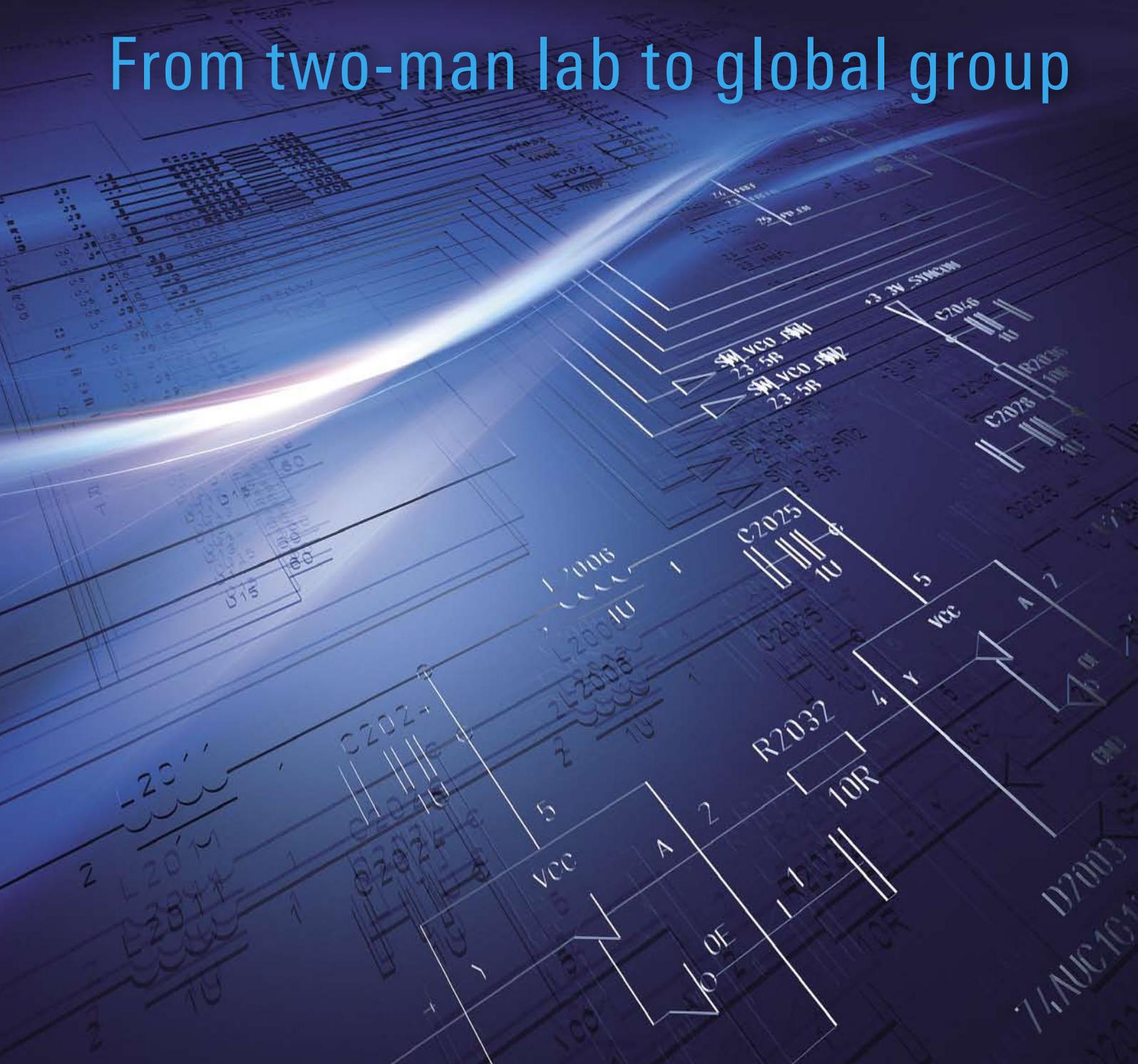


75 Years of Rohde & Schwarz

From two-man lab to global group



75 years of Rohde & Schwarz: from a two-man lab to a global group

Big stories often have small beginnings – an original idea, a first step, an early success. The beginnings of Munich-based electronics group Rohde&Schwarz are to be found at the university in Jena, Germany, in the late 1920s. Two young physics students became acquainted and soon discovered a shared fascination with radiofrequency technology. Before long, they created a company, the *Physikalisch-Technisches Entwicklungslabor Dr. L. Rohde und Dr. H. Schwarz*, in a Munich apartment with just 120 square meters of floor space. During the 75 years since, the company has fostered many of the technological developments that shape and make possible our modern world of communications. This includes designing and producing measuring instruments in parallel with the latest advancements in electronics. Many milestones in the company's history are also chapters in the history of technology, including the first portable crystal clock (1938), Europe's first VHF FM transmitter (1949), the first vector network analyzer (1950), the first automatic direction finder (1955), the robust and highly accurate EK07 shortwave radio receiver (1957), the first GSM system simulator (1991) and the first professional-level, tap-proof encryption device for mobile phones (2001).

Underlying all of these successes are 75 years of research and development, 75 years of entrepreneurship, 75 years of close customer contacts and 75 years of unparalleled commitment on the part of all Rohde&Schwarz employees. From its modest beginnings as a small team made up of the two founders and two employees, the family-owned company has grown to have subsidiaries and offices in more than 70 countries, with a workforce of about 7500 employees who generate sales of EUR 1.4 billion (July 2007 through June 2008 fiscal year).

This anniversary provides the company with a welcome opportunity to cast a glance back at the past, while embracing the future. The following pages invite you to take a short trip back in time with brief histories of the development of the company's individual divisions. In addition, an interview with the three members of the Executive Board reveals how the company plans to master future challenges.



Dr. Hermann Schwarz (left)
and Dr. Lothar Rohde in the 1930s.



Rohde&Schwarz today:
the newest building at the
company's Munich headquarters,
the Technology Center. A total
of € 35 million was invested in
the 16,000 square meter facility
in 2005, as a sign of growth and
innovation.

T&M milestones

Higher, faster, more precise – the test and measurement industry is almost like the Olympics, and not just since yesterday. Numerous new technologies and increasingly higher frequencies are challenging T&M. For 75 years now, Rohde&Schwarz has successfully combined proven expertise with innovative strength, and the company's T&M solutions for wireless communications, general electronics and microwave are often ahead of their time.

The present – 2008: Munich-based Rohde&Schwarz is a leading global supplier of T&M equipment for wireless communications and electromagnetic compatibility (EMC). Every second mobile phone in use today was produced or developed using T&M equipment from Rohde&Schwarz. Electronics manufacturers around the world rely on the company's cutting-edge products, for spectrum and network analysis, signal generation and power measurement. But how did all of this start? Let's look back to the year 1932. Even before founding the company, Dr. Lothar Rohde and Dr. Hermann Schwarz had already developed their first T&M solution, a dissipation factor meter. In autumn 1933, the company began operations under the name *Physikalisch-Technisches Entwicklungslabor Dr. L. Rohde und Dr. H. Schwarz* – known as Rohde&Schwarz since the 1940s. The company's first bestseller was the WIP interference wavemeter, developed in 1933 and sold throughout the world for more than 20 years.

Since its early days, the company's objective has been to provide customers with cost-efficient, highly integrated solutions. For example, to eliminate the need for numerous separate test instruments, in 1952 the company developed the URI electronic multimeter, a small, ten kilogram tester. Likewise in the 1950s, the T&M expert became a pioneer in network analysis, with the world's first vector network analyzer. This finally made it possible to measure the magnitude and phase of S-parameters and display them in a Smith chart. A further highlight from this era was the compact SWOB wideband sweep generator, whose successor instruments were standard equipment for the alignment of TV receivers for years to come.

Germany's *Wirtschaftswunder* (economic miracle) and the continued general evolution of technology led to a rapid increase in the number of electronic components and instruments over the following decades. EMC measurements gained in significance. Rohde&Schwarz responded logically, using its expertise in receiver development as a springboard to the field of EMC T&M. For example, in 1987/88 the company equipped Europe's largest and most advanced EMC anechoic chamber in Greding, Germany.

During this period, Rohde&Schwarz gained a solid foothold in further T&M fields step by step. In 1985, the UPA audio analyzer rapidly became standard equipment in audio engineering. In 1982, the SWP became the first synthesized sweeper on the market. The high-end SMPC frequency synthesizer also won over customers worldwide with its low single sideband phase noise and high spurious suppression. The company's entry into spectrum analysis followed in 1986 – and somewhat to the surprise of the competition, Rohde&Schwarz



The R&S®FSV was introduced in 2008 as the fastest spectrum analyzer on the market.

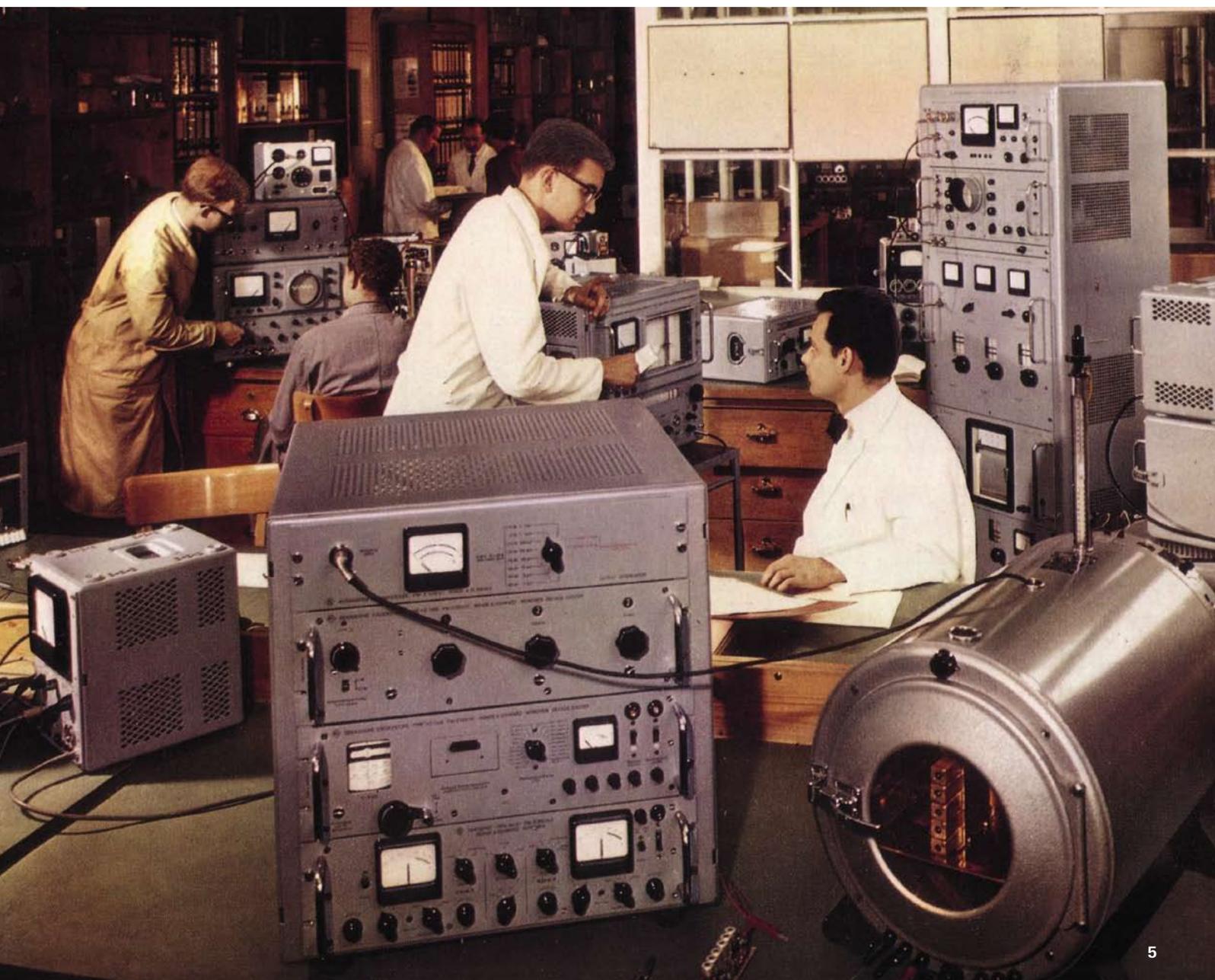
bounded into the major leagues in one leap with its FSA. Moreover, the company presented numerous innovations in power and voltage measurement, one of its key business fields from the beginning. In the mid-1980s, for example, a data memory for calibration data was directly integrated into a power sensor for the first time. In 2002, Rohde&Schwarz brought the world's first USB power sensors to market.

For decades, Rohde&Schwarz has been a major player in T&M equipment for the wireless market. By introducing the first GSM system simulator in 1991, the company helped GSM conquer the world. The system helped determine whether mobile phones performed to standard. Since then, test systems and instruments from Munich have accompanied all major developments in the wireless industry.

Today, manufacturers of electronics and wireless companies value Rohde&Schwarz as a supplier of custom-

ized solutions. The company's signal generators offer dual-path capability and generate spectrally ultra-pure signals. In network analysis, the product portfolio ranges from the economy-priced R&S®ZVL vector network analyzer to high-end, four-port models up to 50 GHz. The R&S®ESIB and R&S®ESU test receivers have become fixtures in EMC labs as reference standards for compliance measurements. Users can also find everything they need in spectrum analysis, from handheld instruments for mobile use all the way up to an industry-leading 67 GHz analyzer. In the field of T&M equipment for the wireless sector, Rohde&Schwarz stands shoulder-to-shoulder with other pioneers in the next-generation wireless applications taking shape with WiMAX™ and 3GPP LTE. Most recently, in 2008, the R&S®CMW500 appeared on the market, embodying decades of combined expertise as the company's sixth-generation wireless tester.

Rohde&Schwarz not only develops and sells T&M instruments, it also uses them in its own labs (picture from 1963).



Milestones in broadcasting

TV and radio have brought the world closer together. People, events and distant regions now appear right before us, with a face and a voice. For almost six decades Rohde&Schwarz has been a fixture in broadcasting and related T&M equipment. As the world market leader in terrestrial TV transmitters, Rohde&Schwarz plays an active role in standards bodies, equipment testing and TV network setup.

The present – 2008: Rohde&Schwarz is driving the transition from analog to digital and mobile TV. The Munich-based electronics group outfits entire countries with complete TV networks in a minimum of time, from the US to Great Britain, Germany, Scandinavia or Spain,

and all the way to Taiwan. Broadcasting equipment manufacturers turn to Rohde&Schwarz for its complete T&M portfolio in R&D and production. But how did this start?

When the company first entered broadcasting, no one thought that it would one day supply nearly the entire world with TV. The initial goal was modest – to bring radio to the people of Bavaria, Germany. That was in the 1940s, when broadcasting meant radio, and radio stations in Europe broadcast primarily in the medium-wave range. After the war, an international conference in Copenhagen reallocated the medium-wave frequencies. Germany was assigned very unfavorable frequencies. An alternative was needed, and one was found – very high frequency (VHF). On January 18, 1949, Rohde&Schwarz received an order from the Bavarian Broadcasting Corporation to build a VHF FM transmitter. Only six weeks later, in a race against time and the competition, the station went on the air. Rohde&Schwarz had put Europe's first VHF FM transmitter into service.

In 1963, Rohde&Schwarz installed this 6 × 10 kW VHF FM transmitter system in South Africa.



The company's broadcasting division was soon providing a full-featured portfolio of VHF FM audio broadcasting products. Stereo transmission, the radio data system (RDS) and the replacement of vacuum-tube transmitters followed in quick succession, with Rohde&Schwarz playing a major role in driving the development of all of them. In 1979, the company launched a transmitter featuring a kilowatt of power. This international bestseller featured the slogan "set up, connect, forget." Based completely on transistor technology, the new device eliminated the maintenance costs associated with vacuum-tube transmitters. In 1995, the world's largest DAB network at that time went on the air, produced jointly by Rohde&Schwarz and the Bavarian Broadcasting Corporation.

In the TV market, the company pursued another course. It initially focused not on transmitters, but on T&M instruments. Highlights such as the AMF Nyquist test demodulator in 1955 defined the T&M industry for decades to come. The AMF made changes in the transmission paths of a TV signal visible, and broadcasters long considered it standard equipment. In the early 1960s, Rohde&Schwarz began developing special TV test transmitters. The 1970s ushered in insertion test signal measurements, which enabled operators to monitor signal quality during live programming.

The first Rohde&Schwarz TV transmitter, produced in 1955, was truly small, with an output of just 20 mW. Its big brother hit the market in 1956, and the transmitter portfolio grew steadily over the following decades. Today, transmitters designed by Rohde&Schwarz are known particularly for their low energy consumption. The latest models match the transmit power of competitor equipment while reducing power needs by up to 25 %.

Today, network operators and broadcasting equipment manufacturers look to Rohde&Schwarz as a reliable and experienced partner, one that offers a full portfolio of products from a single source. Whether DVB-T, T-DMB, ATSC, MediaFLO™ or ISDB-T – broadcasting equipment and T&M solutions from Rohde&Schwarz support all leading digital and analog standards today. Manufacturers of set-top boxes, HDTV television sets and LCD screens turn to Rohde&Schwarz for the equipment that meets their needs, for R&D and for production as well. The R&S®SFU broadcast test platform is an R&D leader, and just under a year ago it celebrated the birth of a little brother, the R&S®SFE100 signal generator – an ideal instrument for production line use. In 2008, the R&S®DVSG followed as a digital video signal generator for the development and production of the newest generation of TV displays.

The new transmitters from Rohde&Schwarz (here the R&S®Nx8600) save up to 25 % in energy as compared to predecessor models.



Milestones in secure communications

Interoperable, reliable, tap-proof. This triple combination best summarizes today's expectations for radiocommunications. Ever since the iron curtain separating east and west was lifted, secure communications have become steadily more important for armed forces, government authorities, security organizations and industry. Rohde&Schwarz has been active in the radiocommunications field for some 50 years, constantly bringing groundbreaking innovations to market. Encryption and TETRA solutions have rounded out the portfolio since the 1990s.

The status quo in 2008: Terrorism and increasing numbers of small trouble spots around the world are causing shifts in threat levels and increased demand for secure communications solutions. Rohde&Schwarz is Europe's leading provider of radio systems for security and defense applications. The Munich-based electronics specialist is also Europe's market leader in high-security encryption technology, and a preferred NATO supplier.

But first let's look at the beginnings. In 1957, Rohde&Schwarz introduced the EK07 shortwave receiver. This milestone set the benchmark for precision engineering in the radiocommunications market. Frequencies could be read with high accuracy, image frequencies were a thing of the past, the receiver was immune to overload, and sound quality was above average. All this was ample reason for the German Armed Forces to adopt the EK07 as its standard communications intelligence receiver in 1962.

In 1968, Rohde&Schwarz entered the military avionics market and began developing on-board equipment for the Tornado fighter. The resulting XT3000 VHF/UHF transceiver and XK401 SSB radio are still in use after more than 30 years. In the early 1980s, Rohde&Schwarz avionics entered service in the Tornado, Alpha Jet, Phantom and a variety of helicop-

The EK07 established the standard for shortwave receivers in the 1960s.

The German Armed Forces adopted it as its standard communications intelligence receiver in 1962.



ters. Moreover, the company entered the naval communications market in 1970 by equipping the German Navy with radiocommunications systems. The first major devices were the SK1 HF transmitter, which was the first to feature an automatically tuned output stage, and the XT3030 VHF/UHF transceiver.

The 1990s saw the radiocommunications business field expand to include secure communications and encryption. The company then implemented Germany's first digital trunked radio project for the German Armed Forces in 1998. The project involved enhancing an existing trunked radio system. Using *ACCESSNET*®-T, 2500 terminals were combined to create a digital TETRA system. Today, Rohde&Schwarz TETRA technology is used around the world, from the Moscow subway system, the Panama Canal and international sporting events such as the Asian Games in Qatar, to Malaysia's nationwide trunked radio network.

In 2001, Rohde&Schwarz made an international name for itself with the introduction of the first tap-proof mobile phone. A special encryption system was integrated directly into the telephone and allowed users to make encrypted calls (end-to-end). Called the TopSec GSM, it became the only mobile phone on the German market to be certified by the German Information Security Agency. A year later, the ELCRODAT 6-2 encryption system from Rohde&Schwarz was approved for the transmission of top secret and cosmic top secret information. The system relies on hybrid technology based

on symmetric and asymmetric encryption. The next stage in the development of secure voice encryption was reached in 2008 with the new TopSec Mobile. This technology is compatible with nearly every mobile phone on the market, because the voice encryption device uses a Bluetooth® wireless interface to connect to the mobile phone.

Our brief journey through 50 years of Rohde&Schwarz secure communications is nearly complete. For the past decade, the software-defined R&S®M3xR family of interoperable radios has been part of the Rohde&Schwarz product line. The radios for the army, air force and navy are based on the same technology platform, and act as a bridge between the different forces during missions or in crisis situations. The solutions are also suitable for communications between the armed forces of different nations. With the R&S®M3AR radio family, which is deployed in the Eurofighter Typhoon and the new Airbus A400M transport aircraft, the company continues its dominance in the field of avionics technology, while more than 200 major airports around the world rely on air traffic control equipment from Rohde&Schwarz. In the naval communications sector, the R&S®M3SR radio is a resounding success. The company's encryption technology portfolio, to date designed primarily for use by NATO and the German government, is being expanded with solutions aimed at addressing a broader market. And the next TETRA projects are already in sight.

Radios from the R&S®M3AR family are used in the Eurofighter Typhoon and in the new Airbus A400M transport aircraft.



Milestones in radiomonitoring and radiolocation

The frequency spectrum is limited, but the diversity of applications in mobile, wireless information exchange is dramatically increasing: Mobile telephony, navigation systems, audio broadcasting, television – everything must run smoothly, around the world. To ensure that it does, for seven decades Rohde&Schwarz has been developing and producing equipment for detecting, locating and analyzing radiocommunications signals. The company has long since established itself as one of the market leaders in this field.

The present – 2008: Users in public safety and national security, regulatory agencies and frequency management work with receivers, direction finders and antennas from Rohde&Schwarz. In many cases the company develops customized solutions, such as the nationwide system currently in service for the Czech Republic's regulatory agency. This system monitors frequency spectrum use fully automatically.

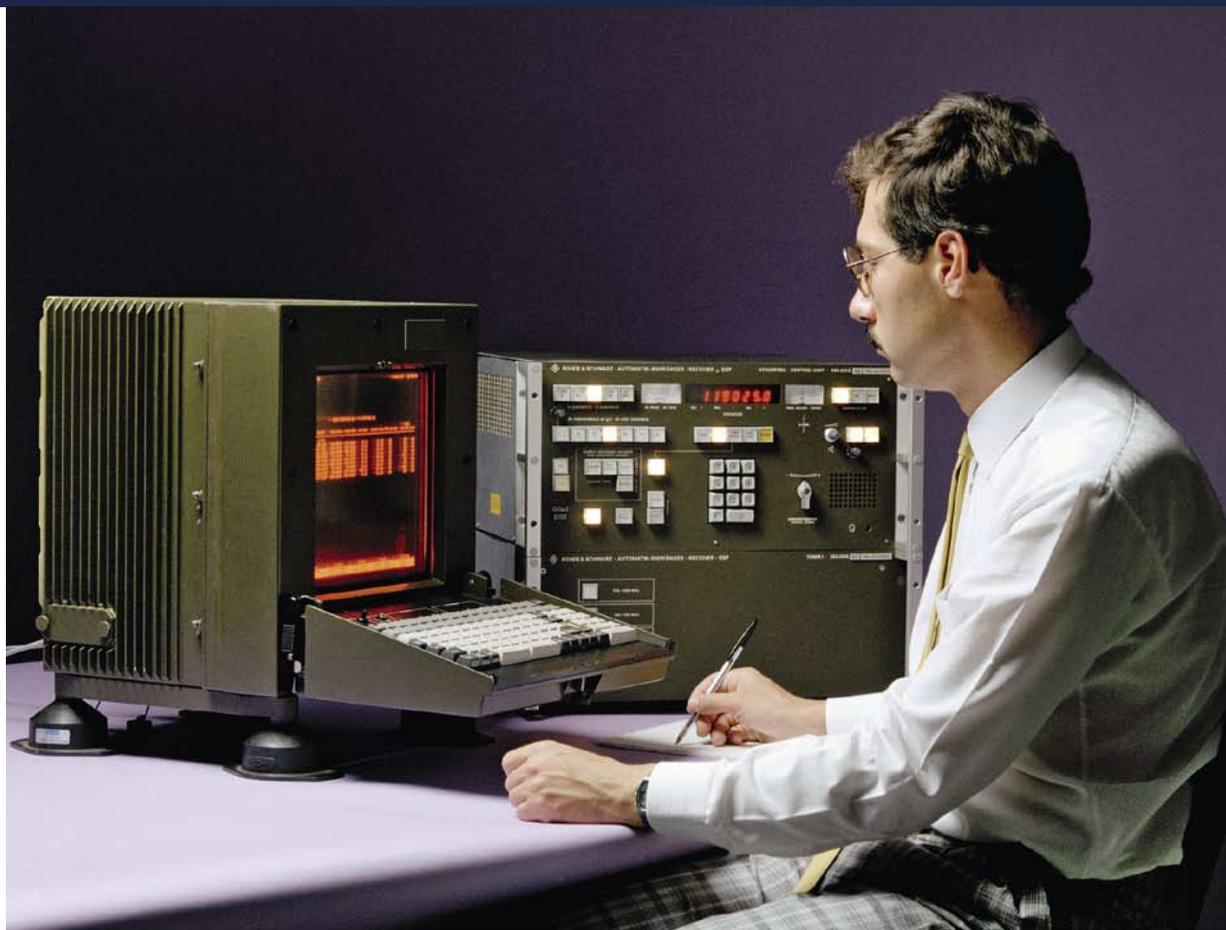
It all started seventy years ago, when the young Munich-based electronics company was the first in the world to present two field-strength measuring instruments, the HHF distant-zone field-strength meter and the HHN near-zone field-strength meter. The receive section of these measuring instruments was of such high quality that it was soon integrated as a key component in the ESD radiomonitoring receiver, and was produced in large quantities.

In 1949, Rohde&Schwarz began developing an entire series of new monitoring receivers. The ESM 180, ESM300 and ESG were used for years in the labs of broadcasting companies and by postal and telephone authorities, for registering signals from distant over-the-horizon transmitters that could not be detected by conventional receivers. In the early 1960s, Rohde&Schwarz produced the ESUM VHF/UHF monitoring receiver, which subsequently established itself as the standard solution for monitoring military radio traffic.



In 2008, the R&S®PR100 was introduced to the market. It offers mobile radiomonitoring that is portable, precise and fast.

1986: the ESP automatic receiver in operation. It checked the occupancy of nearly 1000 frequency channels per second in a frequency range from 10 kHz to 1.3 GHz or 2.5 GHz.



Another coup was the development in the 1950s of the world's first automatic VHF visual direction finder. The NAP1 went into test operation in 1955 and entered service at Munich Airport in 1957. Further innovations followed in rapid succession, such as the NP4 introduced two years later. It was the first direction finder to work on the Doppler principle. Shortly thereafter, Rohde&Schwarz presented the PA001 – at the time the most accurate radio direction finder for monitoring marine traffic, with a system error of just 0.1° maximum deviation.

Besides improving precision, the 1970s and 1980s saw a second key development trend in radiomonitoring and radiolocation: The focus was now increasingly on automating processes. Rohde&Schwarz delivered a classic example of this technology in the ESP automatic receiver, which was able to scan nearly 1000 frequency channels per second in a comprehensive frequency range from 10 kHz to 1.3 GHz or 2.5 GHz. Another milestone was the ESM500 monitoring receiver. Introduced

in 1980, it was the first broadband synthesizer receiver that allowed all functions to be controlled via a processor. Subsequently the PA2000 was launched, the first instrument on the market to combine a search receiver and direction finder. It made it possible to take the bearings of signals transmitted in frequency-hopping mode. With the introduction of the EB100 in 1985, Rohde&Schwarz began producing portable receivers of very high quality. The EB200 came out in 1999 and continued this remarkable sales success.

Today, government authorities and defense organizations know Rohde&Schwarz as a key partner for all fields of radiomonitoring. Everything comes from a single source, from the R&S®PR100 portable receiver as a mobile solution to the R&S®AU900 as a complex antenna system. And with the R&S®ESMD in its portfolio, Rohde&Schwarz also offers an instrument that combines all radiomonitoring functions in one box – reception, direction finding, measurement and demodulation of signals.

Looking ahead: an interview with the Executive Board

Mr. Vohrer, you are President and CEO, and have been familiar with the company for more than 30 years. What is your take on the company's history?

For 75 years, Rohde&Schwarz has been shaped by the philosophy that we always go the extra mile and continuously cultivate close customer relationships. The idea of the company's two founders to open up a completely new market, by developing RF test and measurement solutions, was the first step in this direction. It was quickly followed by the decision to offer products rather than patents, because customers wanted to buy instruments, not just designs. In the 1940s, the company added products for the broadcasting industry to its existing test and measurement portfolio. In the mid-1950s, Rohde&Schwarz expanded into yet two more fields, radiomonitoring and radiolocation as well as radiocommunications. It's fair to say that we have always been driven by the idea of discovering something new and bringing it to the market.

And how do you see the future?

Today, we are among the top three players in the world in each of our fields of business. Our objective is not merely to maintain that position; we want to move up to being one of the top two. Therefore, we will remain focused on the core trends driving our industries, such as higher frequencies, greater speed and even more precision. At the same time, technology cycles are becoming ever shorter, creating a demand for flexible platform concepts. Our portfolio ranges from solutions for specific applications to general-purpose systems for wide-ranging high-tech applications. Moreover, we are constantly testing the waters to see if the world offers other compelling ideas in addition to those that have already made us successful, ideas that are of interest to us and that can help us grow. Rohde&Schwarz is intent on becoming an even more important player – that much is clear.

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We have virtually the entire value-addition chain within the company, from the initial idea through to final testing.



Mr. Fleischmann, on the Executive Board you are responsible for Production. How prepared is Production for future challenges?

Maximum flexibility, low production costs and short turnaround times – these are the challenges we face in Production. Over the past years, Rohde&Schwarz has done a great deal in this area to position itself for the future. By introducing the just-in-time concept and switching to flow production, we have drastically reduced delivery time in transmitter production, for example: Customers now receive the products four times faster than prior to the changeover. At the same time, we have also become competitive on production costs. While keeping expenses steady, we have significantly increased the output of units, placing us above average in the German electrical industry in terms of productivity growth. If necessary, our factories can switch to three-shift operation six days a week when large orders create unexpected peaks in demand.

When your business is high tech, top quality is a must. Simultaneously, the need to protect the environment calls for sustainable production methods. How do you achieve this?

The key here is manufacturing depth. We have virtually the entire value-addition chain within the company, from the initial idea through to final testing. This lets us implement the most suitable test methods throughout the entire development and production process, and ensure the utmost quality. In addition, we keep a constant eye on environmental protection in every phase of the product life cycle – starting with a development planning process that includes measures for saving raw materials, and extending to the reduction of CO₂ emissions during transportation, plus the minimization of energy consumption during product life. Our plants are certified compliant with internationally applicable DIN standards in the areas of quality assurance and environmental protection.

Mr. Leicher, you are responsible for International Sales.
What challenges does the company face?

We do business on the world stage and have a global sales structure. Our objective is not only to ensure our competitive edge for the long term, but also to expand market shares and increase our prospects for future growth. Our customers expect us to be an expert partner with a strong local presence; companies that are increasingly shifting their focus to the global arena also expect a partnership that offers a global network.

This is why we are creating such structures in our company. Strong national subsidiaries provide expertise and stability at the local level. Our teams in Global Customer Management and Business Development address global customers and specific market segments; as support, we have established key contacts for each and we make sure that our activities are coordinated worldwide.

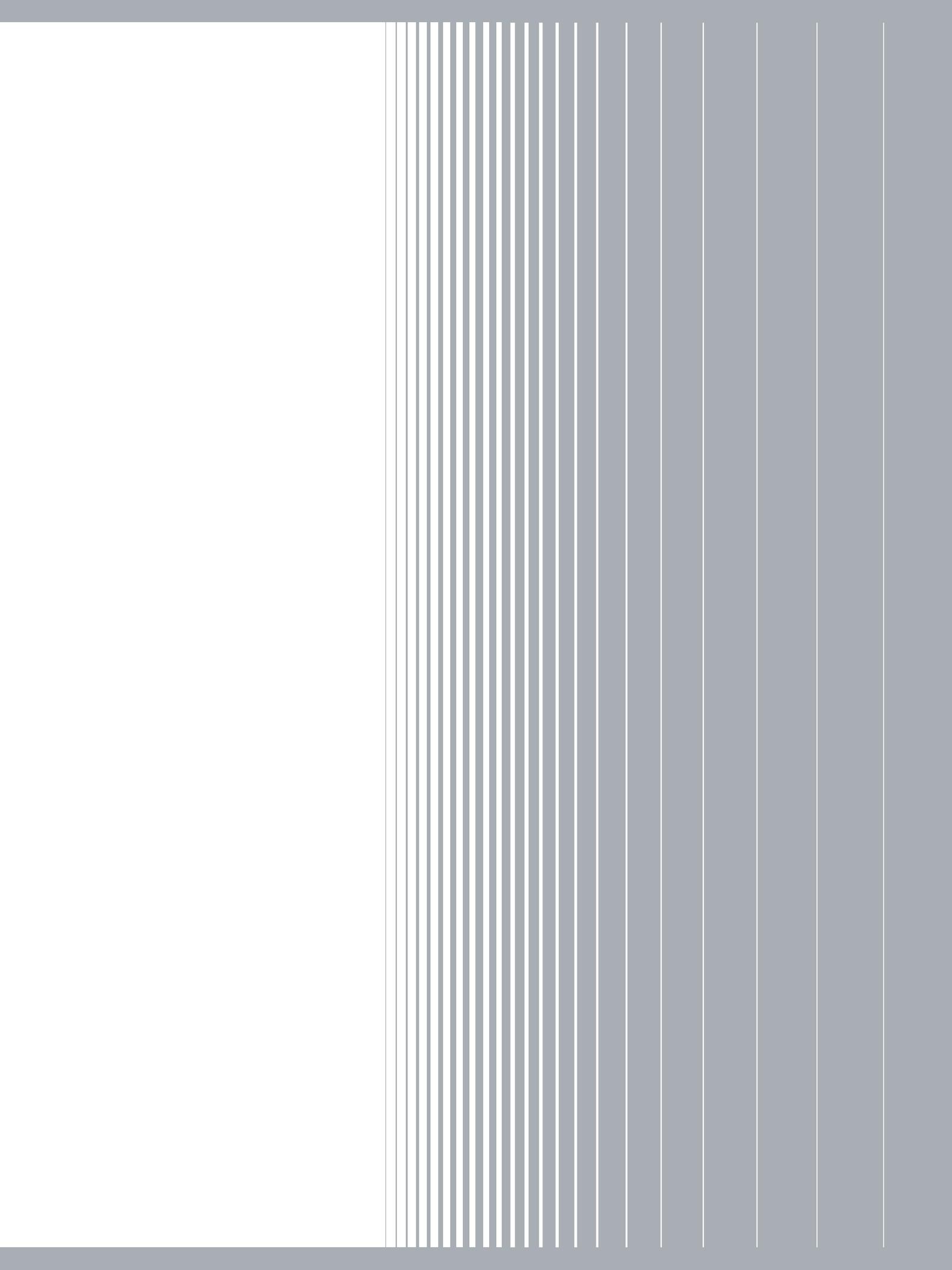
When it comes to developing new features or applications, we maintain close contact with our customers starting at the earliest stages. A trusting partnership enables us to do our work with an eye to the future, and to meet our customers' needs promptly. We are strengthening our development teams in important markets around the world to stay even more closely in tune with the market and to shorten decision-making paths.

You are the youngest member of the Executive Board.
What makes Rohde&Schwarz special for you?

For me, it is the exciting combination of proven values – you might call it tradition – and great innovative strength. And we clearly understand that this combination cannot be taken for granted, but that it must be cultivated. A culture of openness that creates freedom and space for creative employees, based on mutual respect. This must be lived every day, because only this kind of atmosphere lets us actively demand and foster innovations. Our repeated success in one employer ranking after the other shows that this is not merely polished rhetoric: Our employees have voted us one of Germany's best employers for the fifth time in a row, and in the field of communications engineering we were ranked the number one top employer in 2008. Our rich company culture has made us strong in the past, and will continue to do so in the future.



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Want to know more Rohde & Schwarz history?
Just visit www.rohde-schwarz.com/ad/75

And don't forget the anniversary quiz at
www.rohde-schwarz.com/ad/75quiz/news.
First prize is a week-end trip for two
to Rohde & Schwarz headquarters in Munich.

