XFlash® silicon drift detector technology Bruker energy dispersive X-ray fluorescence (EDXRF) systems offer highest analytical precision and stability. The S2 PICOFOX allows the analysis of thin films as well as the analysis of traces down to 0.1 ppb using total reflection X-ray fluorescence (TXRF). The S2 RANGER with TouchControl™ provides you with instant answers for element concentrations from Na to U in unknown samples.

Applications
- Fresh water, sea water
- Sewage, sludge
- Pharmaceuticals
- Blood, urine
- Proteins, macromolecules
- Food, dietary supplements
- Wine, beverages
- Nanoparticles
- Washcoats
- Contaminations
- Aerosols
- Thin films

XFlash® LE SDD Detector

The XFlash® LE detector further expands the application range of Benchtop-EDXRF systems such as the S2 RANGER. Due to the ultrathin high transmission entrance window the XFlash® LE SDD with 50 W excitation power eliminates conventional limitations of EDXRF systems and significantly enhances the sensitivity for light elements, such as eight times more sensitivity for sodium and four times more sensitivity for magnesium. In addition the XFlash® LE achieves an excellent energy resolution of less than 129 eV for Mn Kα₁ at very high countrates due to the advanced MCA electronic enabling users to achieve excellent analytical precision.

Applications
- Petrochemicals
- Minerals and mining
- Slags
- Cement
- Geology
- Pharmaceuticals
- Metals and alloys
- Soil, sediments and waste
Unrivalled Analytical Performance

Our wavelength dispersive X-ray fluorescence (WDXRF) systems provide you with excellent analytical results for elements from Be to U in your samples. They feature high accuracy and the best achievable precision for effective process and quality control. They are reliable and robust for all industrial applications, yet flexible and powerful for all non-routine applications in research and development.

**TouchControl™**

Reliable results and error-free instrument operation is the key to success. This is why Bruker developed the intuitive instrument operation with touch screen. With minimum training, even inexperienced operators can obtain optimum results. And your analytical data are safe due to the unique TouchControl™ concept.

- Easy-to-use – intuitive operation
- No mouse or keyboard needed
- Minimal training required
- Immediate results on the touch screen
- Compact all-in-one design

**Applications**

- Petrochemicals
- Plastics and polymers
- Cement
- Geology
- Metals and alloys
- Precious metals
- Minerals and mining
- Glass and ceramics
- Chemicals and catalysts
- Pharmaceuticals
- Soil, sediments and waste
- Foods

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**S8 TIGER**
Sequential WDXRF

**S8 LION/S8 DRAGON**
Simultaneous WDXRF
Micro-X-ray Fluorescence Analysis (MA)

μ-XRF is the method of choice for the elemental analysis of inhomogeneous or irregularly shaped samples as well as small samples or even inclusions. The M1 and M4 tabletop spectrometers offer maximum versatility for all applications, whether for routine analysis in quality control or for individual setups analyzing special samples.

Applications

**M4 TORNADO**
- Minerals
- Metals and alloys
- Electronic components (RoHS)
- Particles
- Forensics
- Layers
- Art conservation, archeology

**M1 MISTRAL/M1 ORA**
- Jewelry
- Metals and alloys
- Layers (M1 MISTRAL)

**ARTAX**
- Non-destructive element analysis in art conservation, archeology and archeometry
- Metals, alloys, sheet metal
- Thin layers

The ARTAX is a unique, portable μ-XRF spectrometer designed to meet the requirements for a spectroscopic analysis of immobile and valuable objects on site, i.e. in archeometry and restoration. It can be used for both spot measurements and high-resolution 1D and 2D mapping.

**Speed and Spatial Resolution**

Using polycapillary optics Bruker’s μ-XRF spectrometers can illuminate areas down to 25 µm in diameter with maximum X-ray intensity. The integrated Peltier-cooled XFlash® Silicon Drift Detectors process highest count rates at optimal energy resolution. Short measurement times and fast sample stages lead to extremely quick results regarding the elemental composition of a sample.

- Spatially resolved analysis of arbitrarily shaped samples, including fine structures
- No cooling media or consumables required
- Non-destructive measurement without sample preparation
- Outstanding analytical flexibility
Handheld XRF Spectrometry

**Applications**
- Analysis of metal alloys for Positive Material Identification (PMI)
- Non-destructive testing with grade ID and chemistry
- Light element capability: Mg, Al, Si, P
- Scrap metal recycling
- QA/QC in the manufacturing environment

**Applications**
- Art conservation, archaeology and archeometry
- Research and teaching tool for universities
- Research and development
- Selected by leading Museums like the Getty and MOMA

**XRF Elemental Analyzer**
- Light element analysis – Mg, Al, Si, P, S and Cl without vacuum or He
- SDD provides rapid analysis and ID of alloys
- TÜV SÜD certification – trusted the world over!
- Joint Bruker/NASA patent, earned NASA’s Space Seal for vacuum technology
- Tube-based XRF for handheld elemental analysis – no radioactive materials

The Bruker handheld XRF analyzers provide quick and easy non-destructive analysis. The S1 TITAN enables fast analysis and ID of most alloys. The TRACER III-V⁺ and III-SD tube based systems include the Bruker/NASA joint patented vacuum system and high-resolution detector allows for laboratory grade results of elements from Mg to U.
Optical Emission Spectrometry (OES)

High-End Elemental Analysis of Metals

Spark optical emission spectrometers (S-OES) are the ideal instruments for all types of metals. From pure metal trace analysis to high alloyed grades, spark OES covers the complete range from sub-ppm to percentage levels. All relevant elements can directly be analysed simultaneously.

Spark spectrometer instruments cover all types of metal applications. Our range of high-end instruments allows our customers to elevate their business into new levels of quality and process control.

Applications Q2 ION
- Iron and steel and alloys
- Aluminum and alloys
- Copper and alloys
- Nickel and alloys
- Cobalt and alloys
- Magnesium and alloys
- Lead and alloys
- Tin and alloys
- Titanium and alloys
- Zinc and alloys

Applications Q4 MOBILE
- Positive Material Identification of metals
- Sorting of metals
- Analysis of metals

Applications Q4 TASMAN
- Iron and steel and alloys
- Aluminum and alloys
- Copper and alloys
- Nickel and alloys
- Cobalt and alloys
- Magnesium and alloys
- Lead and alloys
- Tin and alloys
- Titanium and alloys
- Zinc and alloys

New Freedom in Mobile OES – Q4 MOBILE is offering innovative solutions:
- Patented CCD optic
- Special power management
- Hybrid cable for more flexible probe cabling
- Ultra-light probe
- Arc/spark probe with quick adapter change

Spark Stand With Co-axial Argon Flow
The innovative co-axial Argon flow represents the culmination of our efforts to further improve performance:
- Extended cleaning intervals
- Low Argon consumption
- Better analytical quality
- Reduced operation costs
High-end Photomultiplier Spectrometers

Q8 MAGELLAN feature the latest technology in photomultiplier detectors:
- Lowest dark current
- Large dynamic range
- Highest sensitivity
- Improved limits of detection
- Impressive stability and repeatability

Applications
Elemental analysis of:
- Iron and steel alloys and traces
- Nitrogen in steel
- Aluminum alloys and traces
- Copper alloys and traces
- Oxygen in copper
- Nickel alloys and traces
- Cobalt alloys and traces
- Magnesium alloys and traces
- Tin alloys and traces
- Lead alloys and traces
- Titanium alloys and traces

Automation Control Software QMATION

The Q8 CORONADO is controlled by the powerful QMATION software:
- .Net framework technology
- Graphical user interface for providing system status

Applications
- Process analysis of steels
- Process analysis of cast iron
- Process analysis of aluminum
- Process analysis of copper
C, S, O, N, H – Analysis

CGA Combustion and Gas Analyzers – fast and accurate

Based on the know-how of many decades Bruker Elemental offers innovative solutions for rapid and precise elemental analysis.

The state-of-the-art technologies for fast and reliable determination of Carbon, Sulfur, Oxygen, Nitrogen and Hydrogen with simple and user-friendly operation provide highly accurate results for process and quality control as well as for materials research and development.

The clearly and simply structured Bruker “One-4-All” software interface for the CGA analyzers with intuitive operation via an external PC with Windows® software maximizes convenience and productivity.

Applications
- Iron, steel, cast iron
- Ferroalloys
- Aluminum and alloys
- Titanium, zirconium and alloys
- Ores, minerals
- Cement, lime, limestone, clays
- Coal, coke, fly ash
- Catalysts

CS Analysis

The G4 ICARUS HF combustion analyzer with high frequency induction furnace and infrared detection is the instrument of choice for rapid and precise, simultaneous of carbon and sulfur down to ppm levels in a large variety of solid materials.

By introducing key technology advances, the G4 ICARUS HF creates a new dimension of usability and productivity.

The innovative combustion zone design combined with a unique, fully automatic cleaning system with brush- and vacuum-free dust removal leads to significantly reduced maintenance, thus maximizing productivity, applicability and component lifetime.

CS-Analysis

The G4 ICARUS HF analyzer is designed for simultaneous, fast and accurate determination of carbon and sulfur in a large variety of metallic and nonmetallic materials. G4 ICARUS features:

- Innovative design of the combustion zone with gas extraction nozzle (pat. pending) provides lance-free operation, reduced maintenance, higher productivity
- Fully automatic cleaning system with noiseless, brush- and vacuum-free dust removal into the used crucible
- Double dual range solid-state NDIR detector with two measuring ranges for CO₂ and SO₂ as standard
- Zero-flow mode saves oxygen during break periods, in stand-by mode additionally no reagent consumption
ONH Analysis

The high-end G8 GALILEO ONH analyzer is designed for rapid and automatic determination of oxygen, nitrogen and hydrogen in solid materials, based on the inert gas fusion (IGF) principle, which involves fusion of the sample material in a graphite crucible at high temperatures. When combined with an external, temperature-programmable infrared heated furnace, the G8 GALILEO can measure the diffusible hydrogen content in many sample materials, e.g., in welds according to ISO 3690 and AWS A4.3 as well as in high-strength steel.

The G4 PHOENIX DH carrier gas hot extraction analyzer is the right solution for accurate and rapid diffusible hydrogen measurement in a wide variety of matrices. The quartz tube diameter of 30 mm of the temperature-programmable infrared furnace enables the analysis of large samples such as steel sheets, strips, and weld coupons according to AWS A4.3 and ISO 3690.

Coupling a mass spectrometer to the analyzers leads to a substantially improved detection limit for the determination of ultra-low diffusible hydrogen concentrations, e.g., in high-strength steels by Thermal Desorption Mass Spectrometry (TDMS).

ONH-Analysis

The G8 GALILEO is available in different configurations for simultaneous or single element determination. Besides total hydrogen by melt extraction, it enables the analysis of diffusible hydrogen by hot extraction with the external tube furnace. G8 GALILEO features:

- Programmable temperature of the electrode furnace, contact-free optical sensor for temperature measurement and precise control
- High stability detection system with NDIR detector for CO and thermal conductivity cell for N₂ and H₂
- Optional automatic furnace cleaning with dust removal, automatic crucible changer, and sample loader
- Optional quadrupole mass spectrometer enables the measurement of ultra-low diffusible hydrogen concentrations
Atomic Force Microscopy (AFM)

Characterize & Measure Nanometer Size Surface Structures

Bruker’s atomic force microscopes (AFMs) drive the world’s leading-edge research in life science, materials science, semiconductor, electrochemistry, and many other applications. The Dimension FastScan™ is the world’s fastest and most productive AFM, offering unrivalled speed and resolution providing the highest levels of nanoscale performance for a wide variety of samples, including measuring biological dynamics with ease. The MultiMode® 8 with ScanAsyst® is the latest generation of the world’s most widely used AFM, offering the highest resolution and the versatility to excel in applications ranging from materials research to life science. The BioScope Catalyst™ has been specifically engineered to image biological samples and offers uncompromised AFM and optical resolution between AFMs and inverted optical microscopes.

The new Innova-IRIS AFM-Raman systems provide the industry’s leading performance for TERS and co-localized Raman-AFM measurements, enabling comprehensive correlated property mapping and extending the boundaries of nanoscale spectroscopy.

Finally, the InSight 3DAFM™ and Dimension AFP™ Automated Atomic Force Profiler provide fully automated dimensional metrology for semiconductor, data storage and LED applications. The systems provide the industry’s best measurement uncertainty for critical dimension, profilometry, yield impacting trench depth measurements, roughness and defect review.

Exclusive PeakForce Tapping Technology

Bruker’s innovative Peak Force Tapping® technology enables unique new AFM imaging modes that deliver quantitative information and a leap forward for AFM ease of use. ScanAsyst uses self-optimizing algorithms to acquire high resolution images in both air and liquids. PeakForce QNM® enables nanoscale quantitative characterization of materials properties while PeakForce TUNATM and PeakForce KPFM™ provide the highest resolution quantitative nanoscale electrical characterization.
Stylus and Optical Metrology (SOM)

3D Optical Microscopes

Bruker’s ContourGT™ 3D Microscopes combine advanced 64-bit, multi-core operation analysis software, patented white light interferometric hardware, and unprecedented operator ease of use to deliver the most advanced 3D optical surface metrology ever developed. These systems provide fast, angstrom-to-millimeter vertical range metrology over large fields of view, with flexible sample setup and industry-leading repeatability for production, research and quality control applications.

Ultimate Stylus Profiling Performance

The DektakXT™ features a revolutionary design that enables unmatched, better than 5-angstrom repeatability. Through its combination of industry firsts, DektakXT delivers the ultimate in performance, ease of use and value to enable better process monitoring from R&D to QC. The technological breakthroughs incorporated in this 10th generation Dektak enable critical nanometer-level surface measurements for the microelectronics, semiconductor, solar, high-brightness LED, medical, scientific, and materials science industries.

Innovations Customized for Your Application

Bruker provides patented metrology solutions that tailor decades of surface measurement experience specifically to your applications. For example, the NPFLEX-LA™ 3D Optical Microscope is the first comprehensive, non-contact metrology solution that repeatably quantifies true lead angle and surface texture of dynamic sealing surfaces. Likewise, our R&D 100 Award winning AcuityXR™ Enhanced-Resolution Microscopy Technology enables ContourGT systems to break the optical diffraction limit and deliver lateral resolutions previously considered unattainable with conventional optical microscopy techniques.
Tribology & Mechanical Testing (TMT)

Tribology Testing
Bruker’s CETR-UMT uses servo motor control for increased accuracy and combines all common test schematics in one platform. The modular design enables measurements of numerous tribological and mechanical properties of any material on the same tester. By simply replacing components, within a matter of minutes the user can alternate between reciprocating and rotating motion, from pin-on-disk to block-on-ring or any of a number of ASTM, DIN or ISO standard tests. Unlike other instruments in this class, the CETR-UMT is capable of highly accurate loading and custom motion patterns through the use of precision servo-control.

Nano & Micro Scratch and Indentation
In semiconductor, solar and MEM’s applications, understanding the properties of thin films and coatings is critically important. Bruker’s CETR-Apex platform is optimized for scratch and indentation these materials. This modular platform allows the user to select either micro or nano-scale testing and to augment the mechanical testing with either AFM or SOM imaging for in line wear scar analysis. Advanced sensors such as acoustic emission or electrical contact resistance and the ability to program custom motion patterns, enable practical and repeatable in-situ testing of thin films and coatings.

The Most Flexible Solution Without Compromise
When it comes to tribology testing or nano/micro scale mechanical testing, there are many standards and test protocols. Only the Bruker CETR-UMT and CETR-Apex allow rapid changeover of configuration on a single, high-precision test platform, eliminating the need to acquire and maintain multiple instruments. From lubricants to cosmetics formulation, semiconductor to LCD coatings, orthopedic to automotive materials testing, no other instrument offers as much flexibility without compromising accuracy and repeatability.
Microanalysis (EDS) and Electron Backscatter Diffraction (EBSD)

Rough surfaces, particles, thin layers, bulk samples … The new generation of QUANTAX EDS features slim-line technology and a wide range of active areas for the XFlash® 6 detector series combined with the new enhanced hybrid pulse processor. It covers the majority of applications and tackles even your toughest challenges with unprecedented speed, accuracy and ease of use.

The QUANTAX EDS works in conjunction with Scanning Electron Microscopes as well as Transmission Electron Microscopes (TEM). The innovative SDDs designed for TEM (XFlash® 6T I 30 and 6T I 60) offer minimum mechanical and electromagnetic interference. They provide optimum take-off angle and avoid the necessity of sample tilt. In addition QUANTAX also provides the option of EBSD analysis with the fully integrated QUANTAX CrystAlign.

QUANTAX EDS for Nano-Analysis
- With worldwide leading technology
- For SEM and TEM
- High collecting efficiency
- Unmatched energy resolution
- Superb light element performance

QUANTAX CrystAlign for Fast and Easy to Use EBSD
- eFlash EBSD detectors with in-situ vertical screen positioning for best available EBSD signal
- Colored images for better grain differentiation using the ARGUSTM FSE/BSE imaging system
- Seamless integration with ESPRIT EDS software

Applications
- Metals and alloys
- Semiconductors
- Layers and coatings
- Thin films
- Minerals
- Glasses
- Nano-materials
- Plastics and organic solids
- Biological samples
- Forensics
Great Science deserves great tools

Single Crystal X-ray diffraction (SC-XRD) is the method of choice for determining the 3-dimensional structure of any kind of chemical compound. The method provides accurate and precise measurements of molecular dimensions in a way that no other investigative technique can begin to approach.

To get the maximum benefit out of this technique, scientists need the latest analytical tools. This was the driving vision of our development team for the D8 Crystallography Solutions: to provide your cutting-edge research with the superior tools it deserves!

With the D8 QUEST and the D8 VENTURE we are introducing a pioneering diffractometer concept with flexibility and modularity exploring the principles of DAVINCI design. The D8 QUEST and the D8 VENTURE can be perfectly configured for the demands of any imaginable application in single-crystal X-ray diffraction.

Applications
- Structure determination of new molecules and minerals
- Absolute structure determination on molybdenum and copper radiation
- Integrated treatment of up to eight-fold twinned samples
- Comprehensive treatment of absorption effects by intuitive correction methods
- Electron charge-density studies by high-angle diffraction
- Structural investigation of high pressure phases and modulated structures
- Diffuse scattering

Riding the Perfect Wave

Matching the right wavelength to your sample can significantly improve the quality of the experiment. Molybdenum (Mo) radiation is most often the wavelength of choice for chemical crystallography. Copper (Cu) radiation’s stronger interaction with the sample leads to stronger diffracted intensities and is typically applied for organic samples and proteins. Silver (Ag) radiation has minimal absorption and extinction effects and allows data collection to higher resolution.

- Sealed tube spot focus with flat graphite or TRIUMPH monochromator
- μS microfocus source
- TURBO X-RAY SOURCE (TXS) with HELIOS optics
Biological crystallography’s rapid evolution has seen structural biologists tackling projects of ever-greater ambition. At the same time, modern structural genomics and drug discovery initiatives are striving for ever-greater productivity and efficiency. This is placing significantly greater demands on researchers and instrumentation. Latest technology achievements used in the D8 QUEST and D8 VENTURE help the researcher to address the even most challenging samples.

**Brighten-up your Home Lab – TURBO X-RAY SOURCE, IμS and HELIOS MX**

A successful diffraction experiment starts with an excellent X-ray source. Whether you choose the high-flux TURBO X-RAY SOURCE (TXS) microfocus rotating anode generator or the outstanding IμS microfocus source, you always get the best-in-class for all of your applications. The new TXS and IμS now deliver beam intensities comparable to those of typical bending-magnet beamlines. For example, a 10-second exposure from the TXS or 70 seconds from the IμS can produce the same diffracted intensity as a 1-second exposure at these beamlines. Our high intensity, superior beam profiles, unmatched beam stability, and instant access makes home-lab crystallography with Bruker solutions more productive than ever before.

**Pioneering CMOS Technology**

D8 QUEST and D8 VENTURE feature revolutionary CMOS technology:

- Large 100-cm² sensor for fast and efficient data collection
- Low-power-consumption sensor for high reliability backed by our unique three year detector warranty
- Air-cooled for low maintenance
- No glass fiber taper for superior spatial accuracy and high sensitivity
- Optimized pixel size and point-spread function for superior signal
- Large pixel volumes for best light conversion
- Fast readout for fast data collection
- No frame correlation needed
- No blooming or streaking
- Perfect match of the pixel size and the point spread of the high-resolution scintillator screens

**Applications**

- Substrate binding
- Membrane proteins
- Molecular replacement
- Protein microcrystals
- Multi-protein complexes
- High-resolution protein structures
- SAD-phasing
- Molecular motors
- Twinned protein samples
- Protein-DNA complexes
- Long unit cell axes
- Structural enzymology
Automated Crystal-Structure Analysis

3D Structures at the Touch of a Button

Bruker’s SMART X2S is the first benchtop X-ray crystallography system for fully automated 3D chemical structure determination. It is designed for use by chemists and does not require special training in crystallography. The SMART X2S takes small molecule structure determination to the next level of convenience by automating the previously difficult aspects of X-ray structure determination, from sample loading through data collection all the way to report generation and data archiving. Its compact design, low maintenance, low cost of ownership and easy and intuitive operation through a touch screen graphical interface are truly groundbreaking.

Features

- Provides you with the 3D structure of a molecule at a bench of your synthesis laboratory
- Crystal-in, structure-out automation
- Answers your structural chemical questions unambiguously

AUTOSTRUCTURE™

AUTOSTRUCTURE is the comprehensive program for fully automatic determination of 3D crystal structures of organic and inorganic molecules from X-ray data. It allows solving and refining structural parameters routinely, providing the crucial tool to make accurate chemical X-ray structure determination quick and easy.

- Fast, reliable, intuitive-to-use, fully-automated
- Results verified using IUCr standard structure checkers
- Cascades through Patterson, direct- and dual-space methods to increase structure solution success
X-ray Micro Computed Tomography (Micro-CT)

Bruker microtomography is available in a range of easy-to-use desktop instruments, which generate 3D images of your sample’s morphology and internal micro-structure with resolution down to the sub-micron level. Each system includes advanced software for visualization and analysis in 3D.

Skyscan 1172 – high resolution micro-CT
Skyscan 1173 – high energy micro-CT
Skyscan 1174 – most compact micro-CT
Skyscan 2140 – combined micro-CT and micro-XRF
Skyscan 2011 – laboratory nano-CT

Non-destructive 3D imaging with X-rays

Micro computed tomography (Micro-CT) is X-ray imaging in 3D, by the same method used in hospital CT scans, but on a small scale with massively increased resolution. It really represents 3D microscopy, where very fine scale internal structure of objects is imaged non-destructively.
Bruker X-ray instruments are designed with high flexibility for future requirements. They can be upgraded to automatic operation. All Bruker X-ray solutions allow seamless and flexible integration into laboratory and total automation solutions.

**D8 FABLINES – Dedicated solution for the semiconductor industry**
- Full automation
- High-throughput
- Analytical flexibility
- Analysis of patterned wafers with automatic pattern recognition
- Up to 450 mm full wafer mapping
- Market leading wafer handler for automated alignment and transport
- Failsafe sample handling
- Wafer storage in cassettes or mini-environments
- Automatic wafer recognition
- SECS/GEM interface
- SEMI S2 and S8 compliance
- Clean room ISO Class 2

**Automation Solution using D4 and S8**
- Sample transportation
- Sample preparation
- Sample handling robotics
- Automation software
- Seamless integration into laboratories
- Total automation solutions e.g. for the cement, aluminum and semiconductor industry
- Container laboratories
- Flexible integration packages
- Upgrade packages
- Powerful Automation Control Software AXSLAB
- Interfacing to plant control system or LIMS (Laboratory Information Management System)

**Automation Control Software AXSLAB**
The laboratory automation is controlled by the powerful AXSLAB software. From any PC in the network, single jobs or batches can be started and the status can be easily checked. Intelligent sample management allows the highest sample throughput and immediate access to priority samples.

**The Whole Spectrum with SPECTRAplus**
The fully IAI Integrated Analytical Intelligence in SPECTRAplus is based on more than 50 years of experience in XRF analysis – for standardless XRF analysis for all types of materials. Corrections can be made automatically.
Almanac 2012
Analytical Tables and Product Overview

Innovation with Integrity