BRUKER

50 years of innovation

Bruker Corporation

50 Years of Innovation

Bruker 1960–2010

think forward

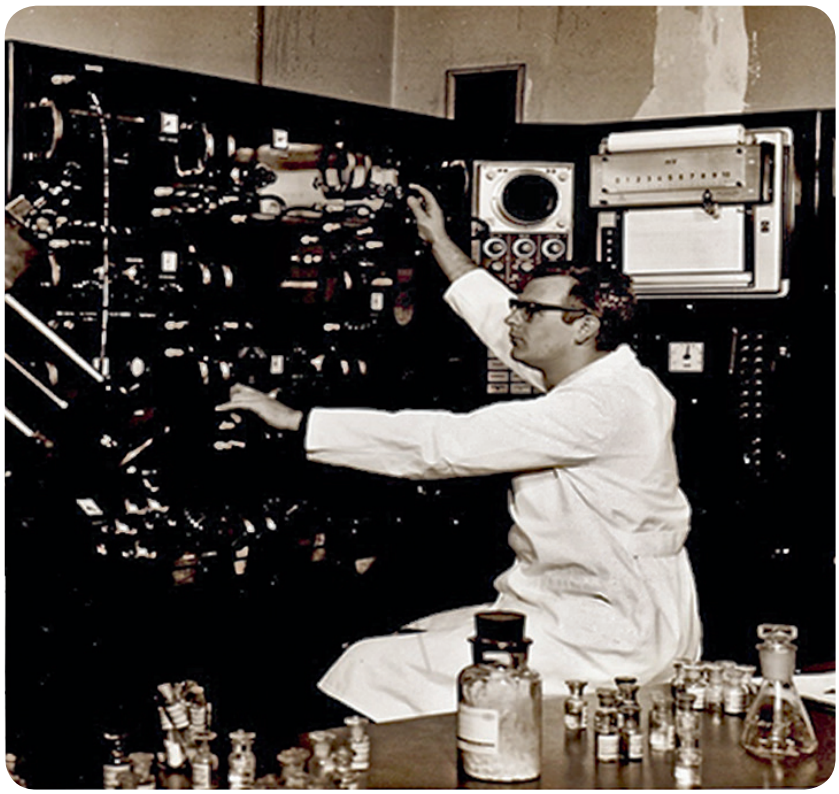
Analytical Solutions

The Beginnings

The formation of the Bruker Company is principally down to one man. Günther Laukien studied physics at Tübingen before moving to the Institute for Experimental Physics in Stuttgart in 1952. Dedicating himself to NMR, he conducted post-doctoral studies in NMR spectroscopy and in 1958 published a pioneering paper on high-frequency nuclear magnetic resonance. This paper described the theoretical aspects of what was known at the time, while also covering the practical aspects of constructing experimental systems. In 1960, he was appointed Professor for Experimental Physics in Karlsruhe.

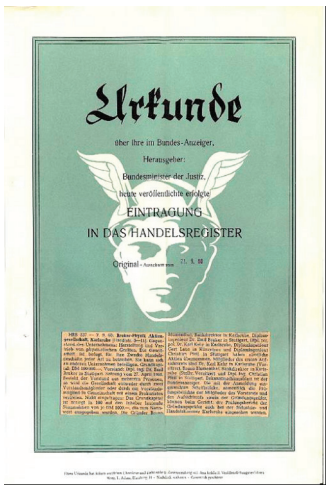
Around that time, laboratories in the US were already building the first high-resolution NMR systems for use in analytical chemistry. Prof. Laukien recognized the power in this technique and the need for an impulse spectrometer not yet produced commercially. He set out to fill this need by establishing his own company.

Prof. Günther Laukien



1962: NMR laboratory with KIS.

Why the Name Bruker?

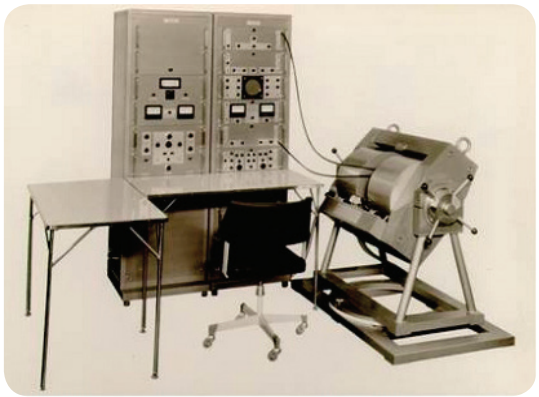


When Bruker was founded, university professors in Germany were not allowed to commercialize research while being in a position of research and teaching. Since Professor Laukien could not be named as a founding member, co-founder Dr. Emil Bruker provided his name to the new company.

The founding of Bruker-Physik AG

Bruker-Physik AG was officially incorporated on September 7, 1960. The new company's first operational facility was located in the backyard of a Karlsruhe residence, producing laboratory magnets and corresponding power supplies. The development of an NMR pulse spectrometer began immediately.

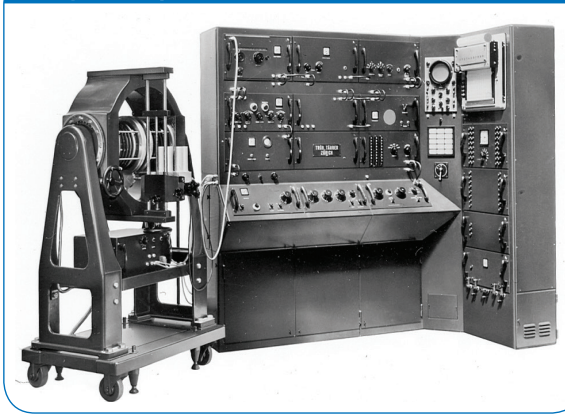
By 1963, the rapidly-growing Bruker-Physik AG employed a staff of 30 developing early high-resolution NMR and EPR spectrometers. With a rapidly expanding market, Bruker quickly outgrew its first facility, so the purchase of a large area of land in Rheinstetten near Karlsruhe led to the first purpose-built premises. The first office outside Germany soon followed, opening in France in 1964.



1963: Bruker NMR pulse spectrometer.

Bruker-Physik AG's first operational facility in Hardtstraße, Karlsruhe, Germany.

Early NMR Spectrometer



1960: 25 MHz permanent magnet KIS NMR system.

High-Resolution NMR at Trüb Täuber; the Onset of Bruker in Switzerland

Meanwhile, in Zurich, a company by the name of Trüb Täuber maintained a small research department for the development of NMR spectrometers, although its main concern at the time was the manufacture of measurement and test equipment for the electrical industry.

Their NMR research had benefited directly from close collaboration with the ETH in Zurich, namely Professors Guntard and Primas, and Dr. Richard Ernst, who, in 1991, was awarded with the Nobel Prize in Chemistry. The first Trüb Täuber system, KIS, operated at 25 MHz using a permanent magnet.

By 1962, Trüb Täuber's competitors had introduced higher field systems, and the KIS 2, a new generation of spectrometers based on a five-ton magnet was introduced for high-resolution spectroscopy at frequencies up to 90 MHz. Around twenty KIS 25 MHz and KIS 2 instruments were installed in Switzerland, France, Belgium and Germany. In the mid-60s, Trüb Täuber found itself in financial difficulty. Wanting to preserve its NMR department, Prof. Laukien founded a new company: Spectrospin AG.

Technological Leadership in NMR

Bruker-Spectrospin Collaboration

The establishment of Spectrospin AG set the scene for close cooperation and a strong synergistic relationship with Bruker. The introduction of manufacturing agreements saw Bruker specialize in magnets, EPR and power supplies while Spectrospin AG focused on the high-resolution instruments. Together, they embarked on an ambitious development project that ultimately introduced the first fully transistorized NMR instrument, the HFX 90, the first of which was delivered to the Technical University of Berlin.

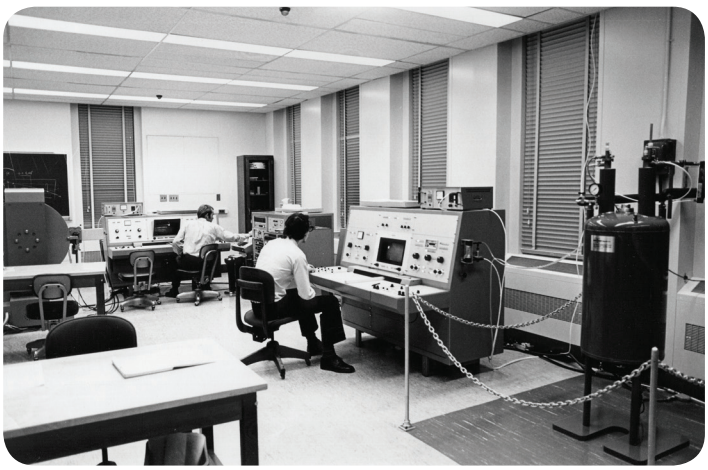
The HFX 90 was the first commercially available spectrometer to offer three independent channels—one each for signal detection, decoupling, and lock. New experiments became possible while previously difficult experiments became routine. Pioneering innovations enabled heteronuclear spectroscopy and signal accumulation and increased reproducibility of experimental data. At the same time, new developments were also rapidly progressing at Bruker, including EPR spectrometers, pulse spectrometers and magnets for applied physics.

In 1968, Bruker began delivering systems to the United States, the first two of which were purchased by Yale University. A momentous event at the time, these systems were shipped by transatlantic air service. To address the growing American demand for these systems, Bruker opened its first US office in Elmsford, NY.

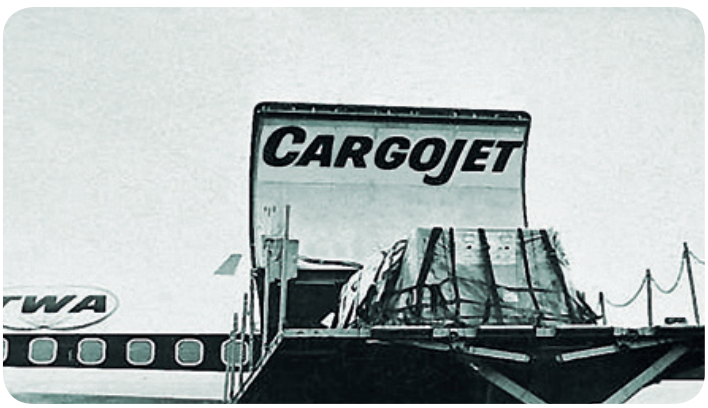
At the end of 1970, Spectrospin AG moved to new, modern premises in Fällanden, near Zurich, that provided more space and dedicated production facilities. Expansion also saw Bruker extend its facilities in Rheinstetten. Consequently, both companies were well equipped to meet the challenges of the next decade.

Multinuclear NMR

1967: HFX 90, the first fully transistorized NMR system, equipped with three independent channels.



1971: HFX spectrometer in an NMR laboratory.



1968: First HFX 90 for the United States (Yale Univ.) being loaded onto a Boeing 707.

Fourier Transform NMR

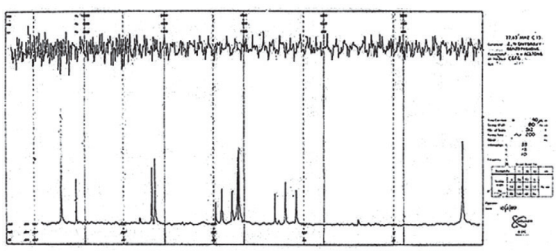
In 1964, Dr. Richard Ernst was the first to use pulsed field NMR and the application of Fourier Transform led to significant increases in experimental sensitivity. Yet at first, skepticism regarding potentially long experiment times prevented the system from being commercialized.

Dr. Ernst continued his research, developing methods to effectively decouple carbon spins of interest from those of their attached protons, thus generating a "pure" spectrum of the carbon spins alone, while again increasing experimental sensitivity.

Likewise, Bruker continued in its development of pulse NMR, ultimately producing the first high-power radio-frequency amplifier that could transmit a pulse as well as decouple. Consequently a new form of broadband decoupling emerged, which was simpler to implement and more effective than the existing methods. This new technology provided unique experimental capabilities that remained unmatched through the 1980s.

1971: WH 90, the first FT-only NMR Spectrometer.

1969: Birth of ^{13}C FT NMR



1969 : One of the first ^{13}C FT Spectra. Measuring time now reduced to 200 seconds.

In 1969, Bruker unveiled the world's first FT-NMR spectrometer system that enabled broadband proton decoupling. Developed in Elmsford, NY, this new spectrometer produced sensational results. The new, superior and revolutionary ^{13}C spectra made a significant impact when presented at a conference in Anaheim, California.

Driven by the unmatched FT-NMR technology, Bruker's share of the market expanded considerably. In addition, the development of pulse spectrometry resulted in the construction of the minispec, a spectrometer dedicated to industrial applications.

1972: WH270, Bruker's first high-field NMR spectrometer based on superconducting magnet technology.

First Industrial NMR Applications

1975: minispec p20 NMR spectrometer.

Going Global

The Bruker Group

During the 1960's, it became evident that to be a key player in the analytical instrument market an increased global presence was needed, with service and support for customers and researchers at a local level.

The first step in this direction had been made with the establishment of an office in North America, a growing center of NMR research. Despite the initial dominance of US-based companies, Bruker grew rapidly due to its technological superiority and its widespread acceptance within the NMR community.

Soon, Bruker SA was established in France, where facilities in Wissembourg began to produce system components and sub-assemblies. The establishment of additional sales offices in Europe, including the UK and Italy, continued through the late 1960s and early 1970s.

In 1969, during the 25th anniversary of the discovery of EPR in Kazan Russia, Bruker announced further expansion into what was then the USSR. A new office was also established in Israel, further strengthening an already-established relationship with the Weizmann Institute.

1968: Bruker expands to North America and opens it's first office in the US in Elmsford, NY.

By 1972, Bruker's expansion had reached Australia, and in 1975 Bruker arrived in China, where a successful appearance at the Swiss Industrial Exhibition in Beijing resulted in the immediate sale of two WH 90 systems—the first FT-only NMR spectrometers. South Korea and Taiwan sales offices soon followed, and in 1976 Bruker opened its first facility in Japan. Bruker was also successful in South America, with the first instrument installations taking place in Venezuela.

During this time of rapid global expansion, it became apparent that further growth in the market of analytical instrumentation would require the expansion into additional and new analytical technologies.

1975: Ceremony for breaking ground in Tsukuba, Japan.

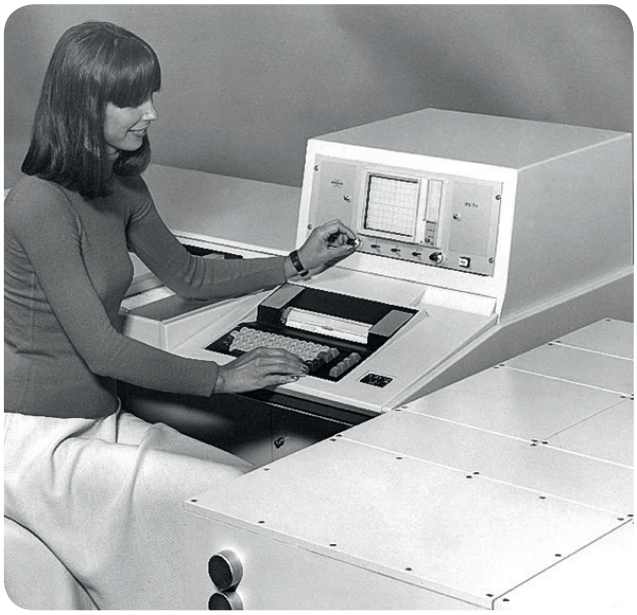
1975: Mr. Fanf Yi, PRC Vice President and President of the Chinese Academy visits the Bruker stand at a trade show in Beijing.

New Analytical Technologies

FT-IR

Bruker began the development of infrared spectrometers in the 1970s. Recognizing the wider potential for technologies originally developed for NMR spectrometers, Bruker was able to build superior infrared spectrometers. This innovative technology was to replace dispersive infrared spectrometers within little more than a decade. In close cooperation with Professor Genzel of the Max-Planck-Institute in Stuttgart, a pioneer in Fourier transform (FT) IR spectroscopy, Bruker's first FT-IR spectrometer (incorporating the "Genzel Interferometer") was launched in 1974. The IFS 110 was a floor-standing FT-IR spectrometer with electronics and computer units separated from the optics bench. This was the beginning of a very successful product line that instantly set standards in FT-IR spectroscopy with evacuable optics and automatic change of spectral ranges. Bruker's vibrational spectroscopy product line continuously expanded to include instruments suitable for both, analytical and research applications.

In 1981, Bruker introduced its first bench-top FT-IR spectrometer, the IFS 85, which was developed for industrial routine applications. This easy-to-use analytical system brought FT-IR spectroscopy to new fields of application. The introduction of a FT-IR microscope in 1984, as well as a FT-Raman system in 1988, underlined Bruker's position as the performance and innovation leader in vibrational spectroscopy. In 1993 Bruker established its successful FT-Near-IR product line. The IFS 28/N was Bruker's first FT-NIR spectrometer dedicated to industrial quality control and process monitoring.



1974: IFS 110, Bruker's first FT-IR spectrometer.

Continuous developments and international success led to the spin out of Bruker Optics in 1998. Today Bruker Optics offers FT-IR, FT-NIR and Raman spectroscopy systems for various markets and applications: from the world's smallest FT-IR spectrometer to the world's highest in resolution, from spectroscopy systems for industrial quality control and process monitoring right up to the most demanding research applications.

The Onset of Magnetic Resonance Imaging

1983: One of the first whole body MRI tomographs with air coil magnet.

Magnetic Resonance Imaging

Bruker's already established strengths in NMR naturally led to developments in the field of Magnetic Resonance Imaging (MRI). Bruker Medizintechnik (Medical) GmbH was formed in 1976, initially offering a range of mobile defibrillators. Later in the decade, Bruker had developed and produced NMR-based tomography systems for use in clinical and pre-clinical applications, leading eventually to whole-body clinical MRI instrumentation.

Over time, Bruker chose to shift its focus towards pre-clinical systems and became Bruker BioSpin MRI, the currently market leader in the field.

Marine Research

In 1977, Bruker Meerstechnik began the production of small submersibles for marine research, tourism, and oil exploration, and has delivered the largest underwater tourist vehicle in the world. Bruker's increasing dedication to its growing analytical instrument business ultimately led to the sale of this unique division.

Partnership with IBM

The late 1970s saw the beginning of global diversification. IBM Instruments, a division of IBM Inc., grew interested in adding to Bruker's already wide range of analytical instrumentation and invested in Bruker in 1978. The partnership led to the development of a large range of instruments for gas chromatography, liquid chromatography and polar graphs, and optimized IR, NMR and TD-NMR instruments for routine applications.

This relationship lasted for a period of ten years, when Bruker re-purchased IBM's holdings and integrated portions of the newly developed systems into its own product line.

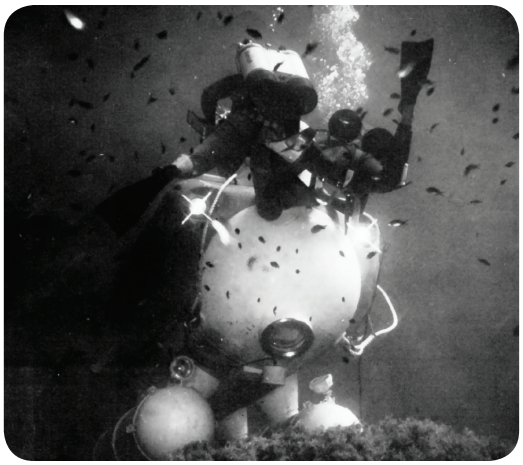
Mass Spectrometry

In 1980, Bruker acquired the "Dr. Franzen Analysentechnik" in Bremen, adding robust quadrupole mass spectrometers to the product portfolio. That same year, the first mobile mass spectrometry system, the MM1, proved successful in both the civilian and military markets.

An important product development milestone was reached when Bruker Spectrospin in Switzerland successfully developed a new type of mass spectrometer-FT-ICR, with the first installations taking place in 1982. An innovative collaboration with the Technical University of Munich in 1983 ultimately led to Bruker's introduction of time-of-flight mass spectrometers, an intrinsic part of the product range to this day.

In 1997 Bruker-Franzen Analytik GmbH was renamed Bruker Daltonik GmbH. The name was chosen to honor John Dalton for his work in formulating the theory of the atomic structure of matter.

Marine Research



1978: Bruker submersible 'Meermaid' in action.

1980: MM1, the first mobile detection system.

The field of Mass Spectrometry was greatly expanded with the Nobel Prize winning development of two new ionization procedures in the late 1980s: electrospray and MALDI. Bruker was quick to incorporate these new techniques into it's product portfolio and create a series of innovative, high performance products whose development is on going.

Bruker has been a major innovator and significant driver in promoting the now routine use of Mass Spectrometry in a broad range of molecular analysis applications in the pharmaceutical, industrial, and academic markets.

Continued development efforts and constant dedication to further improvements have produced hundreds of patents in mass spectrometry and sample preparation technology for Bruker. Amongst the latest Bruker developments are smartbeam laser technology, ETD/PTR fragmentation, and SmartFormula 3D molecular identification software. All of these technology innovations are focused on providing researchers with the very best in application focused, customer driven Mass Spectrometry systems.

Bruker's continued commitment to advancing the utility and performance of Mass Spectrometers has been most recently demonstrated when the company obtained the first IVD-CE approval for the IVD MALDI Biotyper. This system is helping to promote the advancement of mass spectrometry into the important field of clinical diagnostics. Given past performance, it can be anticipated that further ground-breaking products and technological innovations will be available in new and traditional markets – from the leader of mass spectrometry innovations, Bruker Daltonics.

ICR Mass Spectrometry

The world's first commercial FT ICR mass spectrometer

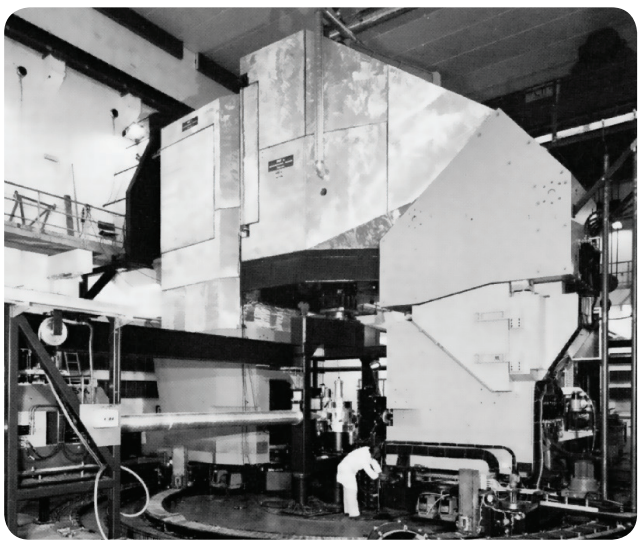
Expansion at Karlsruhe - Formation of Bruker BioSpin

By 1982, Bruker had outgrown its facilities in Rheinstetten. The company purchased a large factory complex in Karlsruhe-Rheinhafen that was perfectly suited to the production of magnets for particle physics research. This site remains the ideal location for magnet production of Bruker's ultra-high field NMR product line.

In 1991, the development and applications center for NMR imaging was opened in the nearby town of Ettlingen, and still serves as a MRI production and demonstration facility.

To guarantee the provision of high-end electronic components for numerous Bruker divisions, Bruker Elektronik GmbH was established in 1985, equipped with state-of-the-art production and testing equipment.

With an ever-increasing number of biological applications using magnetic resonance spectroscopy, the company formed the Bruker BioSpin Group in 2001, bringing together all BioSpin companies specializing in magnetic resonance, to ensure market-leading focus and commitment.



1984: Final assembly of the particle spectroscopy magnet in the Rheinhafen plant.

Today, Bruker BioSpin is the global market and technology leader in analytical magnetic resonance instrumentation including NMR, pre-clinical MRI and EPR and delivers the world's most comprehensive range of magnetic resonance analysis tools for life science and analytical research.

X-ray Technologies

In 1997 Bruker acquired the analytical X-ray division of Siemens AG, which included prime manufacturing facilities in Karlsruhe and Madison, Wisconsin. In subsequent years, besides sustained organic growth and continuous innovation in the traditional areas of X-ray diffraction and X-ray spectroscopy, Bruker AXS significantly extended its technology portfolio by integration of further complementary business acquisitions. Such acquisitions included the X-ray detector and microanalysis system manufacturers Roentec AG and PGT, which were merged with Bruker AXS Microanalysis in 2005 and today, together with the atomic force microscope business of former S.I.S GmbH, purchased in 2008, form the Bruker Nano business unit. In 2006 Bruker AXS entered the handheld X-ray fluorescence spectrometry market by acquiring Keymaster Technologies, Inc., and also expanded into optical emission spectrometry with the take-over of Kleve-based Quantron GmbH. With the addition of JUWE GmbH and its combustion analyzers in 2008, Bruker AXS rounded off a whole new range of products and solutions now being represented by the Bruker Elemental unit. Today Bruker AXS is a global market and technology leader in materials research and quality control instrumentation for elemental and crystalline structure investigations.

D8 ADVANCE, new generation of X-ray powder diffraction instrument launched in 1997.

Production at Bruker Energy & Supercon Technologies in Hanau, Germany.

Superconductor Technologies

Superconducting magnets are an essential component of several Bruker product lines, and special superconducting wire properties are required for the high level of performance our customers demand. Bruker acquired Vacuumschmelze Hanau in 2002 to guarantee quality and quantity for future needs.

Magnets and power supplies for physics research have been a key component for Bruker's business since its beginnings in 1960. In 2009, the acquisition of ACCEL Instruments GmbH further strengthened Bruker's position in this developing market sector and resulted in the formation of a new division: Bruker Energy and Supercon Technologies, a leading manufacturer and developer of a broad range of high-performance superconductor wire products and devices.

In 1997 the company witnessed a change in leadership, brought about by the death of its founder, Günther Laukien. His death was a great loss to the company and the scientific community at large because his ideas, his motivation, and his competence as both scientist and entrepreneur were major driving forces behind the company's success.

His wife and four sons have continued to lead the company in accordance with his vision and beliefs, and the same forward-thinking spirit that drives progress to this day.

The Bruker Corporation

Organizational restructuring within Bruker began in 2000, as the company adapted to meet the needs of modern markets. The Bruker Daltonics group was the first of the Bruker companies to be listed on the NASDAQ stock exchange, soon followed by Bruker AXS in 2001.

In 2003 Bruker Daltonics and AXS merged to form a single listed company. In 2006, they were joined by Bruker Optics. The merger of all Bruker corporate units was completed in 2008 upon the addition of Bruker BioSpin, the magnetic resonance division that started it all.

The synergies resulting from the integration was quickly recognized within product development, production and sales, leading to the development of combined systems delivering unique customer benefits.

Unification under a single parent company, the Bruker Corporation (NASDAQ: BRKR), created one of the strongest brands in analytical instrumentation.

Bruker Corporation headquarters in Billerica, Massachusetts, USA.

Bruker Today

In 2008 Bruker Corporation revenues exceeded the US$ 1 billion mark for the first time, directly attributable to the company's exceptional customer service, innovation, continuity, and product quality. Fuelled by this expansive growth, Bruker's already highly dynamic nature will be driven to introduce many more key innovations in the future. Such positive and committed progress is assured through confidence and reliance on more than 4000 highly motivated employees, and through continuing excellent customer relations.

Bruker's state-of-the-art 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, its broad base of installed systems and its strong reputation with its customers.

As one of the world's leading analytical instrumentation companies, Bruker is confident that these are the ideal conditions for developing innovative solutions for tomorrow's analytical questions, thereby securing an ever-successful future.

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