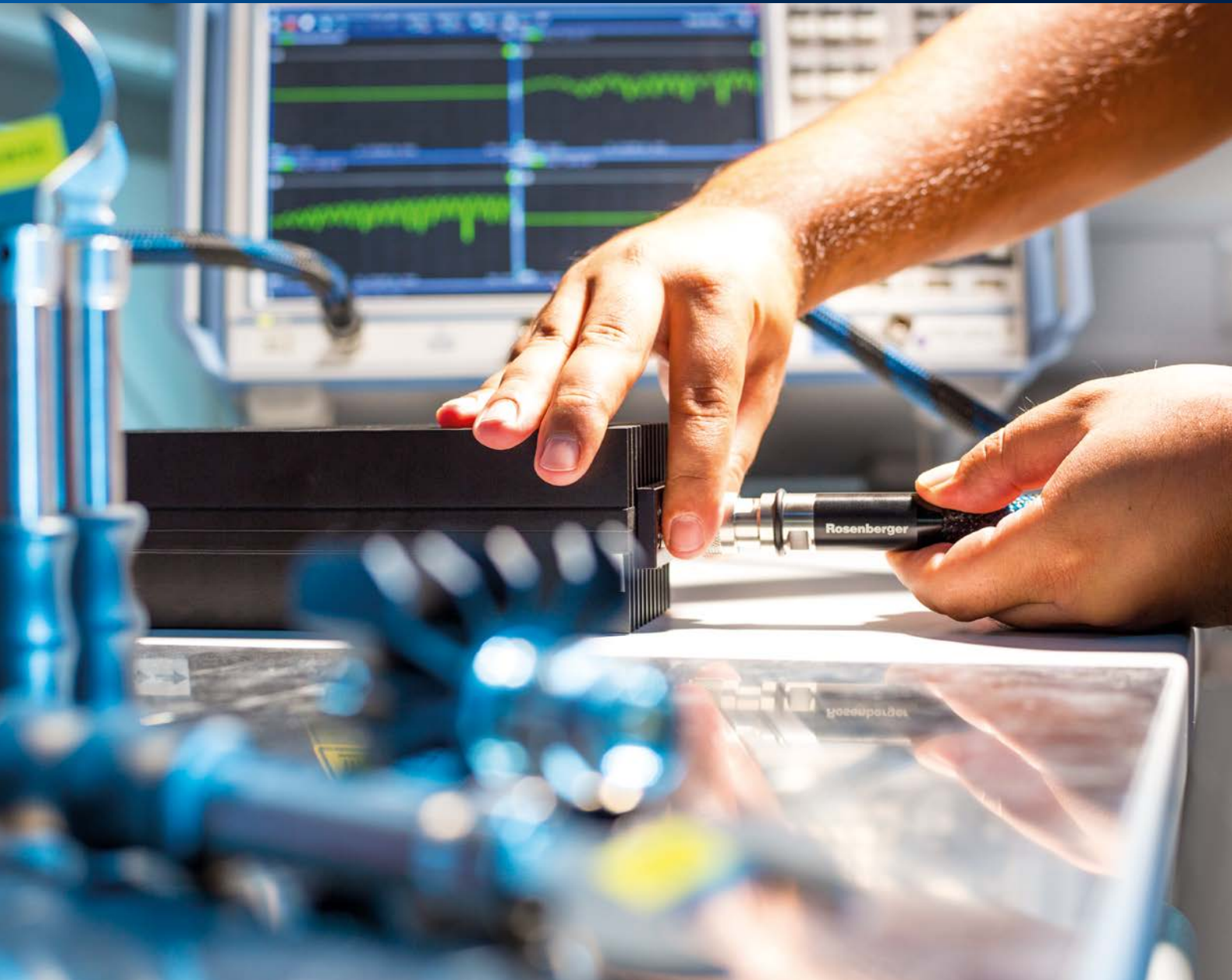


# Rosenberger

Quality and Precision

## Development and Manufacture of Measurement Components

TEST & MEASUREMENT



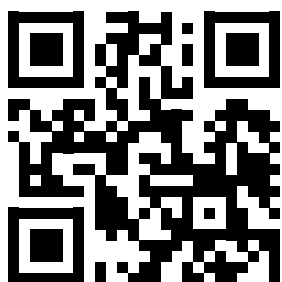


# A SYNONYM FOR QUALITY AND PRECISION.

Rosenberger test and measurement components are designed using the many years of knowledge and experience gained by Rosenberger engineers in this industry segment. The product portfolio includes a wide range of high-quality products for the different requirements in the field of test and measurement.



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## ROSENBERGER ONLINE CATALOG

The Rosenberger Online Catalog contains the current standard product range with specific details, including data sheets, assembly instructions, and panel piercings.

[www.rosenberger.com/ok](http://www.rosenberger.com/ok)



# WELCOME TO ROSENBERGER.

Rosenberger's origins go back as far as 1958. Since then, Rosenberger has grown from a small tooling shop to a global manufacturer of connectivity solutions.

The Rosenberger Test and Measurement Business Area was founded in the sixties to research, design and produce precise and high-quality products in the electronic measurement technology field.

From the beginning, we have developed a close and open relationship with our customers and cooperation partners, which was and is a key for early project involvement and understanding of the specific customer applications. Being an integral part of the overall value chain enables us to create products and systems which help to improve the solutions and services of our customers and partners.

Over the past few decades, Rosenberger has gained an in-depth knowledge of industrial measurement technology: data transmission, connector and system design, and high-quality manufacturing.

With a very high degree of in-house production, we ensure the quality and cost effectiveness of our products.

However, as well as offering innovative technology and products, Rosenberger is a family-owned business and we truly value long-term and personal relationships with our customers. And a trustful relationship is what makes a project successful.

Yours faithfully,

Dr. Tosja Zywietz

Rosenberger  
Chief Executive Officer

Hauke Schütt

Test & Measurement Business Area  
Executive Vice President



Dr. Tosja Zywietz

Hauke Schütt



# HOME OF INNOVATION.

A global network of Rosenberger research & development and production centers provides innovation, optimized cost structure and outstanding local customer service.



The Rosenberger headquarters, located in Fridolfing in the southeast part of Bavaria, Germany, is the global center for our activities.





## COMPANY PROFILE

Rosenberger is one of the world's leading manufacturers of impedance-controlled and optical connectivity solutions. It provides connectivity solutions in high-frequency, high-voltage, and fiber-optic technology for mobile communication networks, data centers, test & measurement applications, automotive electronics, as well as high-voltage contact systems, medical electronics or aerospace engineering.

A global network of R&D, manufacturing and assembly locations provides innovation, optimized cost structure and excellent customer services worldwide – approx. 7,000 employees develop, produce and sell our products.

## ROSENBERGER GROUP

### EUROPE

- Germany: Fridolfing, Augsburg, Laufen, Radeberg
- Austria: Timelkam
- Hungary: Jászárokszállás, Jászberény, Taksony
- Denmark: Birkerød
- Sweden: Kista, Solna, Ytterhogdal
- Spain: Madrid

### NORTH AMERICA

- USA: RNA Plano, RNA Akron, RNA Pennsauken, RSS Lake Charles

### SOUTH AMERICA

- Brazil: Caçapava – São Paulo
- Chile: Santiago

### ASIA

- China: Beijing, Kunshan, Dongguan
- India: Manesar, Goa



Ensuring the optimum quality of products and services and taking responsibility for our environment are fundamental elements of Rosenberger's corporate philosophy. Our quality philosophy does not just cover the optimization of parts and products, but also the continuous improvement of all company processes: from product development, planning, procurement, production, sales, logistics right through to environmental policy. To summarize, we want to offer maximum benefits for our customers all over the world.

We aim to act in an environmentally conscious manner, use materials economically, protect natural resources, recycle, and ensure energy efficiency.

As we have continuously improved our processes and consistently applied our quality management systems, we have been awarded many certificates.

#### **CERTIFICATES**

- ISO/TS 16949
- DIN EN 9100
- ISO 9001
- ISO 14001
- DaKKs accreditation according to DIN EN ISO 17025

Rosenberger has won a number of prestigious quality awards and prizes from several renowned customers and organizations for implementing its quality and environmental objectives.







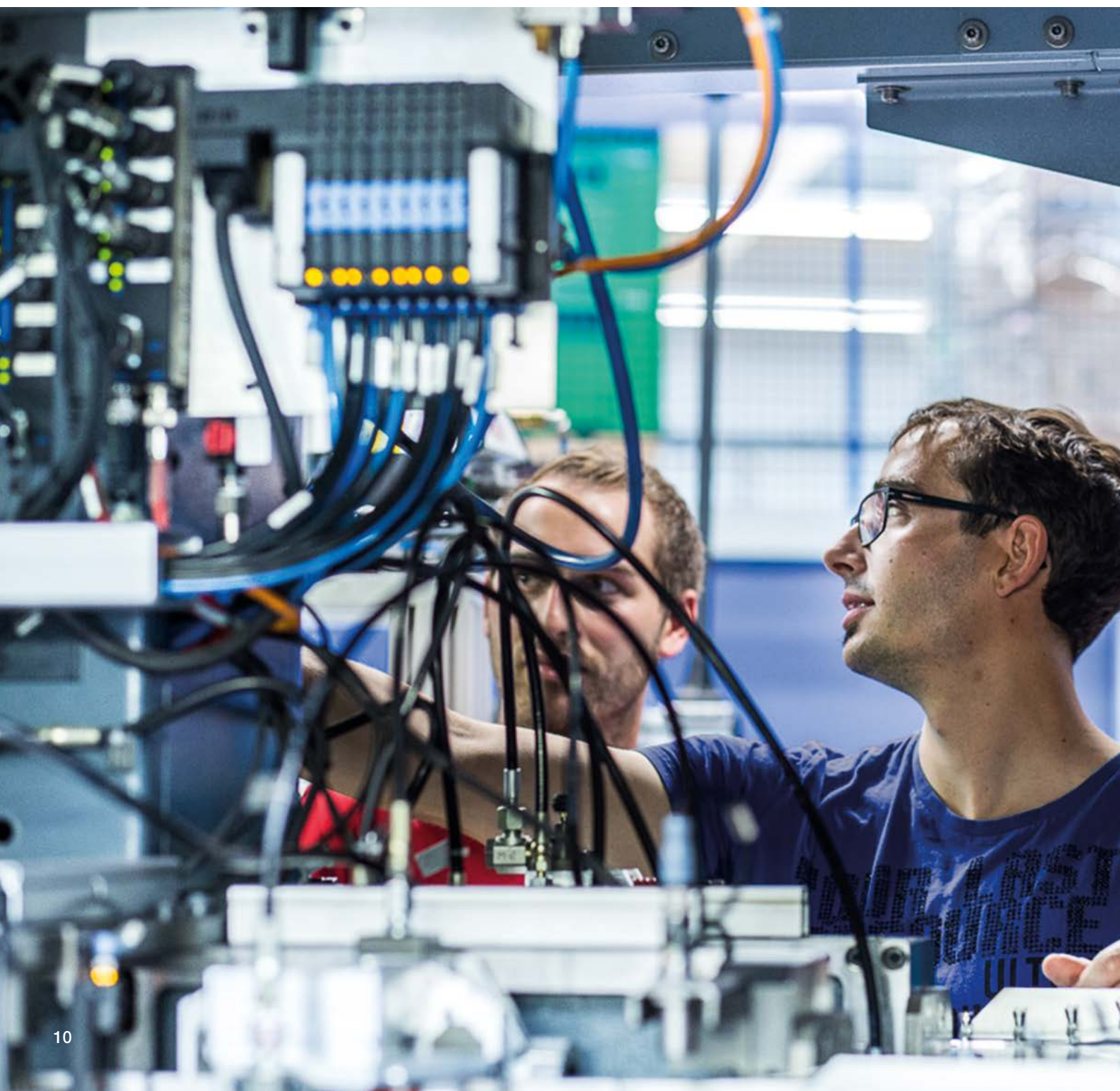
# OUR PROMISE TO YOU. AND TO QUALITY AND ENVIRONMENT.

The quality of our products, solutions and services is an essential part of our corporate strategy.



# CREATING THE FUTURE.

At Rosenberger, we firmly believe in developing technology for the future. We are currently working on products and solutions that will shape our lives in the future.







### **MARKETS CHANGE, PRODUCTS CHANGE**

Rosenberger has a long tradition of designing innovative technologies, keeping with times today and continuing to do so in the future.

### **WE WANT TO GET FASTER AND SMARTER IN WHAT WE DO AND HOW WE DO IT**

Car driver assistance systems, connected car technology, electromobility, infotainment systems – Rosenberger is extremely committed to designing innovative connector systems for future automotive electronics. The Internet of Things is just one of the many examples of everyday electronic equipment which will be connected via mobile telecommunication networks, for future smart home applications, for example.

### **THE INDUSTRIAL WORLD IS NOW ALSO THE DIGITAL WORLD**

We are now facing the next big step in evolution with Industry 4.0. Processes are getting smarter in the supply chain, production, logistics and customer service. But M2M is more: It penetrates our everyday private and professional lives with the Internet of Things and makes them easier and safer.

### **ECOLOGICAL NEEDS**

Ecological requirements, such as limited energy and raw-material resources, are a driving force, which is encouraging us to focus on creating more efficient products. Customers want up-to-date services and technologies to be available in real time and to offer even higher performance. This requires smarter solutions with higher bandwidths, less weight, longer battery life and better usability.

### **TRENDS IN THE TEST & MEASUREMENT FIELDS**

New trends in the test & measurement industry are driven by the semiconductor technology. With data transmission rates and the need for semiconductor applications growing rapidly, new measurement techniques are required – and these form part of Rosenberger's core competencies.



## DRIVEN BY PERFECTION.

Rosenberger's mission is to be a leader when it comes to innovation and technology within its business segments.





The ongoing focus on cost management and process optimization complements our commitment to the increasingly stringent requirements for delivering products of the highest quality. Effective research & development, the very latest manufacturing technologies, the highest possible levels of efficiency in production processes, and continuous improvement of process automation make up Rosenberger's core competencies.

## HIGH ADDED VALUE DUE TO COMPLETE IN-HOUSE PRODUCTION

### PRODUCTION

By manufacturing everything in house and using state-of-the-art manufacturing technologies, Rosenberger can continue to develop and optimize key manufacturing technologies – turned parts production, stamped & formed technology, injection molding technology. Manufacturing everything in house ensures a high degree of flexibility, and continuous quality controls, and means that newly designed products can be produced in the required quantities.

### PLATING TECHNOLOGY

Our components can be electroplated quickly and flexibly in our own in-house electroplating facilities, regardless of whether this is to provide corrosion protection, optimized conductivity, or other technical and physical characteristics. Environmental protection is another key factor which must be taken into account when coating surfaces.

### ASSEMBLY

Rosenberger operates manufacturing and assembly locations around the world – fully automated assembly centers and customer-oriented cable assembly locations offer global support and local sourcing.

### INJECTION MOLDING

We use the very latest machinery and methods, as well as special materials and components to ensure the precision and durability of our tools and products. Rosenberger is able to process all available high-performance plastics.

Scientifically based high-frequency know-how, in-house RF, and EMC laboratories enable us to continuously improve existing products and to design innovative new products and systems. Numerous patents show Rosenberger's leadership as a reliable and creative development partner.

### **ELECTRICAL DESIGN**

Transmission of very fast signals requires extremely precise control of the signal path. At Rosenberger R&D, the full range of design tools are at your disposal in order to make highly precise predictions about key system parameters such as impedance, reflection, attenuation, and electromagnetic coupling.

### **MECHANICAL DESIGN**

Owing to the increasing level of miniaturization and the high cost pressures associated with connectors and cables, the ability to analyze and predict the mechanical properties of our products is becoming increasingly important. All state of the art simulation tools and testing methods are available under one roof at Rosenberger.

### **EMC AND SIGNAL INTEGRITY MEASUREMENT TECHNOLOGY**

Rosenberger's EMC/SI laboratory has been in operation since 2013. The centerpiece of the facility is an anechoic chamber for EMI measurements at component level which is compliant to ISO 11452-2 and EN 55025 (CISPR 25). Our experienced staff as well as our test equipment are available for any kind of signal integrity (SI) test.

### **TESTING AND QUALIFICATION**

All methods for the simulation of environmental influences, the associated procedures for function monitoring, and the subsequent analysis require the use of modern technology. The in-house test laboratory has the equipment necessary to record all the relevant values acquired during product testing.

### **ADVANCED R&D**

#### **COAXIAL CONNECTIVITY ON AN ULTRA-SMALL SCALE**

Rosenberger is developing new technologies to improve signal transmission with true coaxial connectivity on  $\mu\text{m}$  scale with its unique Coax Wire Bond technology.

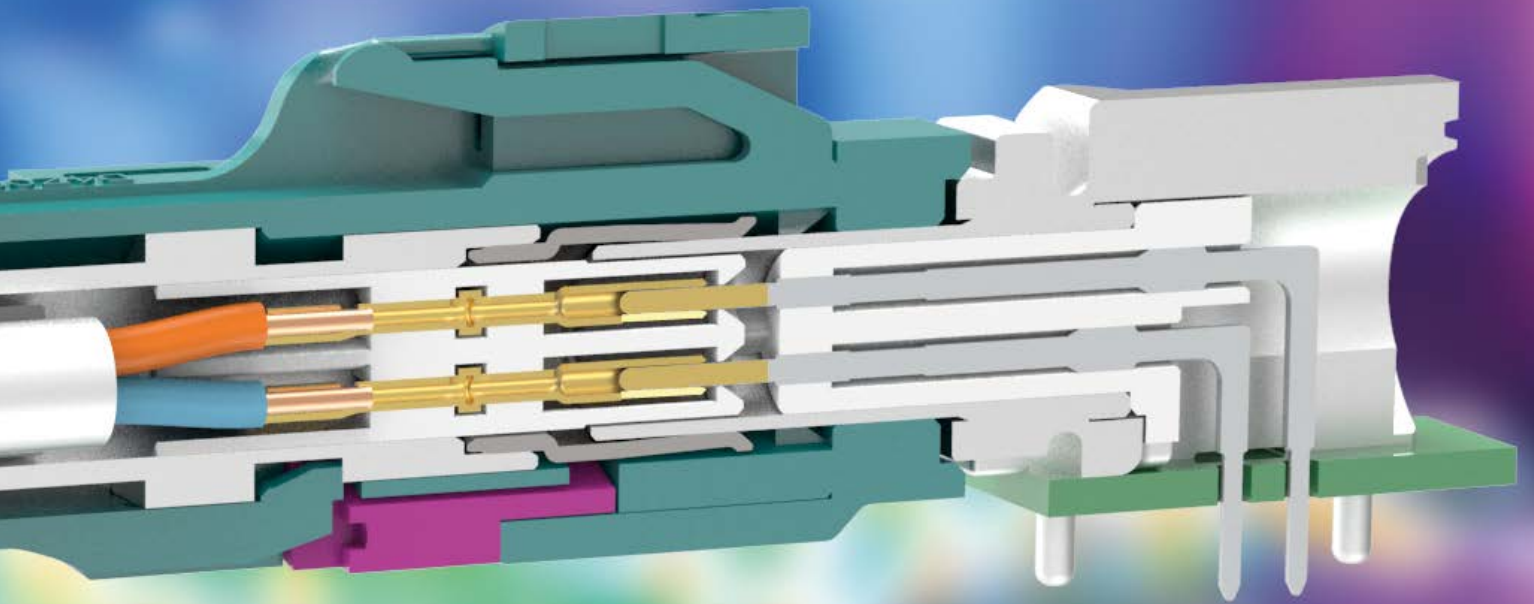
Based on process steps commonly used in semiconductor manufacturing, wire bonds are transferred into impedance controlled coaxial connections with a typical outer diameter of  $70\ \mu\text{m}$ . This enables new leading edge solutions for demanding RF applications by improving bandwidth, while reducing cross-talk and EMI.

The coaxial connection can be attached directly onto semiconductor dies and various lead frame / substrate materials.



Coax Wire Bond with sectional view





# DESIGNING INNOVATION.

Solid ground for new products and systems.

# TEST & MEASUREMENT.

Rosenberger is a dependable and renowned development partner in industrial measurement technology. The fact that we work with leading global companies from the electronic measurement technology field reflects the way that others trust our research and development, our high-quality manufacturing, and not least our customer-oriented “Made in Germany” service. Rosenberger provides customized solutions – cost-optimized and timely – from the initial idea right through to volume production.

## ENABLING TECHNOLOGIES – UNDERSTANDING CUSTOMER NEEDS

### ROSENBERGER'S CORE COMPETENCIES ARE

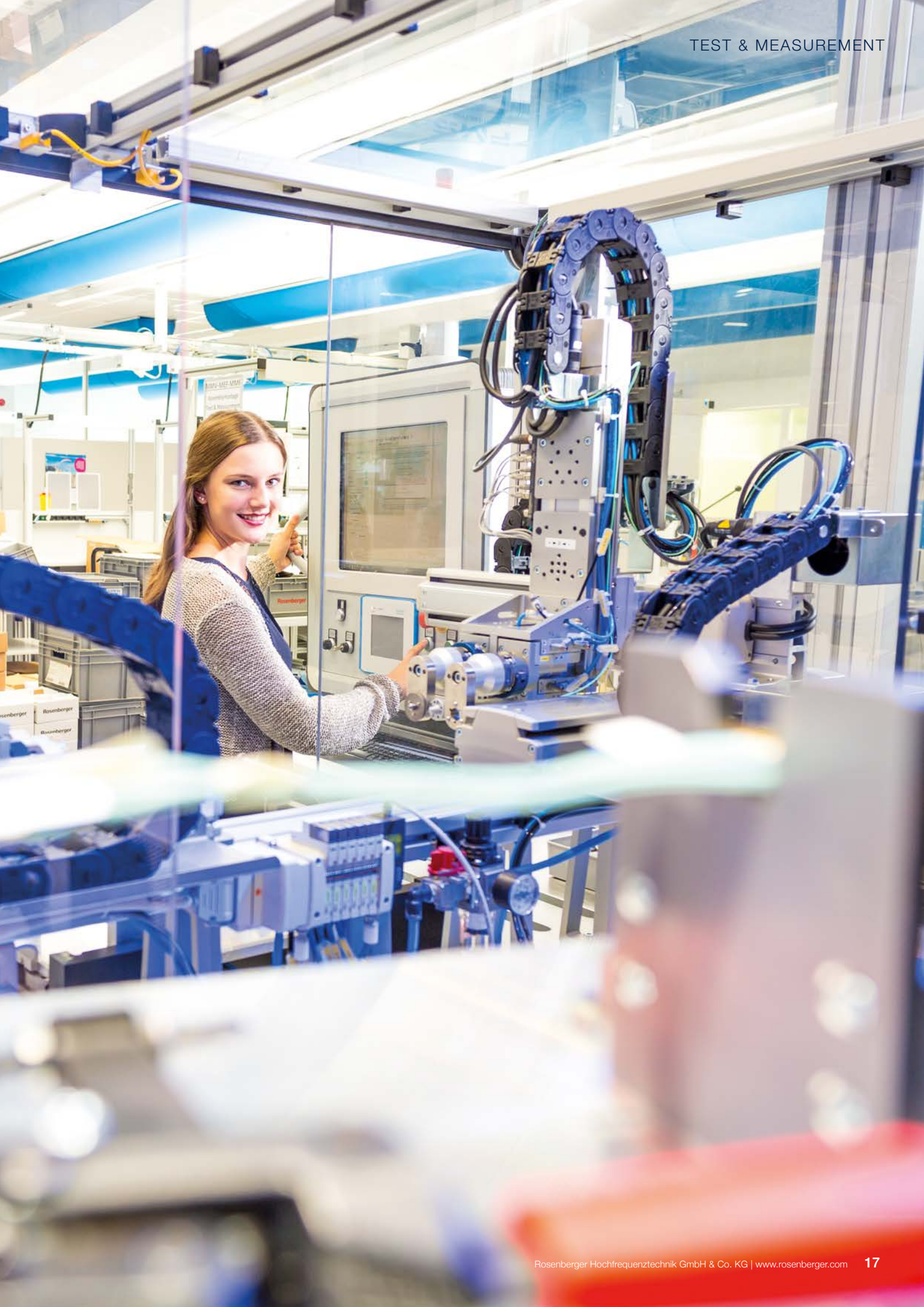
- Mechanical design
- RF design
- Electrical and optical data transmission technologies
- Enclosing solutions in metal and plastics for components and complete systems
- Connectivity solutions
- Electronic systems on circuit boards

Our business is project-oriented and we are highly customer-focused in what we do. As a result, defining the development schedule, selecting the production technologies and materials, using our know-how in development, and producing with internal resources or with external partners are all aspects which form part of the service with us.

The Rosenberger Group is used to handling small and large production volumes utilizing our global manufacturing infrastructure.









# PRECISION TECHNOLOGY. OPTIMAL CALIBRATION.

The Rosenberger calibration laboratory offers accredited calibrations according to DIN EN ISO 17025 (DAkkS) and factory calibrations for calibration kits from Rosenberger as well as from third parties.







Rosenberger is member of "Deutscher Kalibrierdienst" (DKD), a technical committee of PTB (National Metrology Institute of Germany).

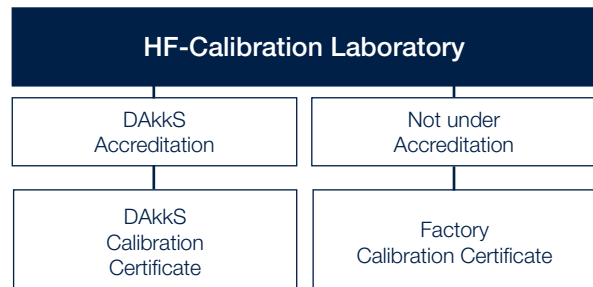


Rosenberger runs a calibration laboratory which specializes in supporting calibration kits. It is accredited and controlled by the German accreditation body DAkkS (Deutsche Akkreditierungsstelle) – according to DIN EN ISO 17025. Calibration certificates issued by an accredited calibration laboratory are accepted worldwide and demonstrate that measurement results can be traced back to national (PTB / Germany) / international standards (e.g. METAS / Switzerland, NIST / USA or NPL / UK).

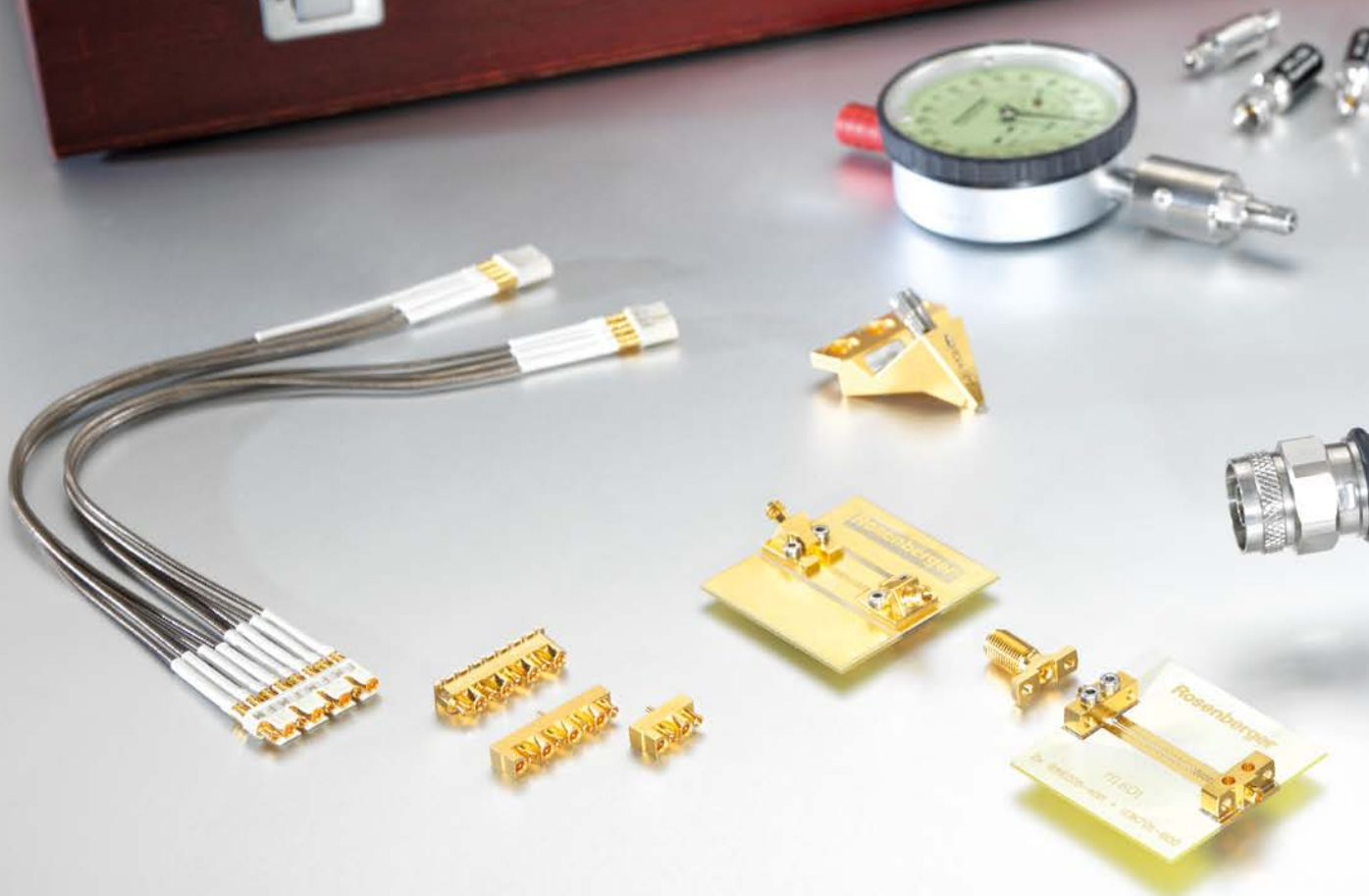
Rosenberger offers accredited calibrations for reflection measurements in several commonly used connector systems:

- N 50 Ohm
- N 75 Ohm
- RPC-3.50
- RPC-2.92
- 7-16

Alongside its accreditation activities, Rosenberger also offers "factory" calibrations as standard calibrations for all connector systems for which Rosenberger offers calibration kits.



All calibration certificates include measurement values as well as measurement uncertainties. Please refer to our application note AN001 for technical details and additional benefits of the Rosenberger calibration services:  
[www.rosenberger.com/t&m/calibration](http://www.rosenberger.com/t&m/calibration)





# PRODUCT PORTFOLIO.

The Test & Measurement product portfolio includes the wide range of high quality products for the different requirements in the field of test and measurement.



As a dependable and precise development partner in industrial measurement technology, Rosenberger develops and produces a comprehensive range of test & measurement equipment.

Our cost-effective, high-quality, and high-precision products open up a wide field of industrial test & measurement applications for active or passive devices.

**THE PORTFOLIO CONSISTS OF**

- Coaxial calibration kits
- Compact calibration kits
- Test devices
- Microwave test cables
- Verification kits
- Gauge kits
- VNA test port cables
- Test port adaptors
- Precision adaptors
- Precision connectors







# ACHIEVE MAXIMUM PRECISION, QUALITY, AND RELIABILITY.

Testing of complex systems with different signals at high frequencies.



## EXCELLENT PHASE AND AMPLITUDE STABILITY.

Rosenberger's highly flexible test cables have excellent phase and amplitude stability and provide protection against wear. Additional products include ruggedized test port adaptors and microwave cable assemblies up to 110 GHz.



For microwave measurements and VNA calibrations, Rosenberger develops, manufactures, and provides test & measurement products which meet the highest demands of industrial test applications. These include high-performance VNA test cables with outstanding phase and amplitude stability, a variety of test port adaptors for VNA applications up to 110 GHz, very robust interchangeable high mating cycle port connector systems, and test devices – from low-frequency devices for simple measurements to components permitting high-precision broadband measurements.

A comprehensive range of calibration, verification, and gauges/gauge kits for selected standard coaxial interfaces is also available. The calibration kit range even includes MSO (3-in-1) and MSOT (4-in-1) mechanical compact calibration kits.

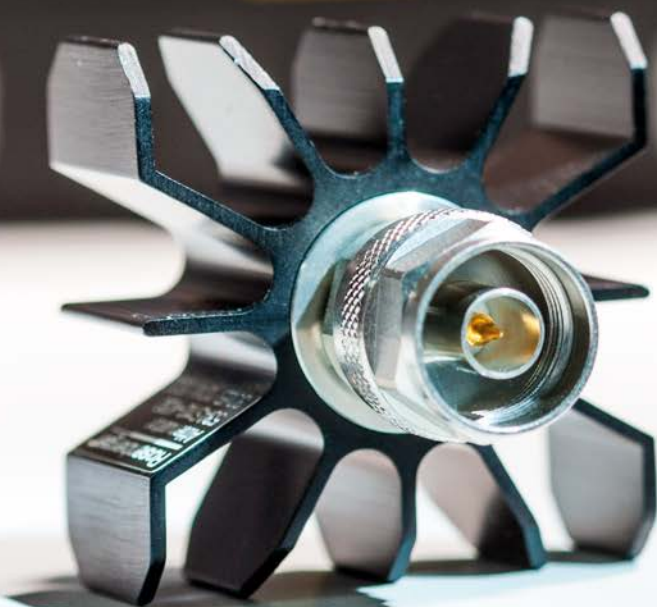
#### THE PORTFOLIO CONSISTS OF

- Coaxial calibration kits
- Compact calibration kits
- Test devices
- Microwave test cables
- Verification kits
- Gauge kits
- Test port cables for vector network analyzers
- Test port adaptors



# PRECISE, RELIABLE, AND REPEATABLE MEASUREMENTS.

Rosenberger offers a wide range of calibration and gauge kits, cable assemblies, and high-precision connectors and adaptors for testing in laboratories.







To fulfill the highest demands of R&D, test labs, or quality assurance departments, Rosenberger offers a comprehensive range of high-precision RF test & measurement products. Our portfolio is synonymous with precise, reliable and repeatable measurements – to meet the ever-increasing requirements of industrial lab test applications.

#### **THE PORTFOLIO CONSISTS OF**

- Coaxial calibration kits
- Compact calibration kits
- Test devices
- Microwave test cables
- Verification kits
- Gauge kits
- VNA test port cables
- Test port adaptors
- Precision adaptors

#### **PRECISION ADAPTORS**

RF precision adaptors – both in-series and between-series – are available for a range of standard interfaces.

Efficient factory testing is vital in order to achieve the tightest tolerances, maximum repeatability, high precision and quality in the manufacturing processes, as well as long production machine lifecycles. What's more, it helps to reduce manufacturing costs due to minimized replacements, retesting processes, and recalibrations. Rosenberger provides an ideally suited factory testing portfolio:

#### **THE PORTFOLIO CONSISTS OF**

- Coaxial calibration kits
- Compact calibration kits
- Test devices
- Microwave test cables
- Precision adaptors





# OPTIMIZED FOR EFFICIENCY IN FACTORY ENVIRONMENT.

Rosenberger high-precision and high-quality factory testing products will reduce operating costs and improve the efficiency of the supply chain.



Rosenberger offers a wide range of PCB connectors, which are tailored to the high demands of industrial test applications. The product range includes many common standard RF series, e.g. SMP, WSMP, Mini-SMP, SMA, QMA, SMB, MCX or Mini-Coax, but also innovative coaxial series such as P-SMP, Longwipe-SMP, FMC or Micro-RF.

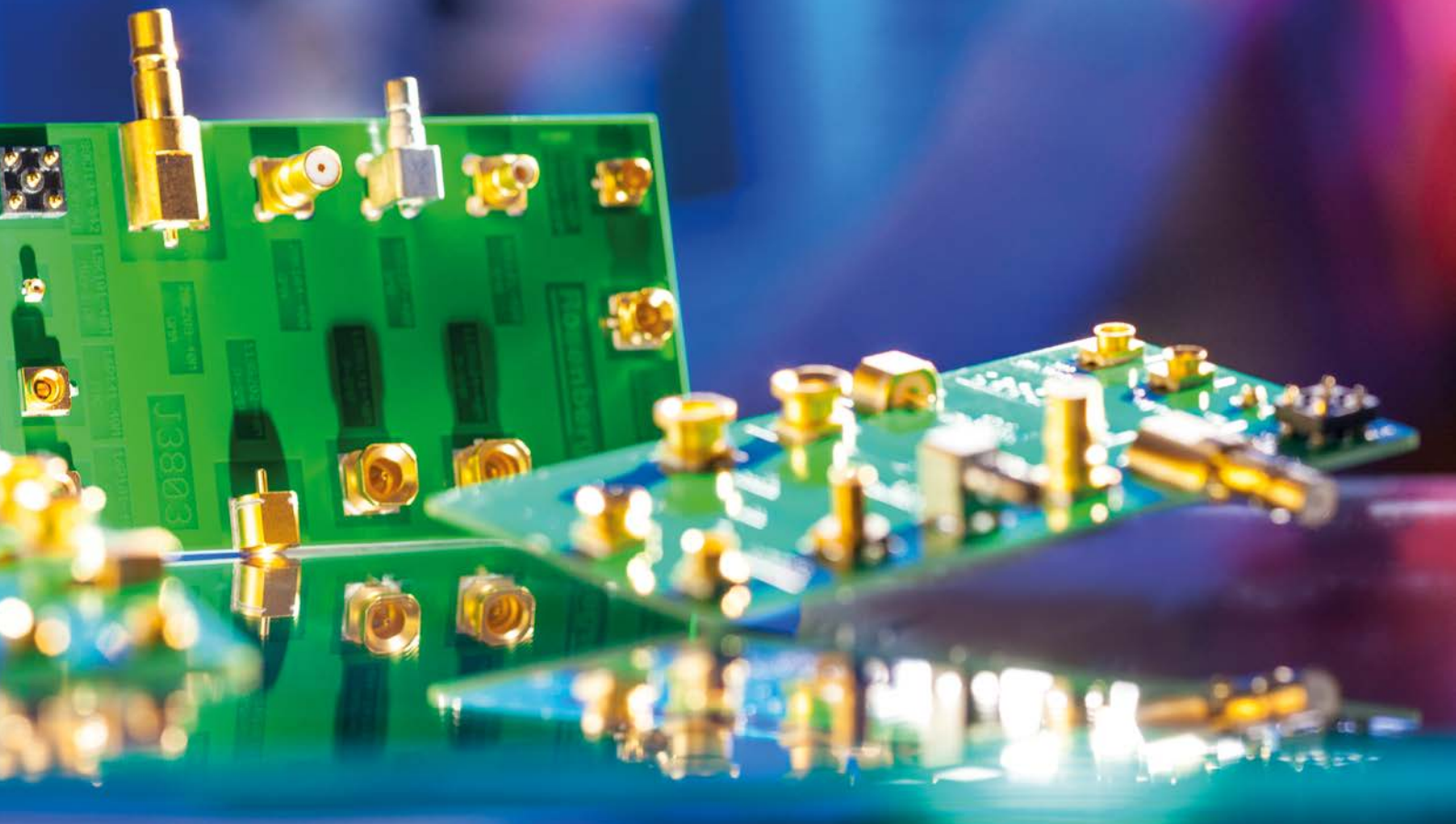
For specific test & measurement applications, Rosenberger develops and produces modular connector systems for DC frequencies up to 50 GHz, solderless PCB mount connectors for ultra-high frequency applications up to 110 GHz or spring-loaded coax systems (> 2,500 matings, pairwise phase matching 10 ps standard, different cable lengths).

#### **THE PORTFOLIO CONSISTS OF**

- RF-PCB connectors
- Modular connector systems
- Solderless PCB connectors
- Spring-loaded coax





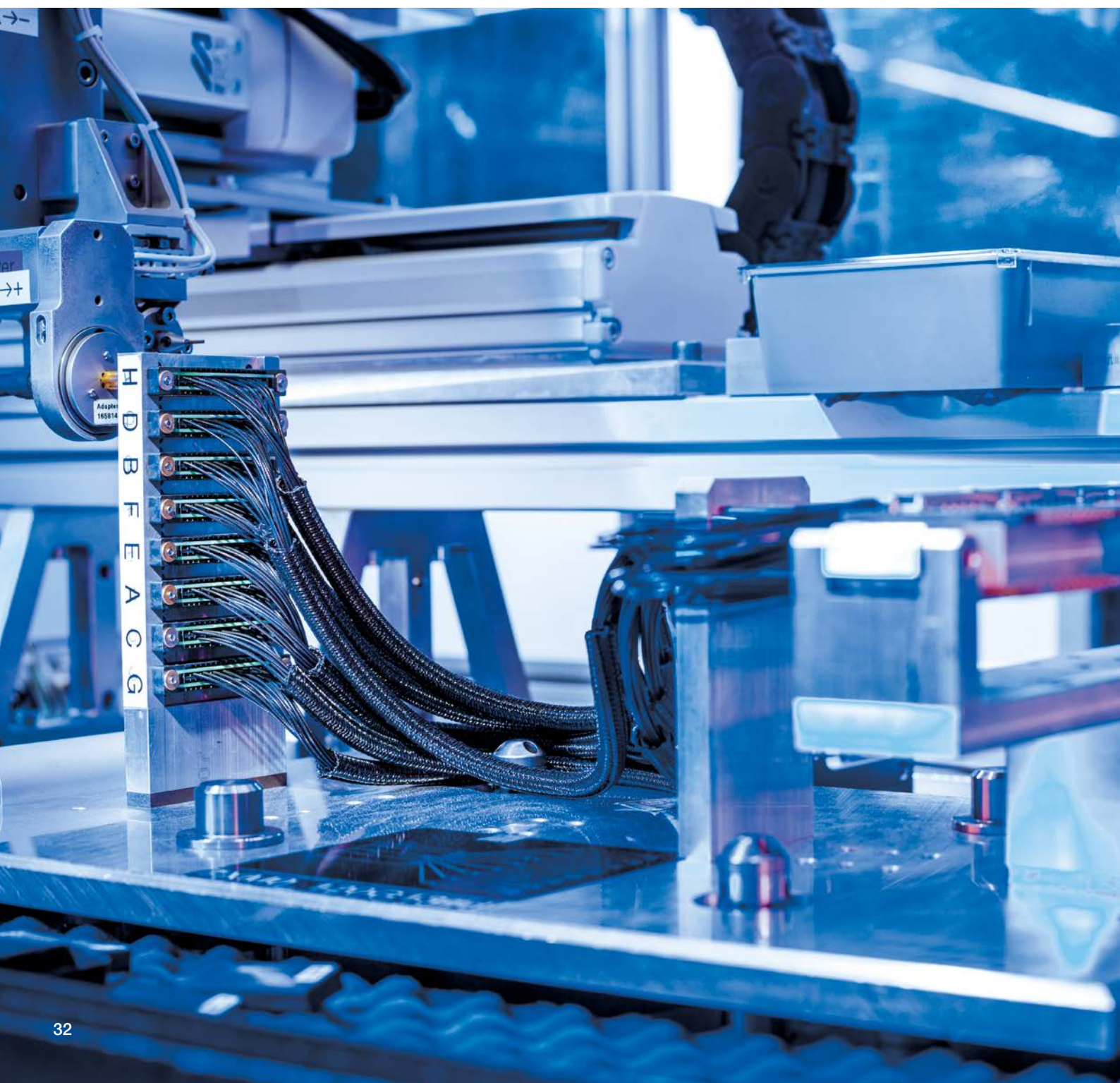


# PCB CONNECTIONS FOR CHALLENGING DEMANDS.

100% mechanically and electrically tested and documented.

# HIGH-QUALITY APPLICATIONS FOR ELECTRICAL CONNECTIVITY.

Rosenberger meets the ever-challenging technological requirements  
of the semiconductor test equipment industry.







The wide product range means that a variety of semiconductor test applications and high-speed digital applications are possible. To meet the ever-challenging technological requirements and increasing demands of the semiconductor test equipment industry, Rosenberger has developed and produces multiport mini-coax connectors and cable assemblies – for applications up to 40 GHz – , and spring-loaded coax products. Probes and customer-specific cable assemblies are also available.

High-density, low-loss, high-performance coax-to-PCB-transitions and cable assemblies – optimized for high speed digital testing.

#### **THE PORTFOLIO CONSISTS OF**

- Spring-loaded coax
- Multiport mini-coax connectors
- Probes and customer-specific cable assemblies

## THE LIGA TECHNOLOGY

Due to the needs for higher packing densities on transistors, it is increasingly difficult to find space for all of the spring pins needed to make contact with electrical interconnects on the DUT (device under test), particularly when the DUT consists of integrated circuits on undiced wafers. However, spring pins or pogo pins cannot be made much smaller using traditional manufacturing methods.

Rosenberger has addressed this challenge by using the LIGA (based on the German acronym for lithography, electroplating, and molding) process, which employs semiconductor manufacturing methods to accurately build tiny yet complex mechanisms – ones that are much smaller than the smallest interconnect produced using conventional methods. A monolithic compliant interconnect (MCI) produced using LIGA can have features as small as 10  $\mu\text{m}$  wide as well as dozens of geometric features to enhance mechanical and electrical performance.

## PRODUCT DESIGN FOR WAFER-LEVEL TEST

Implementing the LIGA technology, Rosenberger designs and manufactures the |Z|Probe® product line for microwave wafer and PCB test systems for Cascade Microtech.

## TOUCHDOWNS

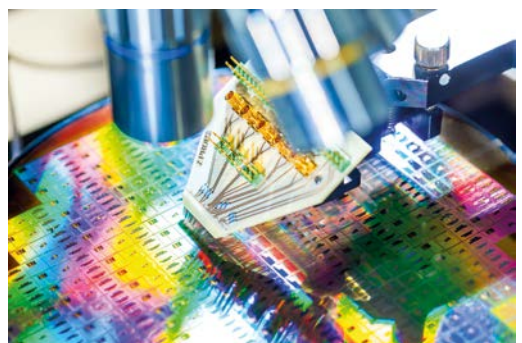
Our patented technology ensures highly accurate measurements with low contact resistance and superior impedance control. The RF/microwave signal makes just one transition to the coplanar contact structure within the shielded, air-isolated probe body. This maintains the signal integrity with stable performance over a temperature range from 10 K to 300° C.

Contacting the DUT with the |Z| Probe® is simple, highly repeatable, and requires significantly less overtravel than alternative RF wafer probes. This is due to the robust design of the coplanar contact structure and the elimination of the micro-coax cable.

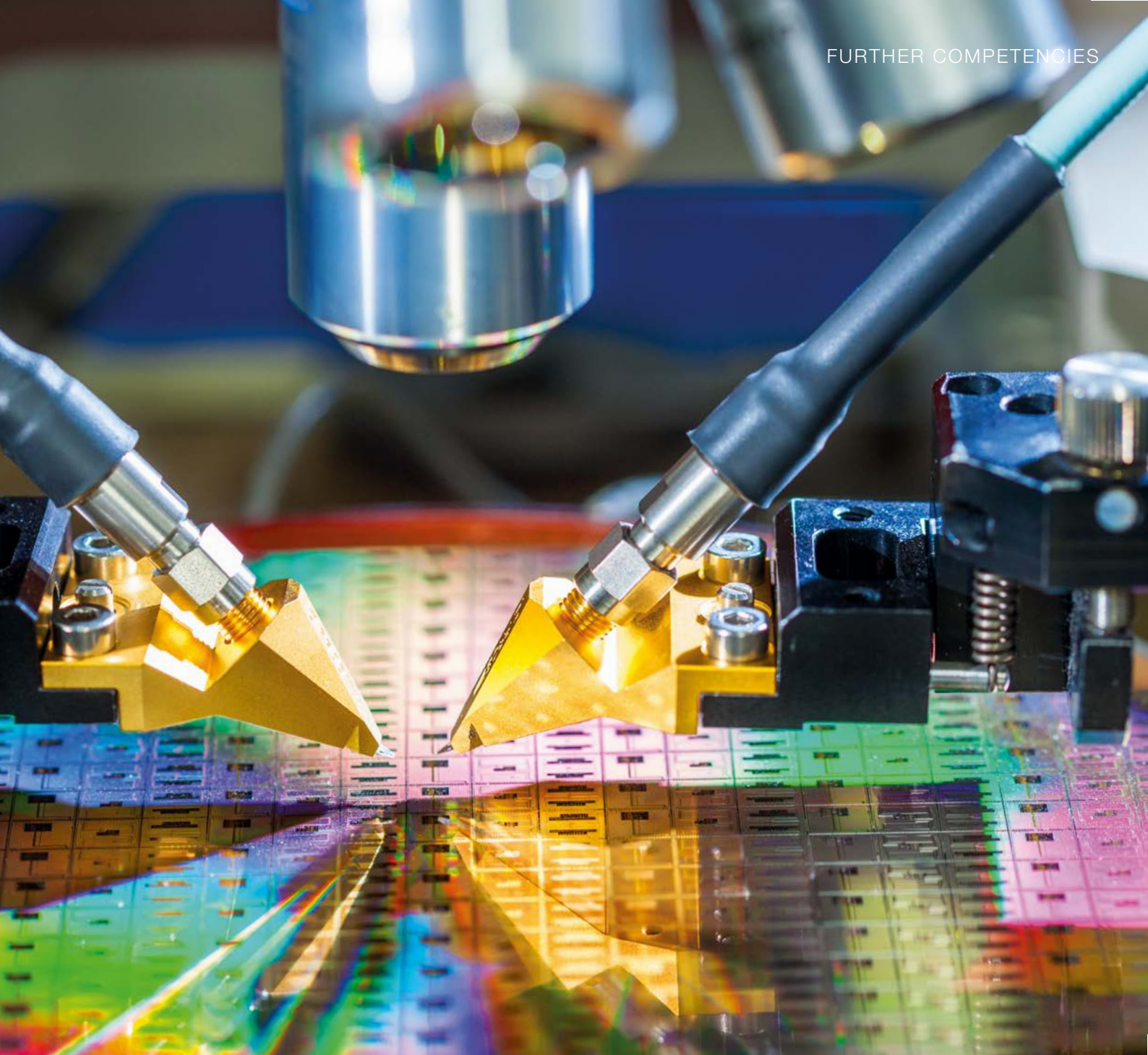
## FEATURES

- Frequency range: DC up to 67 GHz
- High power: 16 W at 5 GHz
- Standard pitches: 50  $\mu\text{m}$  up to 2,500  $\mu\text{m}$
- Contact cycles: > 1,000,000

|Z| Probe® is a registered trademark of Cascade Microtech, Inc





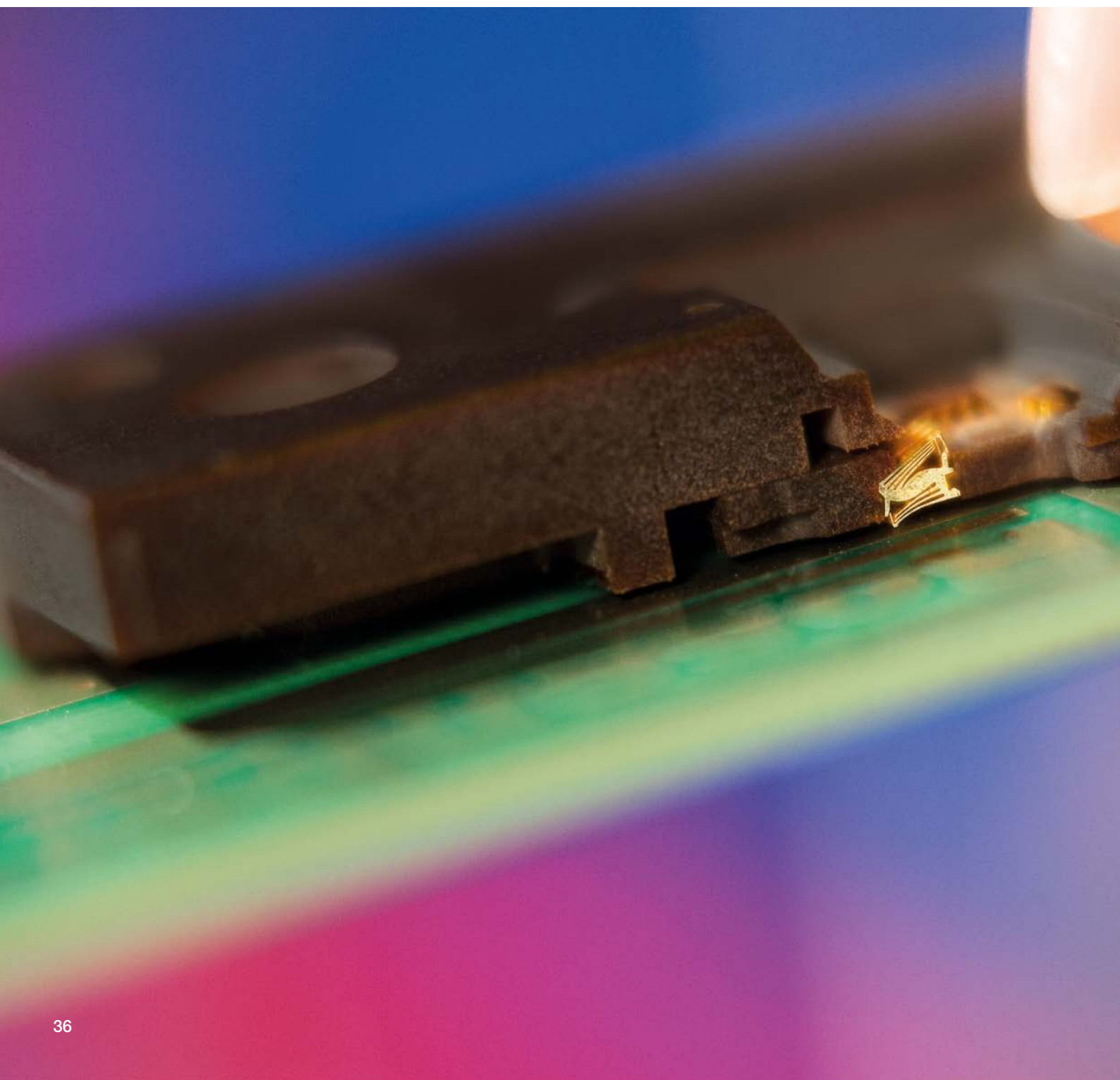


# INVOLVEMENT IN SEMICONDUCTOR TEST APPLICATIONS.

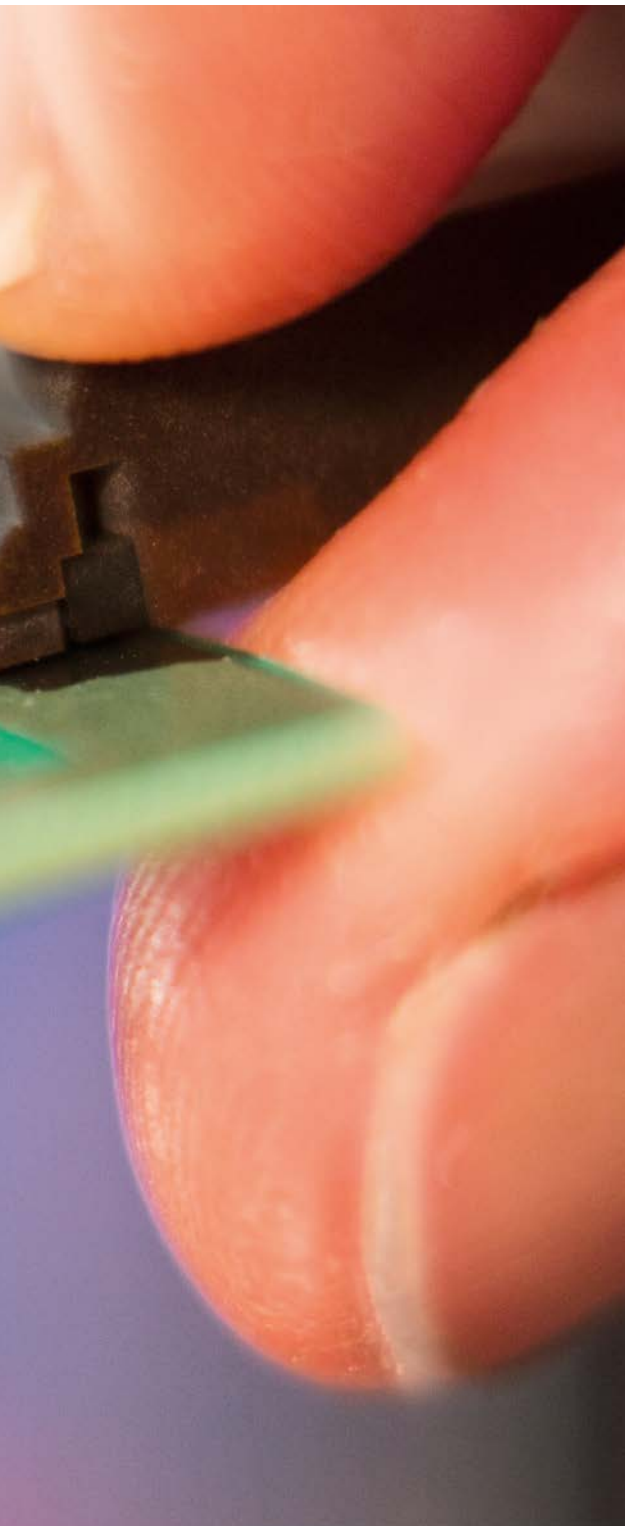
Innovative technology for wafer-level test.

# DURABILITY AND PRECISION IN SMALL FORM FACTORS.

A superior alternative to traditional spring pins for demanding applications.







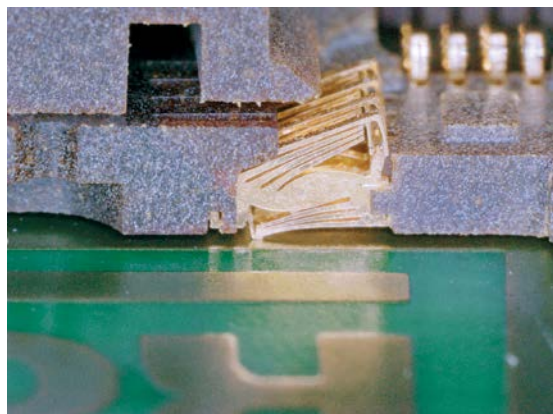
**MCI – Monolithic Compliant Interconnect** contact pins are produced with an electroforming process to meet highest precision requirements and industry leading small form factors. Metal is built up with an additive process to form parts on a micro scale with feature sizes down to 3  $\mu\text{m}$ .

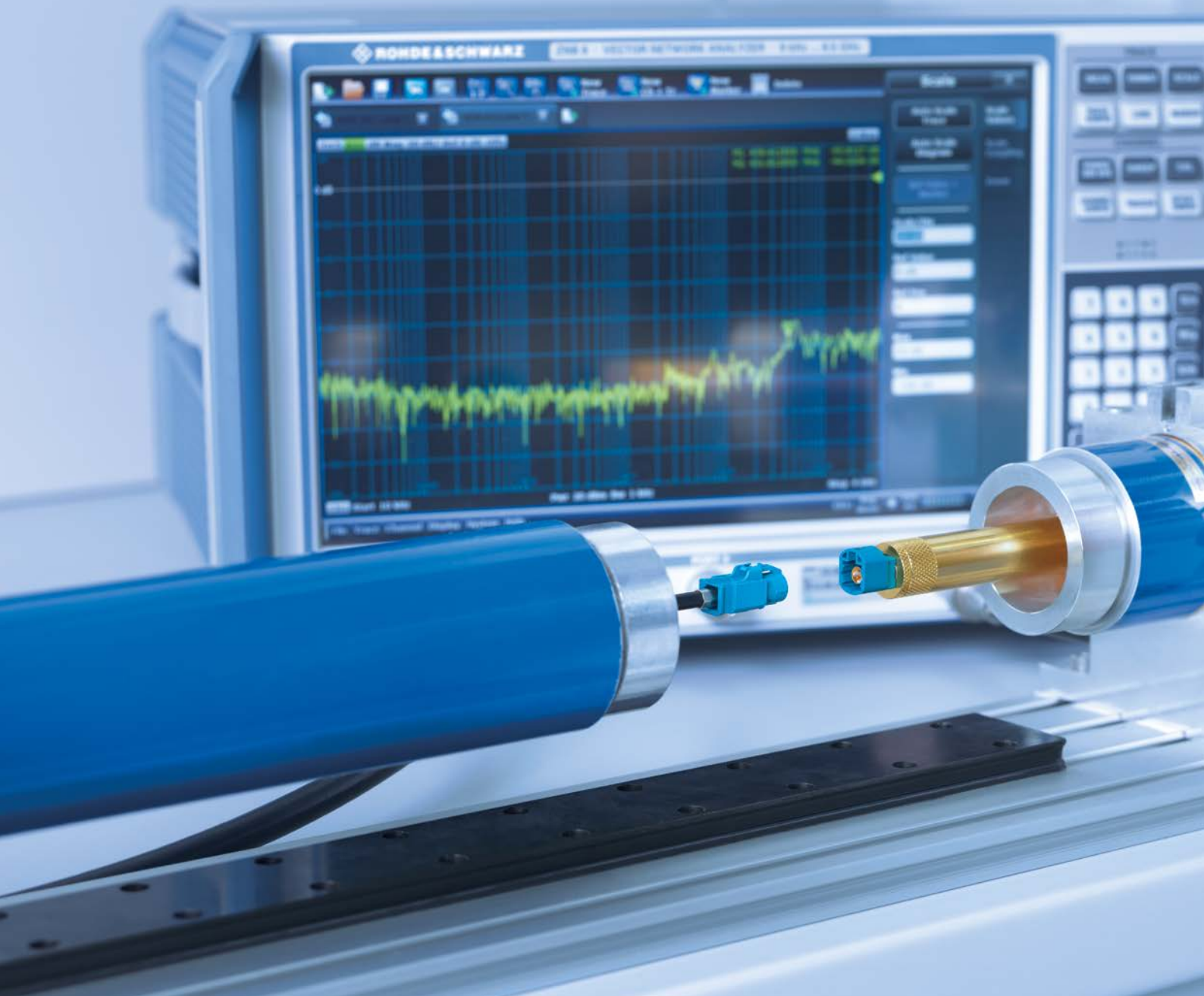
Due to the additive nature of the process, very tiny and well-defined shapes can be designed and replicated. Precise dimensional control is the basis for compact and reliable designs with superior durability tailored to specific application requirements, e.g. interposer or board-to-board interconnections.

Rosenberger has rich experience in the design, production, and verification of micro parts along with relevant state-of-the-art design, simulation, and manufacturing capabilities.

#### **BENEFITS**

- High reliability and durability
- Excellent signal integrity
- High density
- Well defined contact force
- Low and stable contact resistance





## EMI TESTING. INNOVATION THROUGH COOPERATION.

Rosenberger and bedea have jointly developed the CoMeT (Coupling Measuring Tube) test system to measure the shielding attenuation in a triaxial setup.





The CoMeT system measures in accordance with the proven and international standardized triaxial test method. The triaxial test method is not sensitive to external electromagnetic interference and provides a fast and reliable reproducibility. The measuring range reaches from DC to 12 (18) GHz. There is no emission of electromagnetic interference during the measurements.

The transfer impedance and screening attenuation of communication cables, connectors, and cable assemblies can be measured with one test set-up.

The triaxial cell pays special attention to the shielding effectiveness of bigger components like high-voltage components for electric vehicles.

The triaxial test method is the standard test method for determining the transfer impedance, screening attenuation and coupling attenuation for the complete frequency range according to the following standards:

- EN 50289-1-6
- IEC 62153-4-3
- IEC 62153-4-4
- IEC 62153-4-7
- IEC 62153-4-9
- IEC 62153-4-10
- IEC 62153-4-15
- IEC 62153-4-16

bedea is a well-known manufacturer of special cables. Specialists from both companies are collaborating in the national and international standardization organisations.

In today's global communication networks, the infrastructure must be highly efficient to ensure high-speed data transmission. Passive intermodulation can be caused by various factors – low-grade transmission line components, loose connectors, dirty surfaces, magnetic materials or by the surrounding environment. A precise analysis of the quality of mobile communication networks is therefore necessary.

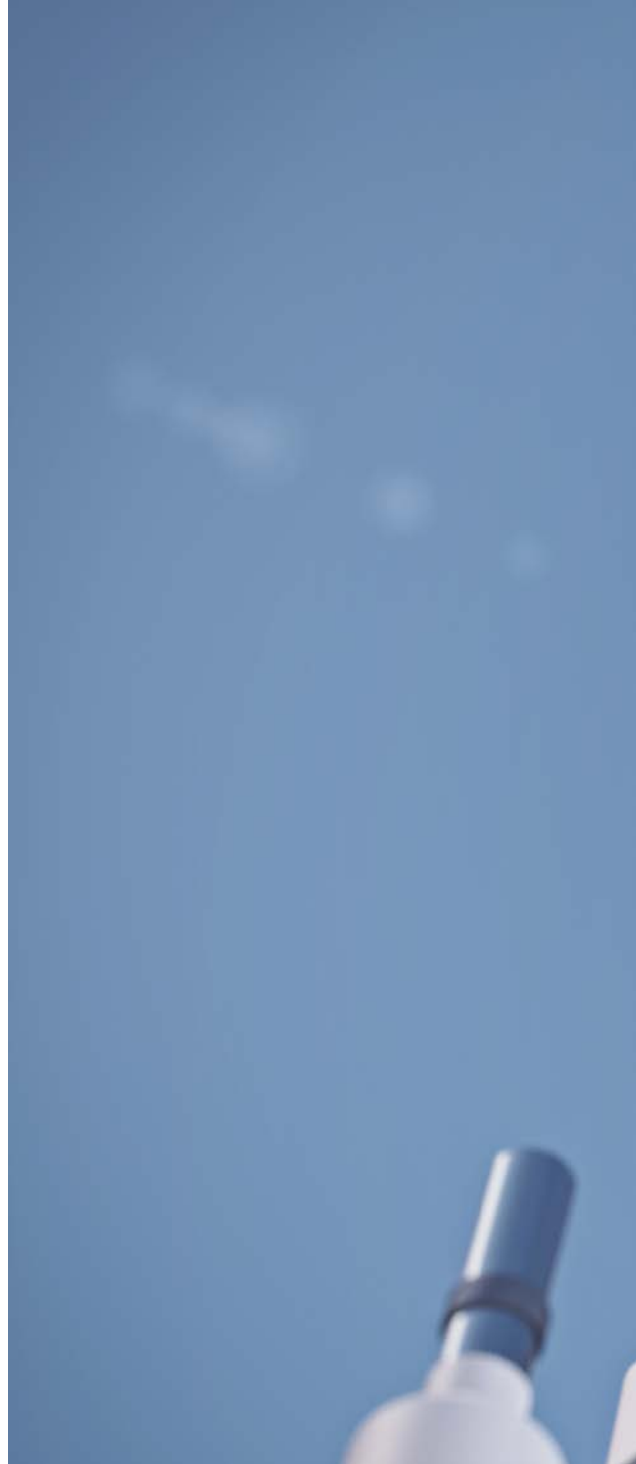
To ensure optimum network quality and to avoid serious interferences by passive intermodulation (PIM), Rosenberger provides high-quality PIM test equipment for a wide range of applications – R&D, test labs, production environment, and site testing.

#### THE PORTFOLIO CONSISTS OF

- PIM Site Analyzer  $\alpha$
- Broadband rack types
- Broadband / single band desktop types

#### PASSIVE INTERMODULATION

Passive Intermodulation (PIM) is a non-linear response of two or more signals of different frequencies mixing together in a passive device, e.g., antenna, cable, connector or splitter. Today, PIM has become a very serious, and challenging issue for mobile operators, equipment vendors, and component manufacturers due to frequency planning in modern communication networks, the usage of high-power transmitters and the usage of more sensitive receivers in base stations. If a PIM with sufficient magnitude generated from a transmitter falls within an adjacent receiver channel, it causes serious interferences to the base station receiver and will significantly degrade the network quality of service.

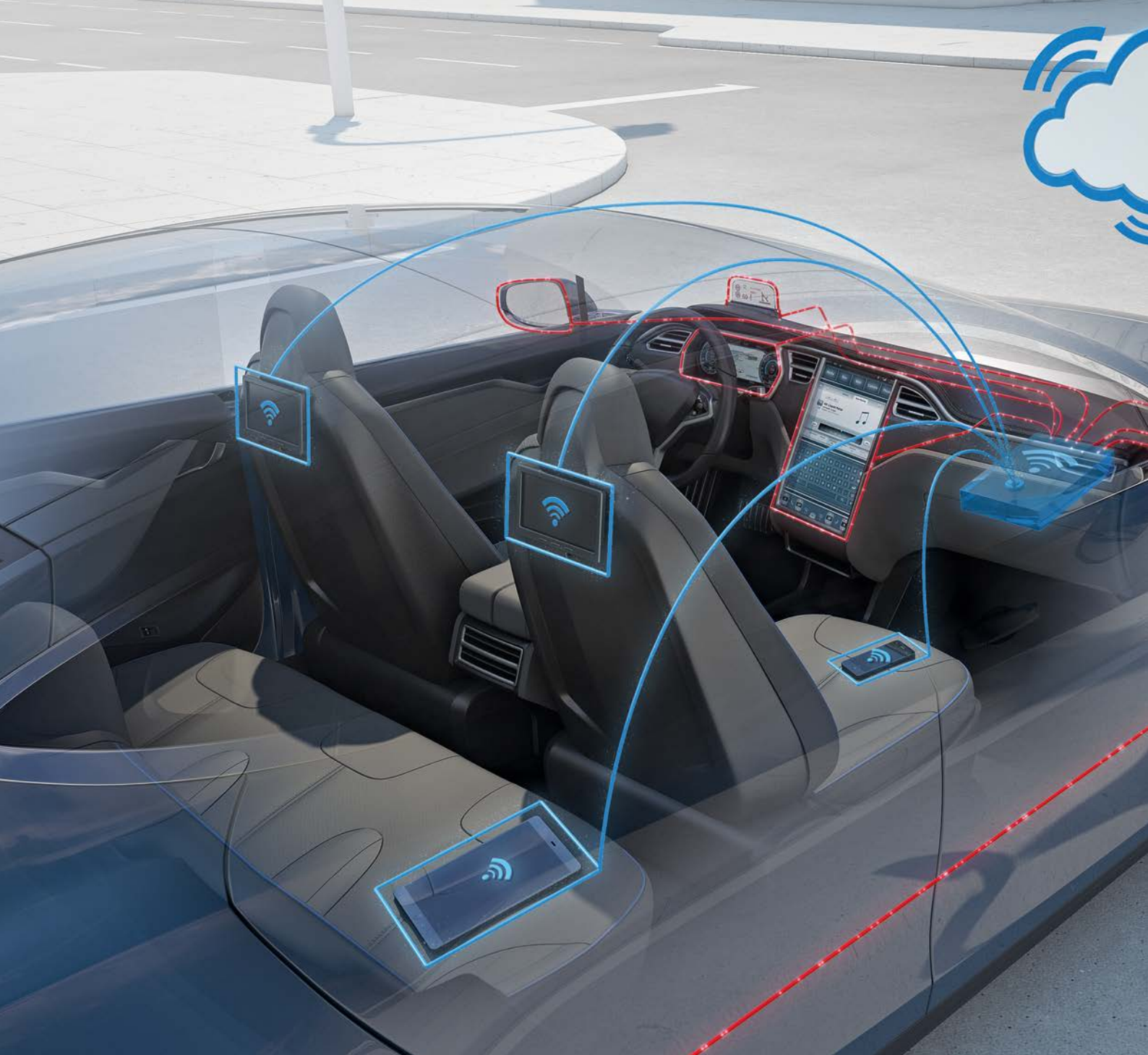






# BEST-IN-CLASS PIM TEST EQUIPMENT FOR YOUR APPLICATION.

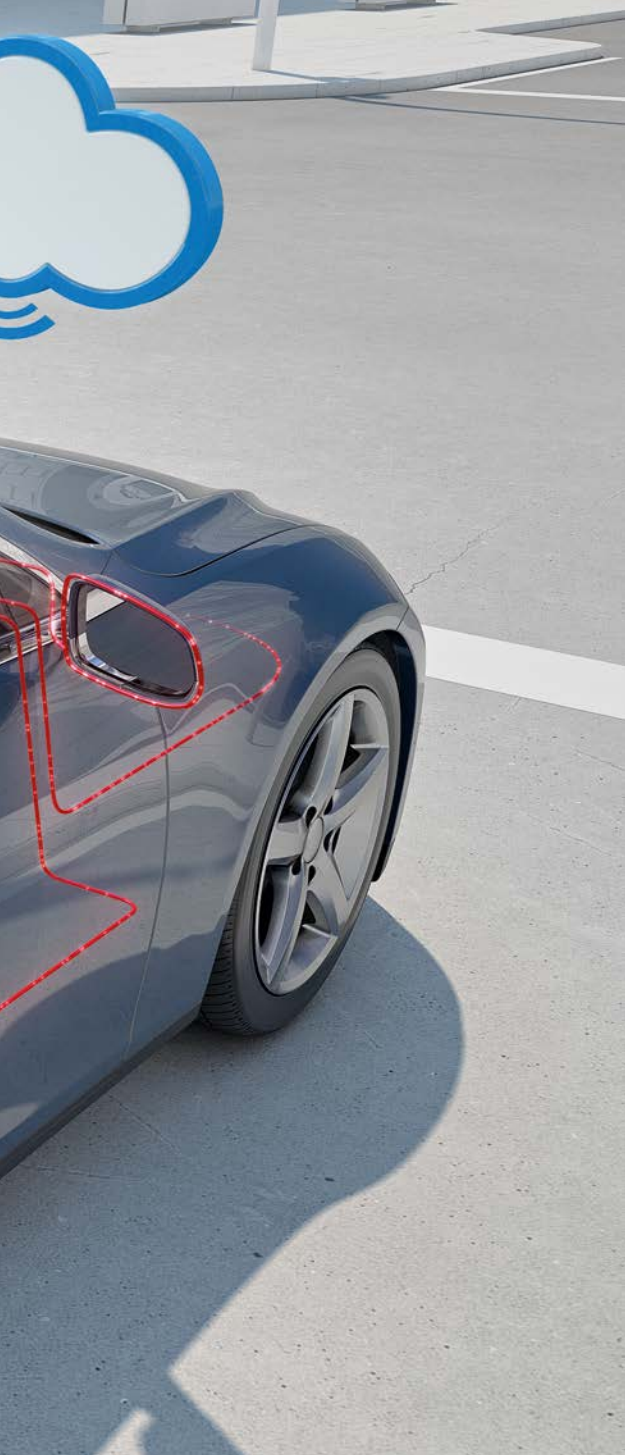
Rosenberger has a great deal of expertise when it comes to manufacturing PIM test & measurement solutions for broadband or single-band units. Our products ensure a high degree of portability and flexibility in production lines, R&D, test labs, or on site.



## MINIMAL INVASIVE MEASUREMENTS OF RF, VOLTAGES, AND CURRENTS.

Rosenberger provides directional coupler-based measurement techniques as well as probes for comprehensive cross-domain coupling analysis.





Nowadays, the introduction of new accessories within vehicles, like rear seat infotainment, smart dashboards, and various advanced driver assistance systems, has increased the demand for high-speed automotive bus systems working in parallel with the high-voltage power networks in electric cars.

In order to support automotive system integration, Rosenberger provides directional coupler-based measurement techniques as well as probes for comprehensive cross-domain coupling analysis.

#### THE PORTFOLIO CONSISTS OF

- MTD®-DCDP
- HV-coupler
- Rosenberger calibrated time domain software

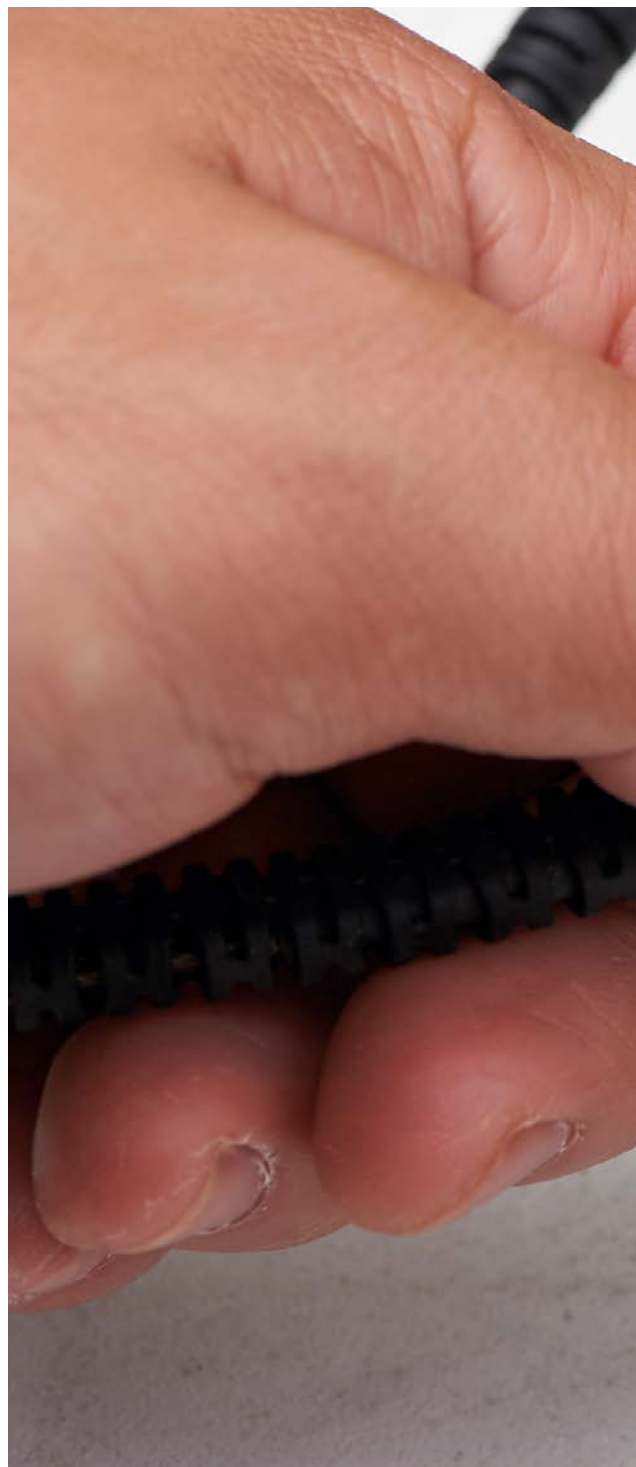


Developing a new oscilloscope probe represents an interesting design challenge, because it incorporates both mechanical and electrical elements along with a good dose of reality about what can and can't be built.

Test engineers working with new semiconductor and hardware designs in the mobile and enterprise communication segments are faced with a new task when it comes to probes, as these devices are different from the ones that engineers have been developing for years now. At the forefront of the challenges they present are bandwidth and size.

Rosenberger has the tools and resources that are needed to provide solutions and design the right RF connection for electronic signal acquisition. Thanks to its experience in RF, signal integrity and mechanical design, as well as with production technologies like the LIGA process, Rosenberger is the right partner when it comes to developing innovative and leading solutions. The result is the very highest-bandwidth signal acquisition systems available on the market.

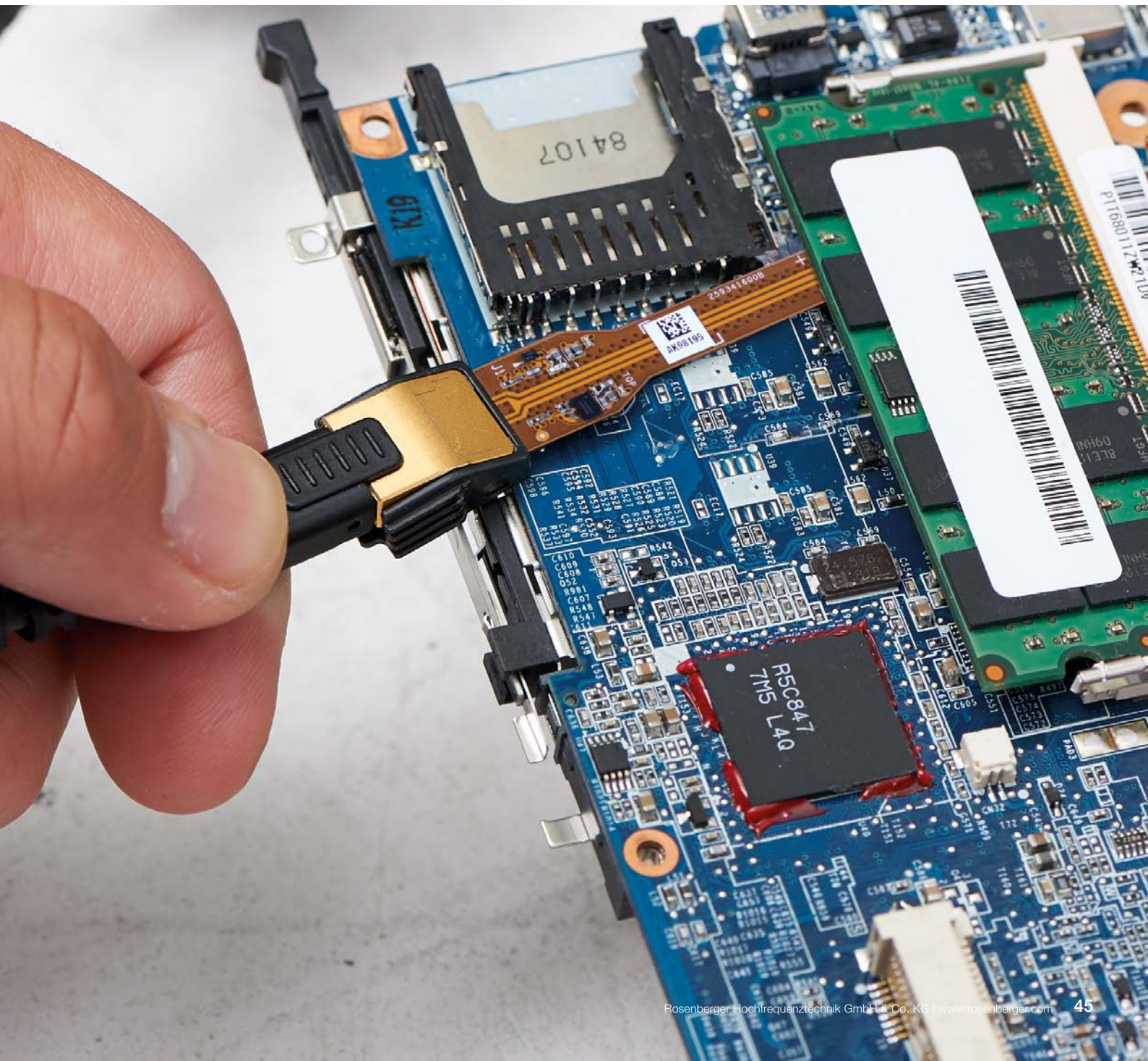
This makes Rosenberger an integral part of the probe development process, working in close collaboration with global leaders in oscilloscope manufacture to provide solutions to the challenges that RF and mechanical requirements bring.





# ENABLING MAXIMUM PROBE FIDELITY FOR REAL-TIME OSCILLOSCOPES.

Rosenberger solutions enable oscilloscope signal acquisition with maximum performance.



A variety of customer-specific and standard test & measurement services provide best-possible values – from recommendations for challenging measurement configurations, optimized layout recommendations, RF training kits or calibration services.

### **DAKKS CALIBRATION**

The Rosenberger calibration laboratory offers accredited calibrations according to DIN EN ISO 17025 (DAkkS) and factory calibrations for calibration kits from Rosenberger as well as for third parties.

Further information:

[www.rosenberger.com/t&m/calibration](http://www.rosenberger.com/t&m/calibration)

### **TRAINING KITS**

As a special service Rosenberger offers a comprehensive RF training kit with coaxial and microstrip standards. The kit is best-suited for laboratory exercises from beginners to intermediate levels.

Further information:

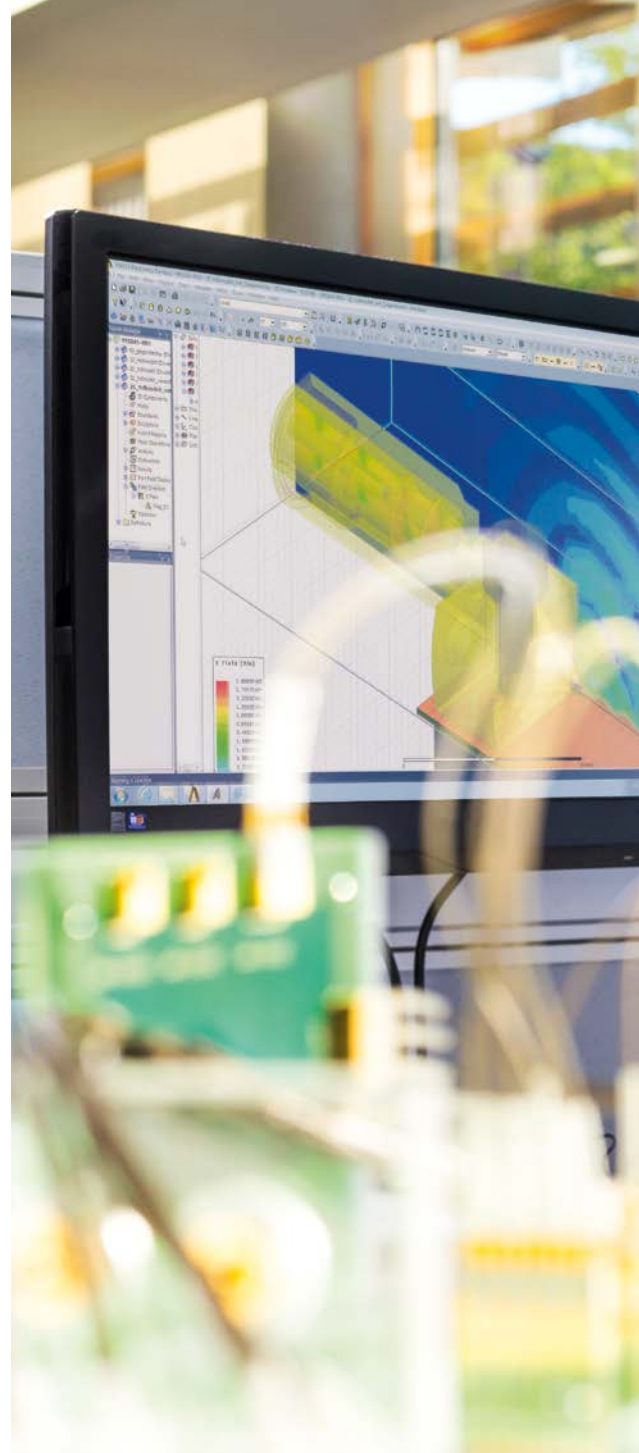
[www.rosenberger.com/t&m/trainkit](http://www.rosenberger.com/t&m/trainkit)

### **MEASUREMENT ACCESSORIES**

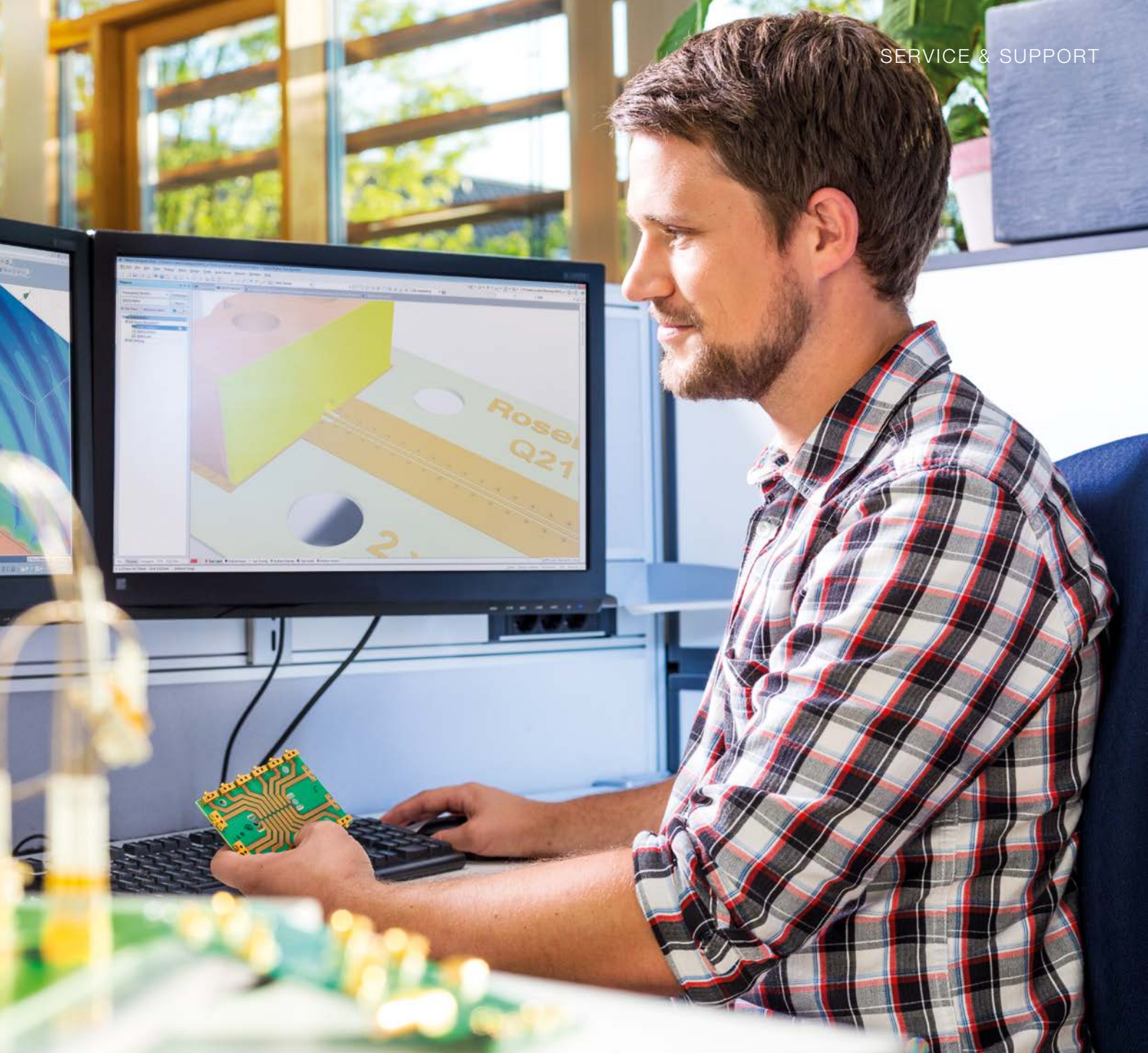
Rosenberger provides also a number of important and useful accessories, e.g. torque wrenches, extraction tools, beads, seals and others.

### **LAYOUT RECOMMENDATIONS**

The performance of RF connections depends on various parameters. Optimized for your application, we provide customer-specific footprints and layout recommendations.







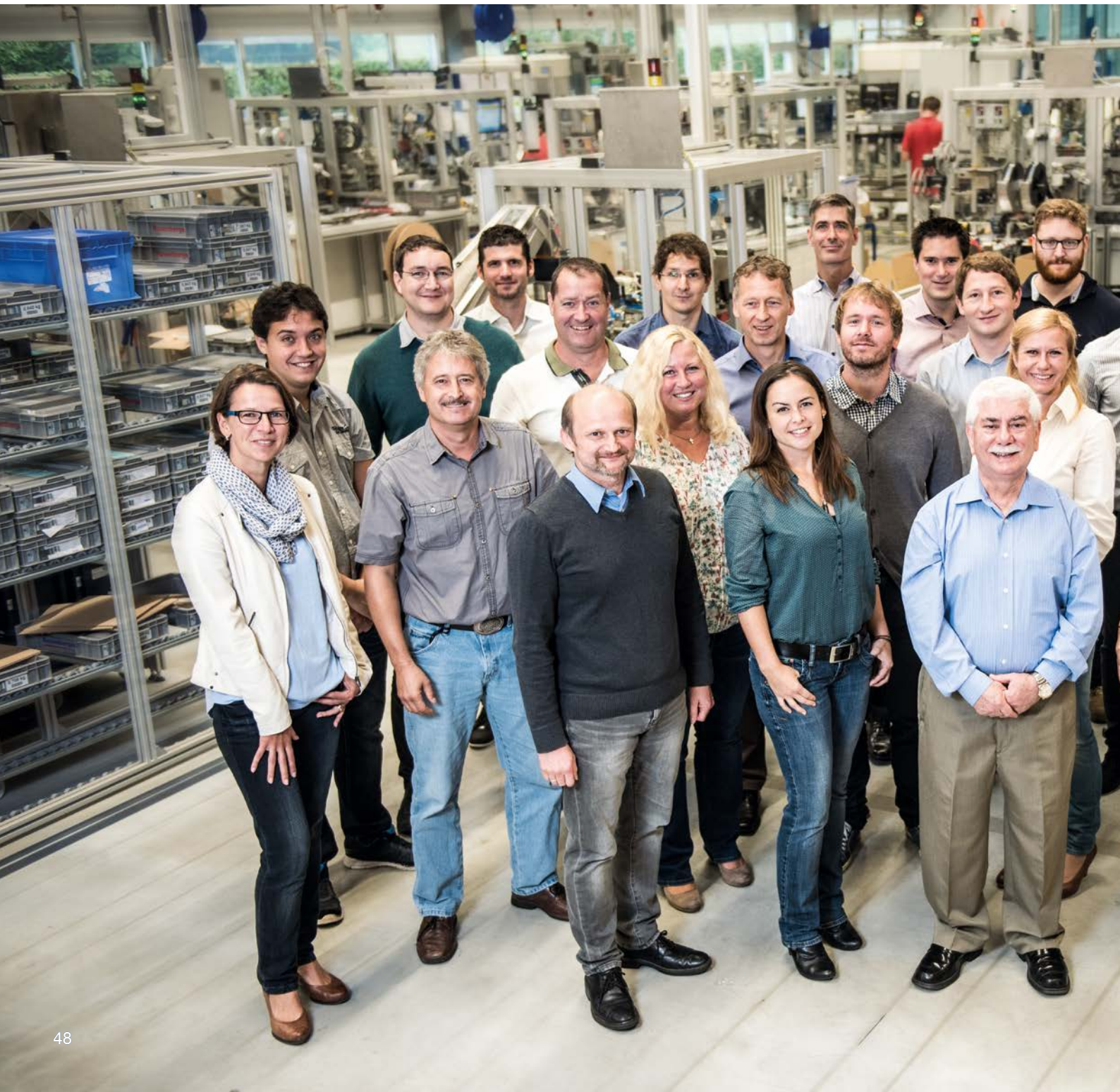
## OUR SERVICE. YOUR ADVANTAGE.

Rosenberger offers a one-stop service. Our global network of R&D, manufacturing, and assembly locations provides innovation, optimized cost structure, and excellent customer services worldwide.



# TEAMWORK.

Our expert staff are available to assist you at all times. Whether you want to chat to us on the phone or send us an email, we will help you to overcome any challenges.







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# TEST & MEASUREMENT PORTFOLIO

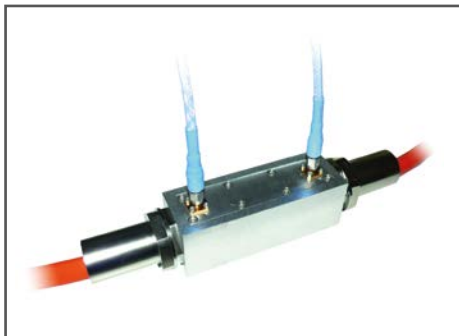
Applications / Productlines	Coaxial Calibration Kits	Compact Calibration Kits	Test Devices	Microwave Test Cable Assemblies for Network Analyzers	Verification Kits	Gauge Kits	Test Port Cables for Vector Network Analyzers	Test Port Adaptors	Precision Connectors	Precision Adaptors	Modular Connector Systems	Solderless PCB Connector	Spring Loaded Coax	PCB Connectors	Multiport Mini-Coax Connectors	Passive Intermodulation Analyzer	MTD®-DCDP	HV-Coupler	Rosenberger Calibrated Time Domain SW
Test & Measurement Equipment	■	■	■	■	■	■	■	■	■	■									
Microwave measurements / VNA calibrations	■	■	■	■	■	■	■	■											
Laboratory testing	■	■	■	■	■	■	■	■	■										
Factory testing	■	■	■	■					■										
PCB connections											■	■	■	■					
Semiconductor test / high speed digital													■		■				
PIM testing		■		■												■			
Coupler Metrology																	■	■	■



## MTD®-DCDP

- Separation of uplink and downlink signals on automotive one pair Ethernet
- Detection of common mode interferences on unshielded differential wires

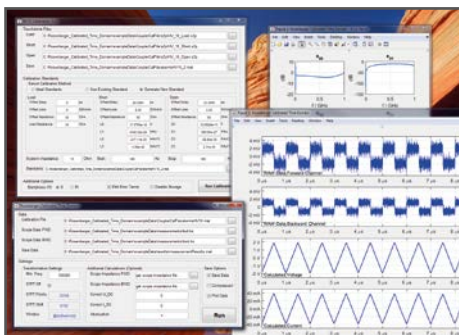
[www.rosenberger.com/ok/mtdcoupler](http://www.rosenberger.com/ok/mtdcoupler)



## HV-Coupler

- Detection of RF voltages and currents in automotive HV-power train
- Detection of fast transients and single shot events in the HV cable harness

[www.rosenberger.com/ok/hvcoupler](http://www.rosenberger.com/ok/hvcoupler)



## Rosenberger Calibrated Time Domain Software

- Novel calibration and post processing software for time domain measurements by the use of a directional coupler
- Minimal invasive measurements of RF voltages and currents due to the use of directional couplers

[www.rosenberger.com/ok/caltds](http://www.rosenberger.com/ok/caltds)





### Coaxial Calibration Kits

Rosenberger calibration kits – with a wide range of coaxial connector series for vector network analyzers (VNAs) – can be used from DC to their maximum frequency. The following versions are available:

- Full version with open, short, load, in-series adaptors, torque wrench and gauges adaptors, and sliding loads for variable measurements
- Industrial version with open, short, load, in-series adaptors, and torque wrench for standard measurements
- LRL and TRL version with air lines and shorts

Interfaces available: F, BNC, 4.1-9.5, 4.3-10, FAKRA, SnapN, SMP, Mini-SMP, QN, P-SMP, RPC-7, RPC-3.50, RPC-2.92, RPC-2.40, RPC-1.85, RPC-TNC, RPC-N. Each calibration kit comes with a certificate from Rosenberger's own calibration laboratory: The standard calibration is the factory calibration; an accredited calibration can be carried out as an option under DAkkS (Deutsche Akkreditierungsstelle) according to DIN EN ISO 17025, to which Rosenberger is certified.

[www.rosenberger.com/ok/calkit](http://www.rosenberger.com/ok/calkit)



### Compact Calibration Kits

They are designed as MSO (3-in-1, open / short / load) and MSOT (4-in-1, open / short / load / thru) mechanical calibration kits – small, easy to handle, and delivered with a lanyard and a standard definition card in a hard shell case.

#### Available for the following interfaces:

RPC-2.92, RPC-3.50, RPC-N (50 Ohm), RPC-N (75 Ohm), 7-16, Standard-N, 4.3-10, and 4.1-9.5

[www.rosenberger.com/ok/compkit](http://www.rosenberger.com/ok/compkit)



### Test Devices

Rosenberger offers a wide range of test devices designed for various requirements and varying demands, from low-frequency devices for simple measurements to components permitting high-precision broadband measurements. The product range includes opens, shorts and loads, sliding loads, T-calibration adaptors, mismatches, air lines, attenuators, matching attenuators, DC blocks, and test accessories, e.g., tools or gauges.

[www.rosenberger.com/ok/testdev](http://www.rosenberger.com/ok/testdev)



### Microwave Test Cable Assemblies for Network Analyzers

The wide portfolio of standard microwave cable assemblies for vector network analyzers (VNA) is available. In defined lengths for applications up to 70 GHz, armoured RFLex™ cables are also available. Customer-specific assemblies and solutions can be ordered on request.

#### Product features

- Very high phase-stability
- High number of mating cycles
- Variety of cable types and connector interfaces for a variety of industrial test & measurement applications

[www.rosenberger.com/ok/micwav](http://www.rosenberger.com/ok/micwav)



### Verification Kits

All verification components from Rosenberger are electrically characterized on a network analyzer measurement system. These measurements are traceable to metrology standards such as PTB (Physikalisch-Technische Bundesanstalt Braunschweig) or NIST (National Institute of Standards and Technology). Verification kits are available for RPC-2.92, RPC-3.50 and RPC-N (50 Ohm).

[www.rosenberger.com/ok/verkit](http://www.rosenberger.com/ok/verkit)



### Gauge Kits

Rosenberger provides gauge kits for RPC-1.00, RPC-1.85, RPC-2.40, RPC-2.92, RPC-3.50, RPC-N (50 Ohm), RPC-N (75 Ohm), RPC-7, RPC-TNC and 7-16. Delivered in stable wooden boxes, they include a male/female gauge and male/female gauge block.

[www.rosenberger.com/ok/gaukit](http://www.rosenberger.com/ok/gaukit)



### Test Port Cables for Vector Network Analyzers

VNA test port cables – with outstanding phase and amplitude stability – are available as sets containing two cables with a standard length of 60 cm each. Test cable sets are supplied in high-quality wooden boxes.

#### The range is optimized for frequencies up to

- 26.5 GHz
- 40 GHz
- 50 GHz
- 70 GHz

[www.rosenberger.com/ok/tportcab](http://www.rosenberger.com/ok/tportcab)



### Test Port Adaptors

Rosenberger offers a wide range of ruggedized test port adaptors for VNA (vector network analyzer) test applications. High-quality test port adaptors from Rosenberger are designed to connect directly to a ruggedized coupling nut to the VNA test port, they are available in the series RPC-3.50, RPC-2.92, RPC-2.40 and RPC-1.85 – for VNA applications up to 70 GHz. The ruggedized construction ensures reliable protection of VNA test ports and reduces mechanical abrasion to a minimum.

[www.rosenberger.com/ok/tportadap](http://www.rosenberger.com/ok/tportadap)

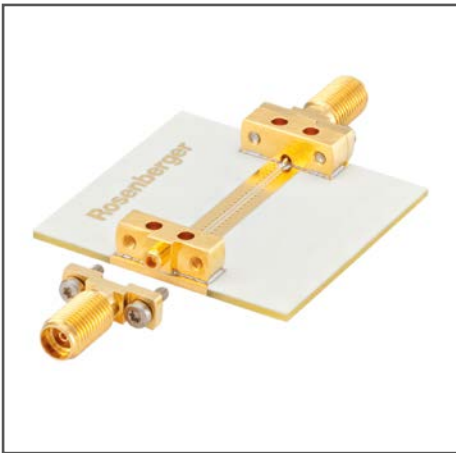




### Precision Adaptors

For a series of standard interfaces RF precision adaptors are available – in-series as well as between-series adaptors.

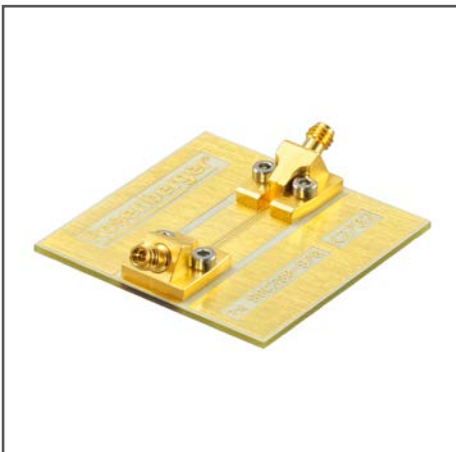
[www.rosenberger.com/ok/precadap](http://www.rosenberger.com/ok/precadap)



### Modular Connector Systems

The Rosenberger modular connector system improves existing solutions and fulfills the increasing requirements of test and measurement industries. To cover the whole frequency range from DC to 50 GHz, only one part of PCB contact has to be processed.

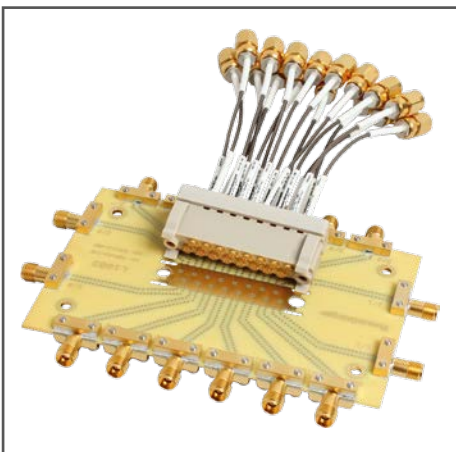
[www.rosenberger.com/ok/modcon](http://www.rosenberger.com/ok/modcon)



### Solderless PCB Connectors

High-performance solderless PCB mount connectors from Rosenberger are designed to provide low-return loss values for frequencies up to 110 GHz for single-layer or multi-layer printed circuit boards where the microwave layer is on the top.

[www.rosenberger.com/ok/soldpcb](http://www.rosenberger.com/ok/soldpcb)



### Spring-loaded Coax

The Rosenberger spring-loaded coax is designed to make quick, reliable and low-abrasion connections up to 40 GHz to single-layer or multi-layer printed circuit boards with the microwave layer on the top.

[www.rosenberger.com/ok/slc](http://www.rosenberger.com/ok/slc)



### PCB Connectors

Rosenberger provides a variety of standard and high-precision PCB connectors for test & measurement applications. The standard portfolio includes N, BNC, SMA, SMP, Mini-SMP, WSMP, and ZSMP, for example. The precision connector range includes connector heads, cable connectors, and adaptors from the following series, for example:

- RPC-N
- RPC-TNC
- RPC-7
- RPC-SP
- RPC-3.50
- RPC-2.92
- RPC-2.40
- RPC-1.85
- RPC-1.00

[www.rosenberger.com/ok/pcb](http://www.rosenberger.com/ok/pcb)



### Precision Connectors

The Rosenberger precision connector (RPC) range includes connector heads, cable connectors, and adaptors from the following series: RPC-N, RPC-TNC, RPC-7, RPC-SP, RPC-3.50, RPC-2.92, RPC-2.40, RPC-1.85, and RPC-1.00.

#### Product features

- High-quality raw materials, e.g., stainless steel, CuBe
- Low-wear use and high durability
- Highest level of precision and quality
- 100% mechanically and electrically tested

[www.rosenberger.com/ok/precon](http://www.rosenberger.com/ok/precon)



### Multiport Mini-Coax Connectors

Rosenberger provides a wide range of multiport-mini-coax connectors and cable assemblies for board-to-board applications up to 40 GHz. The range covers PCB connectors, suitable cable connectors which can be bundled in housings (2, 4, 6 and 8 channels), and various cable assembly sets.

#### Product features

- Frequency range: DC to 20 GHz, new: or DC to 40 GHz
- High packing density – small dimensions (0.12" / 3 mm pitch)
- Mating cycles  $\geq$  500
- Pair matching and phase-matching up to 2 ps (for cable assemblies)
- High electrical and mechanical stability

[www.rosenberger.com/ok/multiport](http://www.rosenberger.com/ok/multiport)



### Passive Intermodulation Analyzers

#### PIM Site Analyzer $\alpha$

- PIM detection over CPRI incl. cancellation function
- Broadband Rx & Tx base model 698 – 2700 MHz with exchangeable filter units

#### Broadband Rack Types

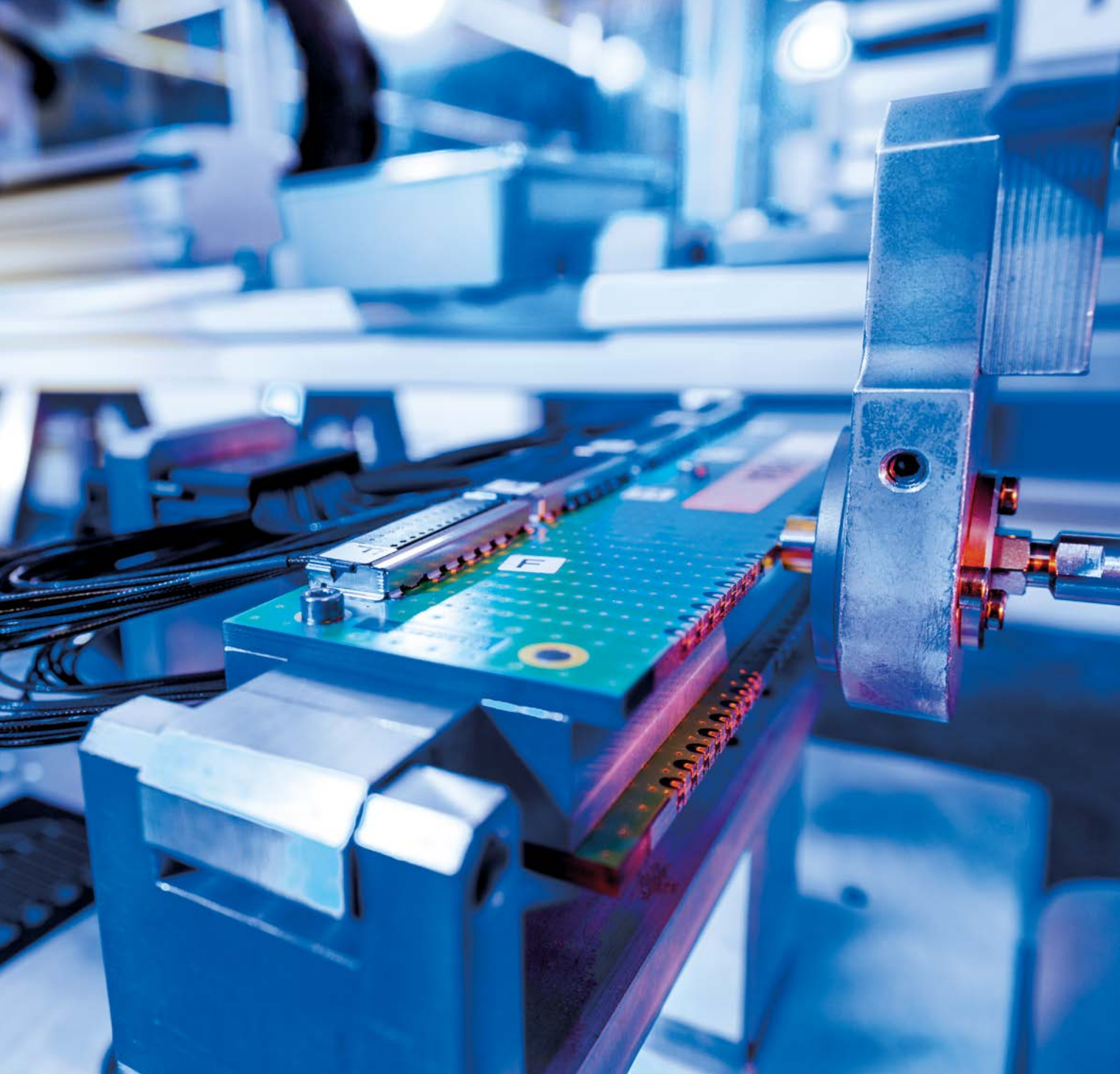
- For fast and precise multiband testing in production lines
- Broadband base unit 698 – 2200 MHz

#### Broadband/single band desktop types

- Reduction of T&M investment cost (for multiband-testing)
- High flexibility/portability in production lines, R&D, test labs

[www.rosenberger.com/pia](http://www.rosenberger.com/pia)





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