

ROHDE & SCHWARZ

Make ideas real



AUTOMOTIVE RADAR TESTING

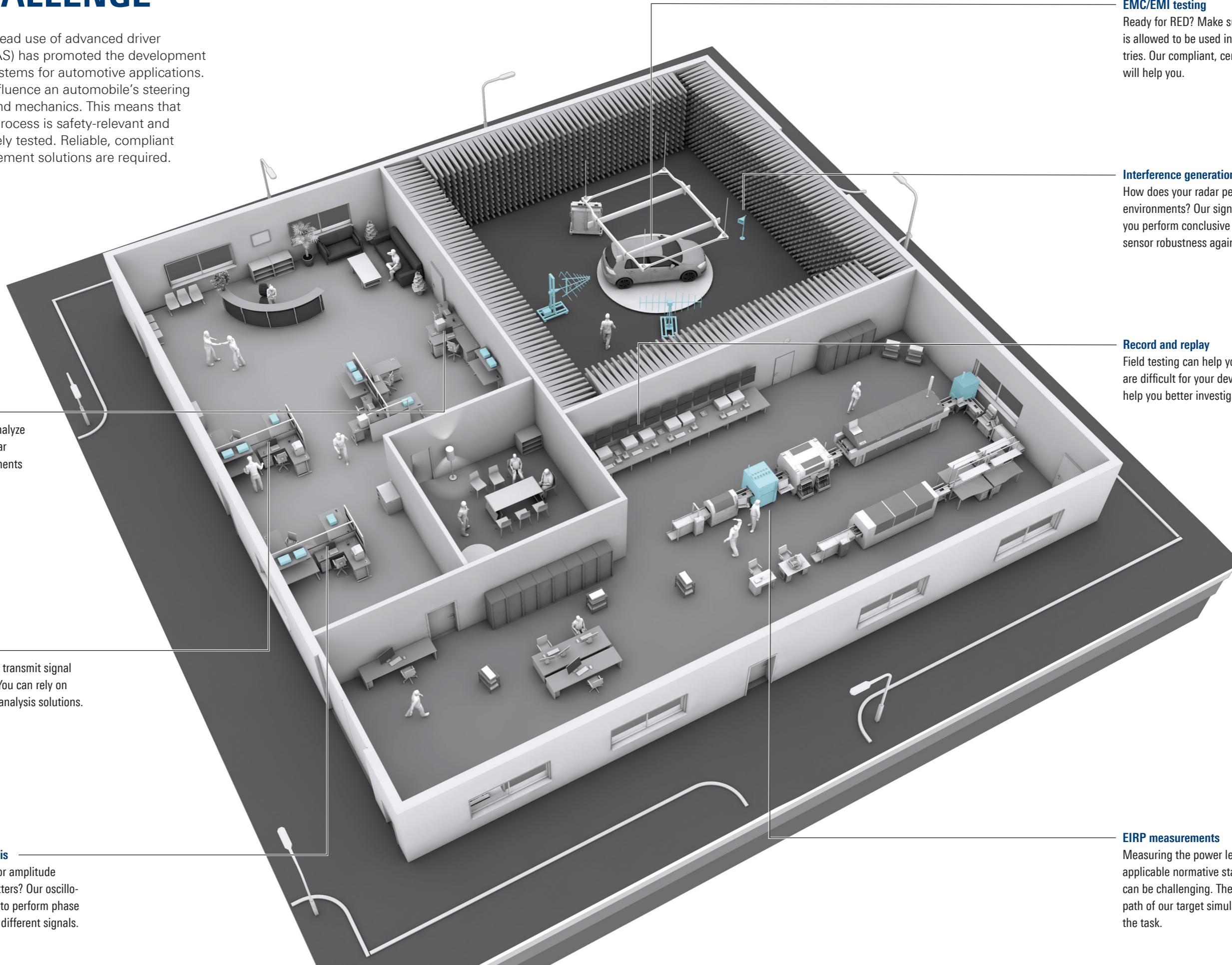
High precision test solutions for todays and tomorrows ADAS-radar



Test it. Trust it.

YOUR CHALLENGE

The increasingly widespread use of advanced driver assistance systems (ADAS) has promoted the development of radar-based sensor systems for automotive applications. All ADAS applications influence an automobile's steering and control algorithms and mechanics. This means that every sensor and every process is safety-relevant and has to be comprehensively tested. Reliable, compliant and quick test & measurement solutions are required.



EMC/EMI testing

Ready for RED? Make sure that your device is allowed to be used in your target countries. Our compliant, certified test systems will help you.

Interference generation

How does your radar perform in real-world environments? Our signal generators help you perform conclusive measurements of sensor robustness against norm interferers.

Record and replay

Field testing can help you find situations that are difficult for your devices. Our instruments help you better investigate the problem.

Radome measurement

How do you measure and analyze radomes for automotive radar within seconds? Our instruments give you an "inside view".

Signal quality analysis

You need a clean and stable transmit signal for your signal processing? You can rely on our spectrum and transient analysis solutions.

Multichannel signal analysis

You need to validate phase or amplitude difference between transmitters? Our oscilloscopes and mixers help you to perform phase coherent analysis of up to 4 different signals.

EIRP measurements

Measuring the power level in line with the applicable normative standards in production can be challenging. The calibrated receive path of our target simulation helps to simplify the task.

ENABLING FUTURE MOBILITY



High-precision testing, simulation, calibration, production and integration of radar chips and modules

Today, the automotive industry again has to reinvent itself. Autonomous Driving and digitization are the megatrends and drivers of new business models, which means the automotive industry has to master even more complex test & measurement challenges in R&D, calibration, integration and production.

Quality and reliability are key to the next step in advanced driver assistance and autonomous driving. OEMs, tier 1s, chip suppliers and others have to ensure that all components function correctly, integrate seamlessly, coexist

successfully and communicate with the outside world without errors.

They rely on our proven expertise and high-end automotive test solutions for all high-frequency, high-bandwidth and high-speed test challenges, making Rohde & Schwarz the market leader for testing automotive radar, infotainment, connectivity, Ethernet and EMC.

Rohde & Schwarz is the industry's preferred partner when it comes to:

- ▶ Development of automotive radar sensors
- ▶ Validation, calibration and certification of automotive radar modules
- ▶ High-volume production of automotive radar sensors

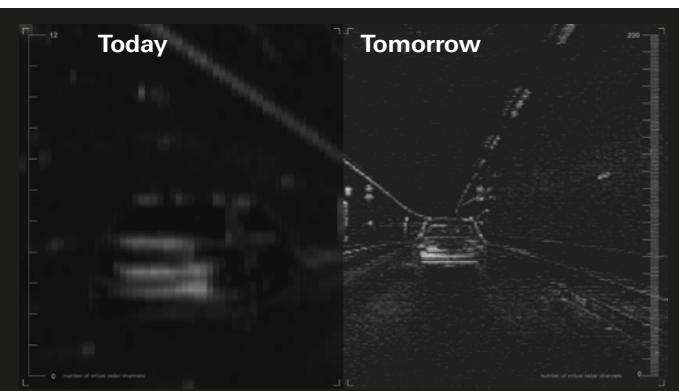
These ready to use, automotive specific, high performance test solutions are designed to deliver maximum reliability, maximum efficiency, best synergies, seamless integration and future readiness for all global standards.

Test it. Trust it.



Check out the high-precision testing in R&D at:

www.rohde-schwarz.com/automotive/radar



OUR SOLUTIONS FOR RESEARCH AND DEVELOPMENT

Signal quality analysis, echo generation, radome measurement, interference generation, clock replacement

The challenge when developing automotive radar devices starts with selecting stable oscillators and components that feature a linear signal throughout the entire temperature range and radar lifecycle. An ideal clock signal is needed to test chipset performance. The R&S®SMA100B signal generator can be used as the clock source to ensure signal quality.

The transmitted FMCW signals can be analyzed directly using an R&S®FSW signal and spectrum analyzer that offers wide-band analysis bandwidth option and covers the frequency range up to 90 GHz. The transient analysis software measures important parameters such as timing, bandwidth and power levels automatically and calculates the deviation from the ideal linear phase. For even more precise phase measurements, Rohde & Schwarz offers the R&S®FSWP phase noise analyzer.

Testing multi-antenna radar systems such as MIMO radar systems is another challenge. A multi-channel and phase-coherent receiver is needed to e.g. measure phase and



R&S®FSW spectrum analyzer with transient analysis option.

amplitude difference of the different signals. The R&S®RTP oscilloscope in combination with R&S®FS-Z90 mixers can measure up to four 24 or 77 GHz radar signals simultaneously while taking advantage from its powerful deembedding and trigger capability. With this solution, you can analyze multi-channel MIMO radar signals to validate your design.

However, 3D antenna characterization as well as sensor validation requires an RF shielded environment. While space in the lab is limited, the R&S®ATS1500C test chamber features high-resolution sensors with wider antenna apertures in order to mimic large far-field distances not practical to measure in a direct-field setup. The R&S®ATS1500C offers the highest precision compact antenna test range (CATR) reflector that generates a quiet zone with 30cm diameter for up to 90 GHz testing. The chamber is on wheels, can easily be moved around in the lab and be placed directly next to your work bench. The R&S®ATS1500C offers a variety of interfaces to attach different measurement instruments, has a high precision 3D positioner and provides excellent shielding effectiveness.

On the road, the recently developed sensor interferes with signals from other radars. The R&S®SMW vector signal generator together with the R&S®K300 pulse sequencer option allows to create customized interference scenarios in a lab environment.

After all, how do you ensure the radar performs after it is installed behind the bumper or a design radome? Using the same frequency range as your radar, the R&S®QAR radome tester provides a high resolution mmWave image along with spectral transmission data to help you find the radome with the least impact on your radar performance.



The most compact field-to-lab test-solution:
[www.rohde-schwarz.com/
automotive-radar/test](http://www.rohde-schwarz.com/automotive-radar/test)

OUR SOLUTIONS FOR VALIDATION AND CERTIFICATION

More about record and replay, interference generation and EMC/EMI debugging



Automotive EMC measurement chamber.

Do you perform certification tests in line with ISO, CISPR, RED or national standards and want to ensure that your tests comply with these standards?

Rohde & Schwarz offers professional support in determining your requirements and delivers turnkey solutions that include T&M equipment and anechoic chambers. We ensure that your system complies with the latest standards and regulations and help you save money by integrating already existing T&M equipment into the system.

Rohde & Schwarz engineers are experienced in installing compact systems for testing the electromagnetic immunity (EMS) of vehicle components in line with ISO 11452-2 (radiated) and ISO 11452-4 (bulk current injection, BCI). Tests in line with ISO 11452-3 (stripline) and ISO 11452-9 (portable transmitters) can also be implemented. EMS test systems from Rohde & Schwarz optionally generate radar pulses up to 600 V/m as required by some vehicle manufacturers.

The R&S®AdVISE visual inspection software together with a camera system monitors your equipment under test (EUT). In combination with the R&S®EMC32 software, you can perform fully automated EMS tests.

Another trend in EMC testing is scenario testing using a more sophisticated interference signal. There are basically two possibilities for field-to-lab (F2L) testing:

- Recording and replaying the signal
- Generating signals/interference in the lab

Used in combination with one or more instruments featuring the R&S®Digital I/Q Interface, the R&S®IQW Wideband I/Q data recorder can store and play data with bandwidths up to 512 MHz in realtime. In order to generate customized interference signals, the R&S®SMW vector signal generator can be used together with the R&S®Pulse Sequencer option.

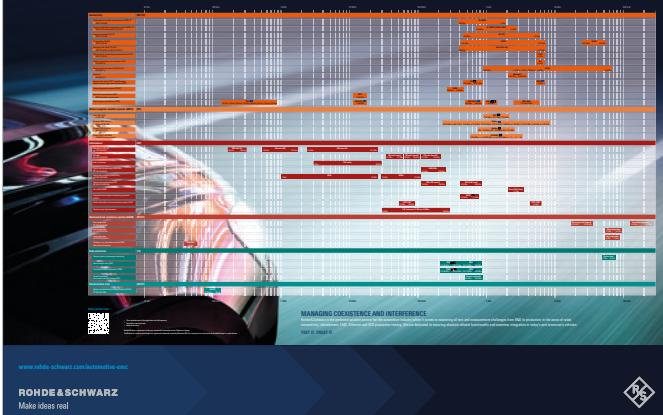
R&S®SMW for signal/interference generation in the lab in combination with R&S®FSW for transient analysis.



For an overview of automotive frequencies and more information, go to: www.rohde-schwarz.com/automotive-emc/poster



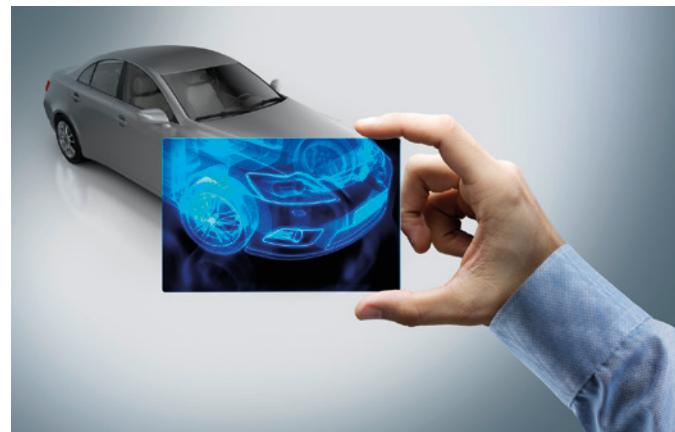
AUTOMOTIVE FREQUENCIES



Check out more details on our
emc webpage:
[www.rohde-schwarz.com/
automotive-emc](http://www.rohde-schwarz.com/automotive-emc)

OUR SOLUTIONS FOR END-OF-LINE PRODUCTION

Echo generation, EIRP measurements



3D imaging capabilities of the R&S®QAR.

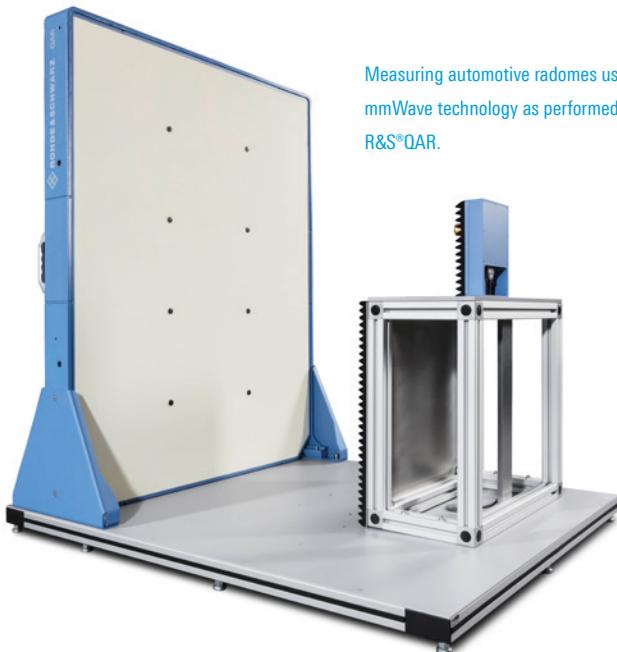
Radar sensors do have a direct influence on the automobile's steering and control system and therefore need to be comprehensively tested in production. Rohde & Schwarz supplies reliable equipment with a small footprint to help you manage the challenges of automotive radar production lines.

We offer the perfect solution for automated production testing of automotive radar sensors. The R&S®AREG100A together with a shielded chamber ensures failsafe testing of automotive radar sensors. Standard remote control interfaces ensure easy integration into existing test automation environments. The flexible and modular concept of the R&S®AREG100A provides the possibility to configure up to four different fixed object distances with adjustable radar cross section.

To guarantee that your automotive radar sensor complies with standardized transmit power limitations, such as defined by ETSI EN 301 091-1 or ETSI EN 302 264-1, the R&S®AREG100A offers a calibrated receive path for directly measuring the received power using, for example, an R&S®NRP8S power sensor.

To ensure the quality of the radomes at either the manufacturing site or the OEM's production facility, the R&S®QAR guarantees reliable results combined with a high throughput. Through its spatially resolved reflectivity measurements, it provides a very intuitive and at the same time powerful measurement procedure. The high resolution of the resulting reflectivity images makes it possible to easily identify even the smallest disturbances in the radome. In addition to the spatially resolved reflectivity measurement, the R&S®QAR also provides a detailed measurement of the transmission loss of a radome.

To solve ambitious radar test needs, R&S®provides powerful customizable test control software that fulfills the demanding performance requirements of production tests and provides the flexibility for test automation. In addition, a high-speed test sequencer with a powerful graphical user interface for the parameterization and control of test execution automates radar interference tests and controls all instruments and devices during the test.



Measuring automotive radomes using mmWave technology as performed by R&S®QAR.



R&S®AREG100A future proof Automotive radar echo generator.



Find more details in our newest end-of-line production app note:
[www.rohde-schwarz.com/
radar-production](http://www.rohde-schwarz.com/radar-production)

Service that adds value

- Worldwide
- Local und personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

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