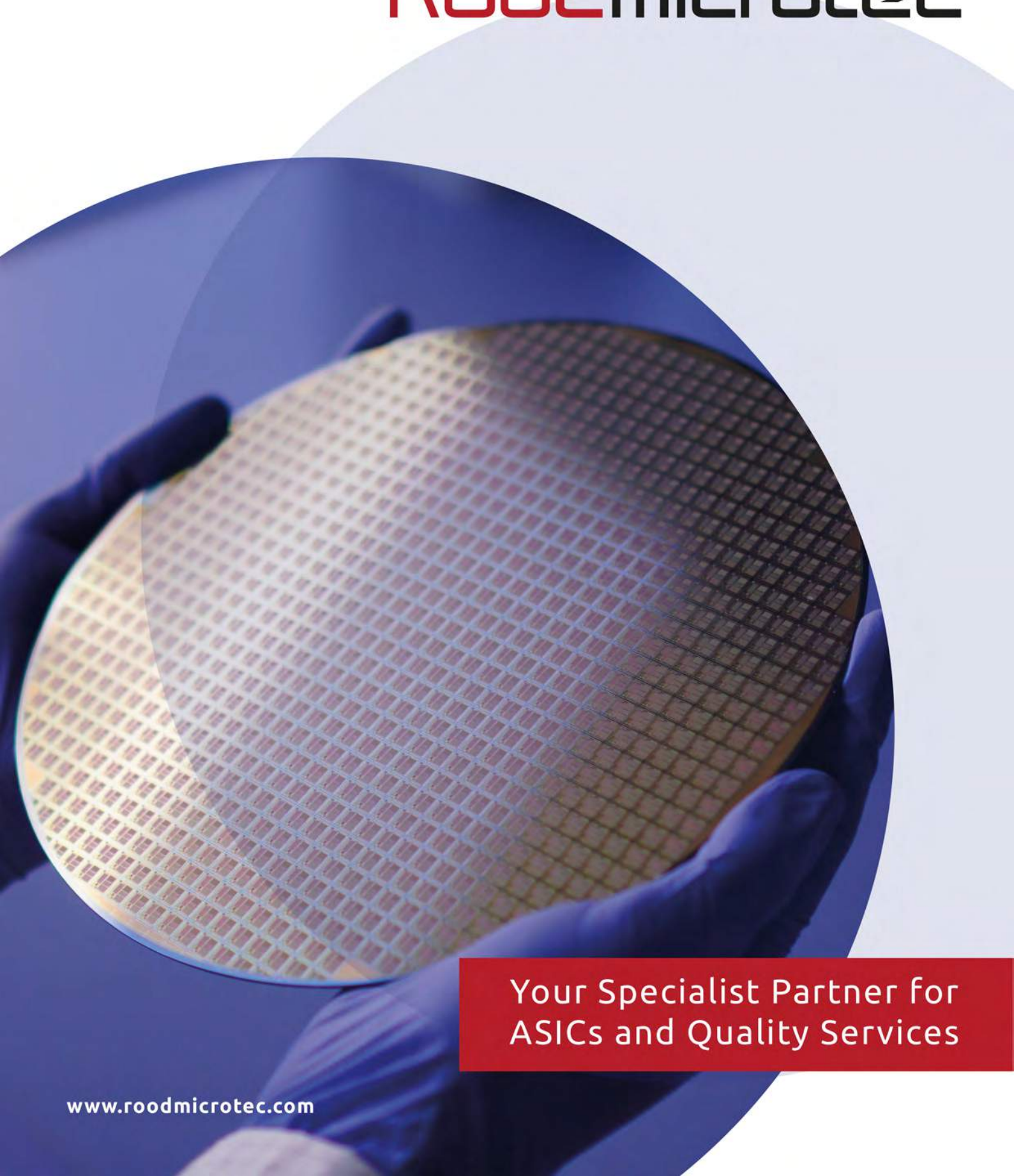




RoodMicrotec



Your Specialist Partner for
ASICs and Quality Services

www.roodmicrotec.com

Company Profile

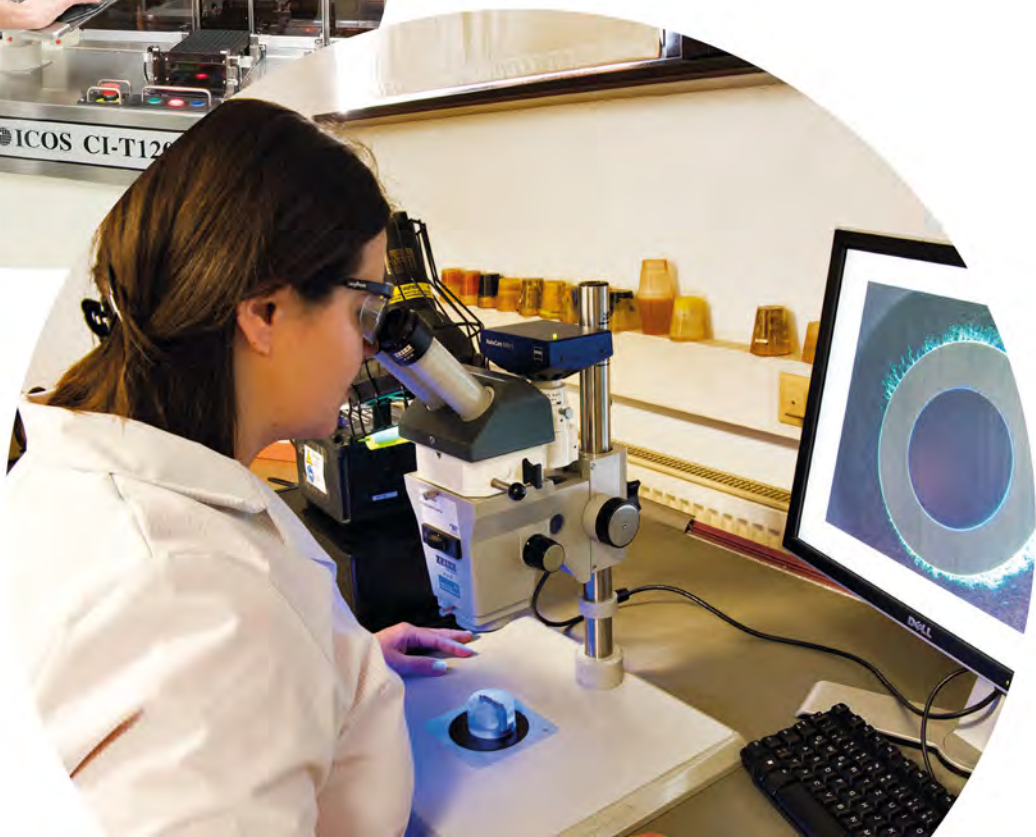
RoodMicrotec is the leading independent company for semiconductor supply and quality services.

With almost 50 years' experience as a service provider in the semiconductor, microelectronics and optoelectronics industries, RoodMicrotec is well established as a highly valued partner to many companies in Europe and many other countries. It supports both OEMs and Tier 1 suppliers in the automotive, industrial, healthcare and aerospace markets. These range from start-ups to market leading multinationals and from fabless IC suppliers to IDMs and systems manufacturers.

In co-operation with selected partners, RoodMicrotec supports the design, manufacture and supply of the highly complex microchips (ASICs) to customers' specifications. RoodMicrotec is a turnkey ASIC supplier, managing and operating a complete range of capabilities, ranging from chip design to delivery of tested and qualified parts. This includes project management, quality assurance and worldwide logistics. The engineering, test capabilities and qualification services are also offered as individual services to the market.



In addition to the well-equipped facilities, operating under high-quality standards, RoodMicrotec has experts with long experience and in-depth know-how in the field of microelectronics manufacturing technology and product quality management. It is the objective of RoodMicrotec to contribute to the success of its customers.



Supply Chain Management

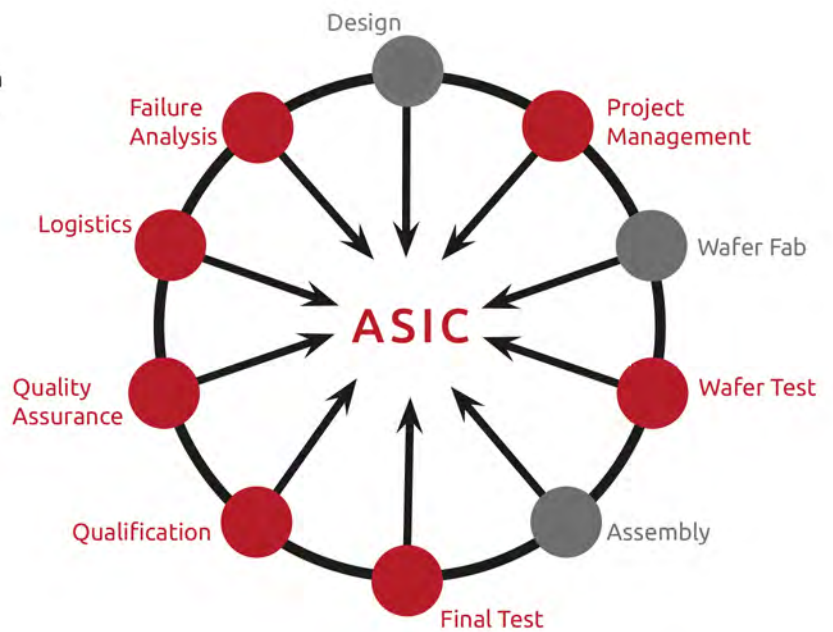
RoodMicrotec supports electronics companies that need high-quality semiconductors, in particular ASICs for their products or their customer's applications. In close co-operation with selected partners, we develop ICs according to customer specific requirements. RoodMicrotec offers a full turnkey service from the beginning of the development process all the way up to the delivery of the final product.

Turnkey Solutions

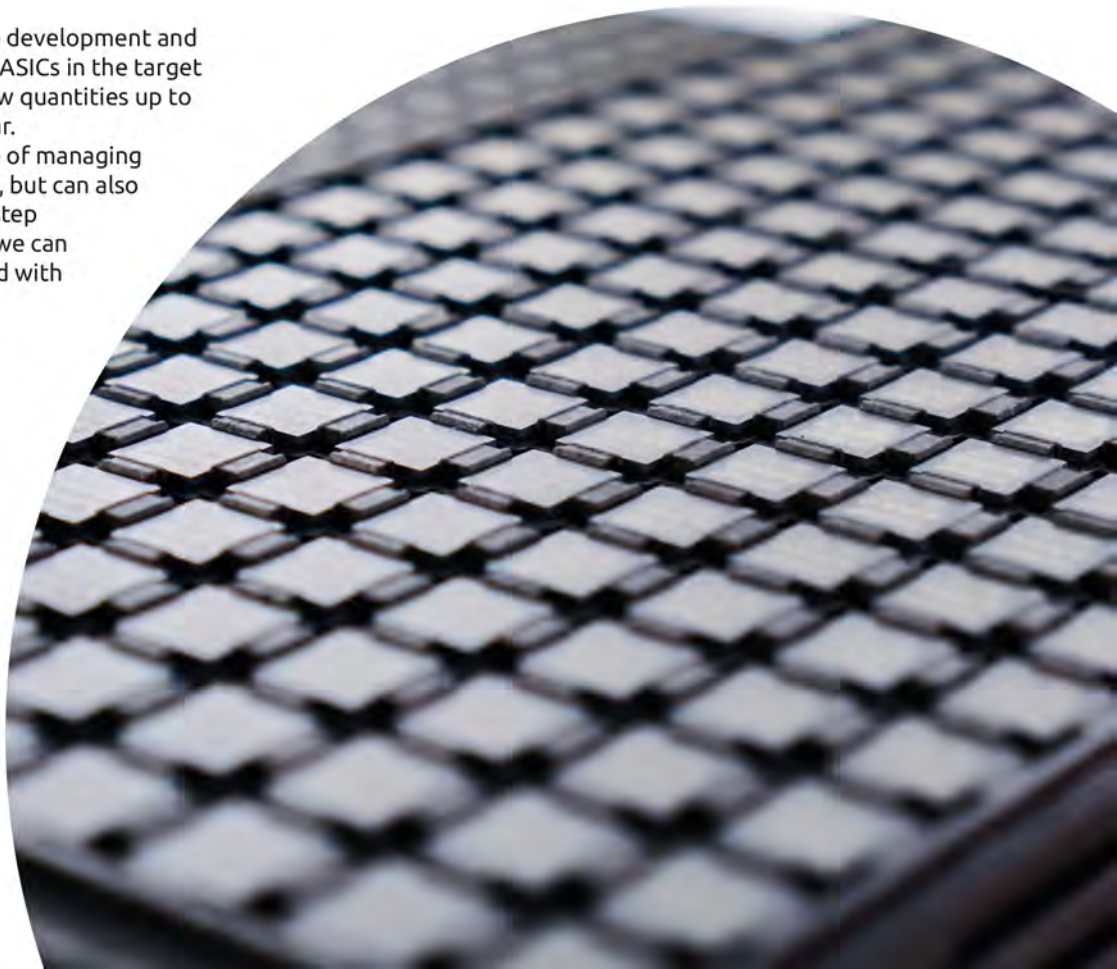
We work together with qualified partners in the area of design, wafer fab and assembly.

Our SCM service includes:

- RoodMicrotec
- Our Partners



We handle the complete development and industrialisation flow of ASICs in the target volume, ranging from low quantities up to multiple millions per year. RoodMicrotec is capable of managing the process 'end-to-end', but can also provide each individual step separately. On request, we can supply the ASIC mounted with other devices on a PCB providing the complete module.



Wafer & Component Testing

RoodMicrotec has extensive experience in semiconductor testing. We provide all testing services required for ICs, from wafer test, through qualification testing, to the final test of semiconductor components.

Test Engineering

RoodMicrotec's Test Engineering team provides complete test solutions for a wide variety of components ranging from mixed-signal, digital, analogue to RF ICs. Our highly skilled engineers develop individual test programs for optimal and efficient testing. We develop probe cards and load boards for characterisation, production and qualification to the highest standards as required by the automotive and high-reliability sectors. We also offer tests for optoelectronic components such as image sensors, photodiodes and Opto-/Photonic-ASICs and LEDs.

Our services include:

- Development of test software and hardware for Automatic Test Equipment (ATE)
- Characterisation
- Test program conversion
- Test data evaluation, modification and optimisation of test solutions
- Development of electrical test for qualification and failure analysis



Test Operations

RoodMicrotec's in-house test floor in Nördlingen performs services for component and wafer testing, device programming, straightening and scanning of components and tape & reel of semiconductor components. Our test floor operates in clean room conditions of class 6 (1000 particles/cubic feet).

Our services include:

- Wafer testing up to 12 inch at -40°C up to 150°C
- Final test: using gravity and pick-and-place handlers
- Component testing on a variety of industry standard packages
- Scanning, straightening and tape & reel
- Screening of selected parameters
- Optoelectronic testing
- Device programming



Qualification & Reliability Investigations

RoodMicrotec performs customer specific qualifications as well as to specific industry standards as defined by International Standards Associations.

We provide the following services in the field of testing and qualification:

- Preparation of test concepts and qualification plans
- Life-Test (HTOL/LTOL) and monitoring burn-in of ICs, LEDs and laser diodes (VCSEL)
- Intermittent Operating Life (IOL)
- Power Temperature Cycling (PTC) / Temperature Cycling (TC)
- Temperature-Humidity-Bias (THB)
- High Temperature /Humidity Reverse Bias (HTRB/H3TRB)
- Highly Accelerated Stress Test (HAST) and autoclave
- Mechanical tests, such as shock, bump and vibration
- ESD and gate leakage test
- Solderability test
- Special services for optoelectronic components
- Measurement of eye safety of LEDs and lasers

Reliability Competence Center (RCC)

RoodMicrotec's interdisciplinary competence center for reliability consulting combines all the expert competences which are necessary for special projects.

Depending on requirements and demands, experts from any RoodMicrotec Business Units can be consulted. In addition, we work together with experienced external consultants who have proven know-how in various industry sectors.



Failure & Technology Analysis

RoodMicrotec's extensively equipped failure & technology analysis laboratory is capable of supporting customers with sophisticated failure analysis, construction and qualification-related analysis. We offer analyses of wafers, integrated circuits, discrete/optoelectronic/electromechanical components, printed circuit boards and complete printed circuit board assemblies. Our highly qualified experts provide full advisory and consulting advice by not only giving a full root cause analysis, but also provide recommendations for corrective actions.

Our optoelectronics team offers comprehensive qualification of LEDs, laser diodes, photodiodes and more. We help to analyse the failure precisely and define suitable measures.

We are experts for the following procedures:

Non-destructive testing

- X-ray microscopy
- X-ray computer tomography
- Scanning acoustic microscopy

Materials analysis

- Metallography
- Measurement of ionic contamination
- Scanning Electron Microscopy (SEM) and EDX spectroscopy
- Dye penetration inspection

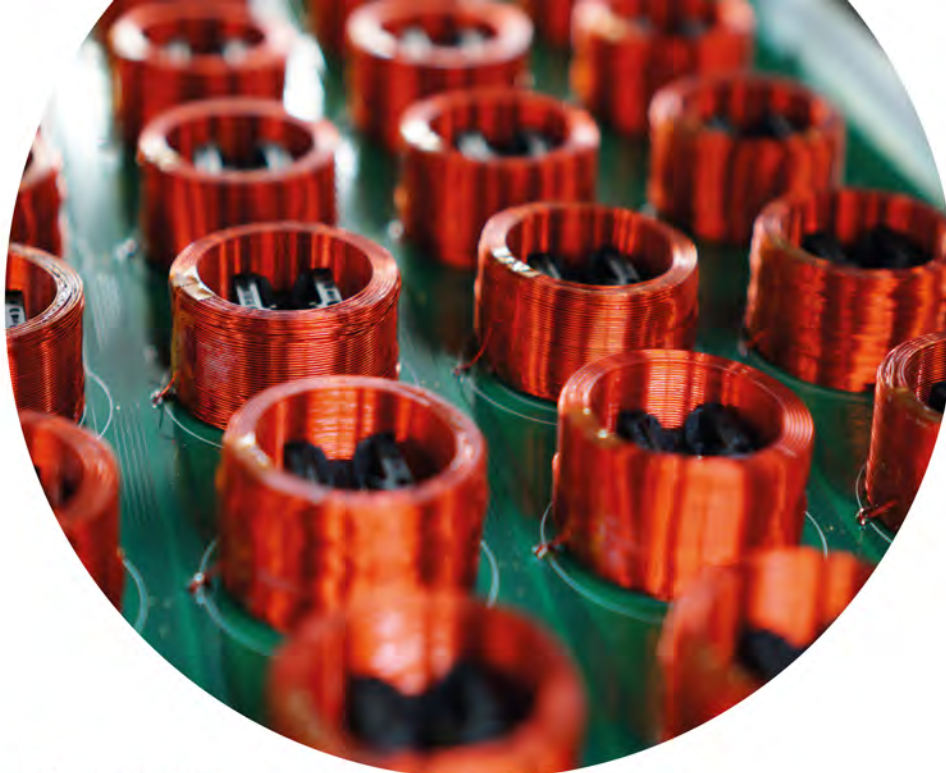
Services related to integrated circuits

- Failure analysis
- Destructive Physical Analysis (DPA)
- FIB circuit editing
- Authenticity verification

Further services

- Particle Impact Noise Detection (PIND)
- ESD certification





Quality Management

RoodMicrotec's success is the success of its customers, employees and investors. This is the main guiding principle of RoodMicrotec's quality policy. This requires continuous improvement of quality management and its processes & procedures. It also demands a high level of dedication and commitment of our employees. From Operator to Managing Director, our employees strive for "Quality First" to achieve customer satisfaction.

We aim to exceed our customers' expectations in terms of quality. We are delivering the highest quality services to get the best results. We comply with highest quality standards and therefore our integrated quality management system is certified according to DIN EN ISO 9001:2015. In addition, our quality management is broadly consistent with the Automotive Specification ISO/TS 16949.

Our test laboratories in Nördlingen and Stuttgart are accredited according to DIN ISO/IEC 17025:2005 by the German accreditation body DAkkS. The accreditation is valid only for the scope listed in the annex of the accreditation certificates D-PL-12120-01-01 and D-PL-12120-01-02.



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