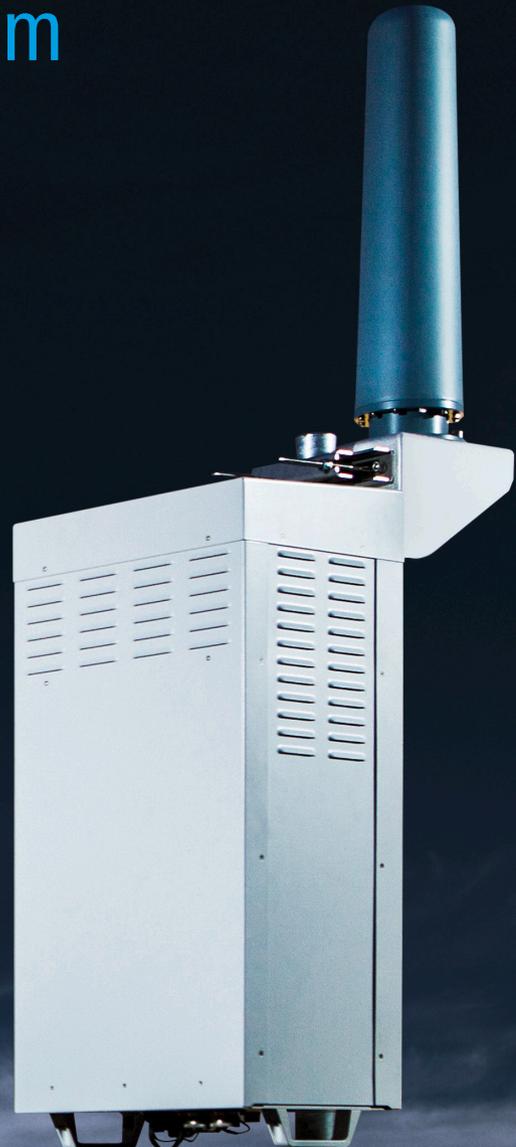


# R&S®UMS300 Compact Monitoring and Radiolocation System

High performance for  
signal monitoring and  
AOA/TDOA location



# R&S®UMS300

## Compact Monitoring and Radiolocation System

### At a glance

The R&S®UMS300 is the first system to combine ITU-compliant monitoring, direction finding with conventional angle of arrival (AoA) and emitter location based on measuring the time difference of arrival (TDOA) in a compact outdoor solution.

The R&S®UMS300 is the latest addition to the successful R&S®UMS family of universal monitoring systems.

The high-performance receiver performs all measurement and direction finding (DF) tasks quickly and reliably. The

built-in PC provides the platform for the control software while also controlling the temperature and managing the interfaces.

Since the system was designed for outdoor mast or roof installation, the site selection process is greatly simplified. Short antenna cables significantly boost the system's sensitivity, allowing even weak transmitters to be reliably measured and precisely located.

An Ethernet interface with a router is provided for remote control. Connection via the GSM/3G/4G mobile radio network is possible as an option.

Two tried and tested software packages are available for various applications: R&S®ARGUS for ITU-compliant spectrum monitoring and R&S®RAMON for radiomonitoring. The open interfaces used in the operating system and hardware allow users and system integrators to develop their own control software.

The modular design allows the system to be optimally used in various scenarios.

#### Key facts

- Complete monitoring and radiolocation system in a compact weatherproof housing
- ITU-compliant monitoring
- Emitter location based on standard direction finding (AoA), TDOA and hybrid direction finding (combination of AoA and TDOA)
- Wide frequency range from 9 kHz to 6 GHz
- Open interfaces



# R&S®UMS300

## Compact Monitoring and Radiolocation System

### Benefits and key features

#### High-performance monitoring and DF receiver from Rohde & Schwarz

- Wide frequency range from 9 kHz to 6 GHz (direction finding from 300 kHz to 6 GHz)
- Fast scan with up to 12 GHz/s across entire frequency range
- IF spectrum and demodulation up to 20 MHz
- Multichannel DDC signal extraction within realtime bandwidth
- Integrated GPS with high-accuracy timestamp for TDOA applications
- Fast, reliable direction finding due to high DF accuracy
- In line with all applicable ITU requirements and recommendations

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#### AoA location

- Extension for conventional direction finding (optional)
- Reliable DF results even in difficult environments (e.g. urban areas with up to 50% reflection)
- Use of DF antennas with horizontal and/or vertical polarization
- Use of DF antennas with active/passive switchover; optimum solution for any signal scenario

▷ [page 5](#)

#### TDOA location

- Use for emitter location within a TDOA network
- Automated recording of I/Q data with high-accuracy timestamp
- Use of R&S®UMS300 in any combination with other TDOA capable devices and systems from Rohde & Schwarz thanks to the company's unique technology

▷ [page 6](#)

#### Hybrid AoA/TDOA location

- Combined benefits of AoA and TDOA
- Flexible choice of suitable method for given application
- Use of same hardware for both methods
- Practically simultaneous use of DF and TDOA capabilities

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#### Easy site selection due to minimal infrastructure requirements

- Installation on mast close to antennas; no additional building structure required
- Remote control via LAN and mobile radio networks
- Flexible power supply (AC and DC)
- Compact design

#### Use for wide range of monitoring tasks

- Spectrum monitoring with optional R&S®ARGUS software
- Radiomonitoring with optional R&S®RAMON software
- Customized applications based on open interfaces and special software solutions

# High-performance monitoring and DF receiver from Rohde & Schwarz

The integrated receiver meets all applicable ITU requirements and recommendations. The standard measurement functions are field strength, modulation, frequency (offset) and bandwidth. I/Q data is used for analyzing digitally modulated signals. The extremely fast scan mode provides an overview of the complete spectrum. When used within a smaller frequency range, it can reliably detect signals with very short durations. At the press of a key, a particular emission of interest can be passed to the fixed frequency mode (FFM) or direction finding mode (DF) for more precise analysis and position fixing.

The IF spectrum display (realtime) shows signals up to 20 MHz wide, allowing precise signal analysis with high resolution.

The IF spectrum display is polychrome. The duration of a signal in the IF spectrum is color-coded. Signals with a short duration are displayed in blue while continuous signals appear in red. This makes it possible to separate superimposed short-term and continuous signals that cannot be differentiated using conventional methods such as max. hold and average.

The maximum demodulation bandwidth (for analog signals) is 20 MHz.

Another feature of the receiver is its three digital downconverters which basically represent three additional software receivers. Within the realtime bandwidth, these downconverters function in parallel to the demodulation path and accept independent parameter settings.

# AoA location

Equipped with the DF option (R&S®UMS30-DF), the R&S®UMS300 also offers conventional direction finding based on angle of arrival (AoA).

In wideband DF mode, all signals within a frequency range of up to 20 MHz undergo simultaneous direction finding.

Due to the use of wide-aperture DF antennas and a very large number of antenna elements, the correlative interferometer DF method offers a high degree of accuracy and outstanding immunity to reflections. This makes the R&S®UMS300 particularly well suited to perform DF tasks in environments with heightened reflections and multipath propagation such as in urban areas.

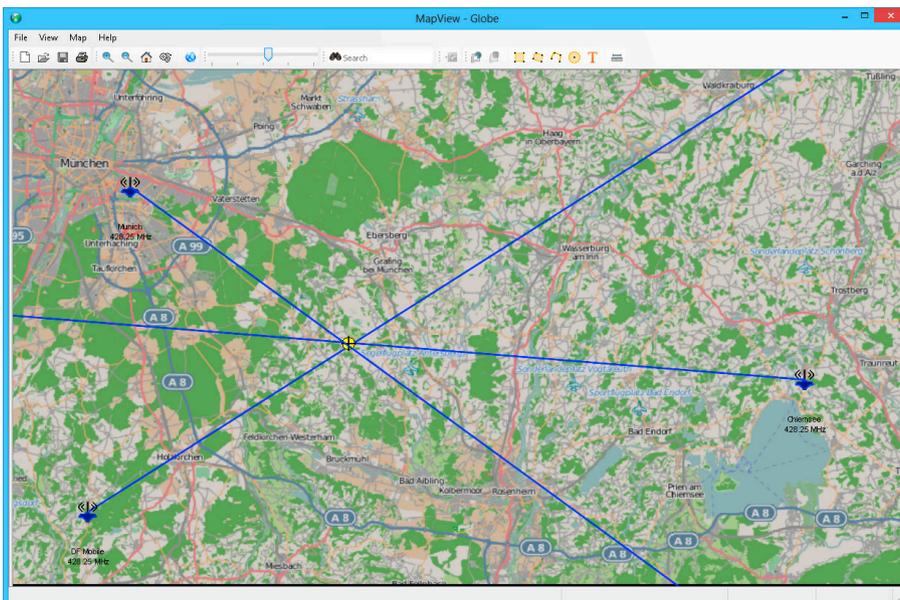
The DF accuracy is 1° RMS (typ.; actual value depends on antennas used) and enables high DF precision.

In order to handle all possible requirements and signal scenarios, DF antennas are available with horizontal and/or vertical polarization.

The R&S®ADD295 VHF/UHF wideband DF antenna supports active as well as passive modes. Active mode is associated with higher sensitivity, allowing weaker signals to be reliably detected even at great distances. Passive mode has better immunity to strong signals. This is especially important when the R&S®UMS300 is installed in the vicinity of strong transmitters. A mouse click suffices to switch between these two modes. The R&S®UMS300 is thus quick and easy to adapt to the prevailing signal environment.

Every direction finder provides a DF line of bearing to show the direction to the transmitter. At least two direction finders are required for precise emitter location. Using the integrated communications module, the R&S®UMS300 performs a DF measurement as specified by the control center and transfers the result back to the initiator. The control center can then combine this result with data from further R&S®UMS300 systems (or other direction finders from Rohde&Schwarz) and determine the transmitter's exact location.

Example of a DF measurement (three interconnected stations) with results displayed in R&S®MapView.



# TDOA location

Time difference of arrival (TDOA) exploits instantaneous snapshots of a transmitter signal (I/Q data) recorded at the same time by several TDOA receivers. Since the receivers are located at different distances from the transmitter, they receive the same signal at slightly different times. The transmitter's position is then determined by correlating the individual I/Q data.

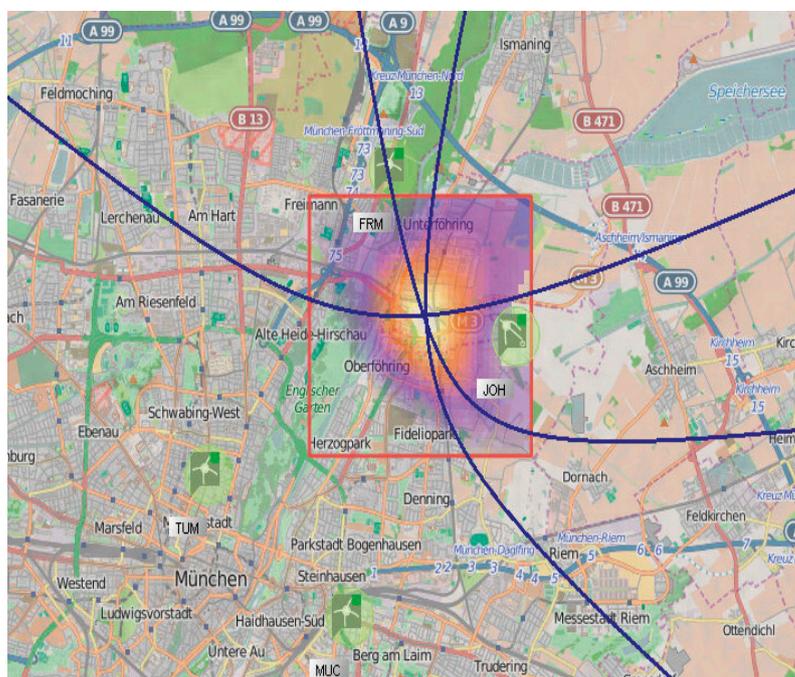
The GPS receiver integrated in the R&S®UMS300 provides a timestamp with accuracy in the nanosecond range. Combined with the I/Q data, it forms the basis for the subsequent analysis process.

One unique selling point for TDOA devices and systems from Rohde&Schwarz is that they take into account the signal delay between the antenna input and signal processing. This substantially boosts the time and location accuracy. In addition, all Rohde&Schwarz devices and systems that support TDOA can be combined in any arbitrary configuration to perform emitter location based on the TDOA method.

Like conventional direction finding, data from multiple stations is necessary. The TDOA method requires data from at least three receivers. The R&S®UMS300 sends the I/Q data to the control center requesting the measurement. The control center gathers the data from multiple R&S®UMS300 systems (or other TDOA devices and systems from Rohde&Schwarz) and determines the transmitter's exact location.

Since the amount of data to be transmitted is significantly larger with TDOA compared to conventional direction finding, good network performance is a prerequisite for effective TDOA operation.

Locating a TETRA transmitter using TDOA.



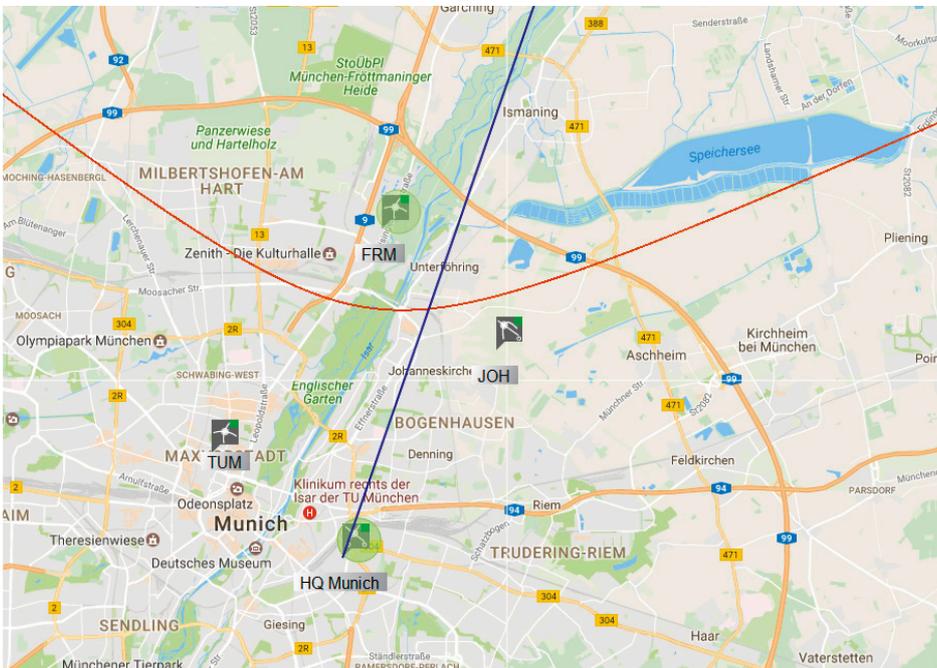
# Hybrid AoA/TDOA location

Both AoA and TDOA have their individual advantages. One of the two methods can always be expected to provide better results as a function of the transmitter properties, signal environment and location, for example.

The R&S®UMS300 is the only system that allows the same hardware to be used for both methods. Depending on the particular task at hand, the operator can choose between DF or TDOA functionality.

The DF and TDOA functionalities can be used practically simultaneously. Two devices (one R&S®UMS300 and one additional TDOA receiver) are enough to combine the AoA and TDOA functionalities into a flexible and powerful hybrid radiolocation system.

Hybrid location based on TDOA and AoA.



# System configuration

The main component of the R&S®UMS300 is the R&S®EB500 monitoring receiver (9 kHz to 6 GHz). Along with its control PC, power supply and Ethernet router, the receiver is accommodated in a compact weatherproof housing. The integrated temperature control system provides active heating and cooling so the R&S®UMS300 can be used across a wide temperature range.

Thanks to its GPS module, the R&S®UMS300 can also be used as a receiver in a TDOA radiolocation system.

The base unit has a single antenna input. For connection of multiple antennas, options are available with two antenna inputs (R&S®UMS30-B1) and with four antenna inputs (R&S®UMS30-B2). Each option includes the appropriate antenna switches. These options are required when

R&S®UMS300: ITU-compliant monitoring and direction finding with TDOA capability.



several antennas cover a similar frequency range, e.g. a monitoring and a DF antenna or two monitoring antennas for different polarizations.

If two antennas with adjacent or overlapping frequency ranges are used, the R&S®UMS30-B3 option is recommended. This 1-out-of-2 switch is controlled via the receiver's TTL output to enable very fast switching during scanning.

Active antennas can be powered via the internal DC feeds (R&S®UMS30-B4).

The R&S®UMS300 is designed for use as an unattended, remotely controlled system. For communications with a control center, an Ethernet interface with a router is provided in the basic version. The wireless option (R&S®UMS30-B5) can be used for connection via the mobile radio network, enabling remote control via GSM, 3G and 4G networks.

Note: These options are factory-added and are fully integrated in the housing.

If necessary, the R&S®UMS300 can be extended to include DF capability (R&S®UMS30-DF option). All DF antennas that are suitable for the R&S®EB500 can then be used. In case two DF antennas are connected simultaneously, the outdoor DF control cable splitter (R&S®UMS30-H3) is required. The ports required for the RF and control cables are provided as standard. Note: Special DF control cables (R&S®UMS30-H2) are needed to use connectors intended for outdoor applications.

Other receiver options include the HF frequency range extension from 9 kHz to 32 MHz (R&S®UMS30-HF), the SHF frequency range extension up to 6 GHz (R&S®UMS30-FE) and the panorama scan (R&S®UMS30-PS).

A low-noise outdoor amplifier (R&S®UMS30-H4) compensates cable losses between antenna and receiver, which is especially important in higher frequency ranges.

The control PC, receiver, antenna selection switches and all relevant interfaces are freely available and documented. This allows customers and system integrators to develop application-specific control software to meet any special requirements.

For control of the R&S®UMS300 via R&S®ARGUS, the R&S®UMS30-SWB and R&S®UMS30-SWE options are recommended. If necessary, they can be extended with further R&S®ARGUS options. The R&S®UMS300 thus allows fast and reliable integration into existing monitoring systems.

# Application examples

With its outstanding performance and flexibility, the R&S®UMS300 can be used for a wide variety of tasks, such as:

- ▮ ITU-compliant monitoring
- ▮ Automatic detection of unknown signals
- ▮ Automatic location of unknown signals
- ▮ Automatic detection of interferers
- ▮ Automatic location of interferers
- ▮ Automatic license violation detection
- ▮ White space monitoring
- ▮ Grid monitoring
- ▮ Monitoring of large areas such as borders and coastlines
- ▮ Emitter location as part of a DF, TDOA or hybrid network



# Specifications in brief

Specifications in brief		
<b>Receiver data</b>		
Frequency range	base unit	20 MHz to 3.6 GHz
	with R&S®UMS30-HF option	9 kHz to 3.6 GHz
	with R&S®UMS30-FE option	20 MHz to 6 GHz
	with R&S®UMS30-HF and R&S®UMS30-FE options	9 kHz to 6 GHz
Scan speed	with R&S®UMS30-PS option	max. 12 GHz/s
Demodulation	all IF bandwidths	AM, FM, PULSE, I/Q
	IF bandwidths ≤ 9 kHz	LSB, USB, CW
	IF bandwidths ≤ 1 kHz	ISB
Preselection		included
<b>Direction finding (DF) data</b>		
	with R&S®UMS30-DF option	
DF method	HF	Watson-Watt
	VHF/UHF/SHF	correlative interferometer
Frequency range	base unit	20 MHz to 3 GHz
	with R&S®UMS30-HF option	300 kHz to 3 GHz
	with R&S®UMS30-FE option	20 MHz to 6 GHz
	with R&S®UMS30-HF and R&S®UMS30-FE options	300 kHz to 6 GHz
<b>Interfaces</b>		
DC voltage input		7-contact circular connector (DC IN)
LAN		10/100/1000 Mbit Ethernet, RJ-45 (female)
WAN		10/100/1000 Mbit Ethernet, RJ-45 (female)
GPS antenna		SMA female, 50 Ω
COM antenna		N female, 50 Ω
DF antenna control		MIL connector (female)
AUX		5-contact circular connector (female)
Monitoring inputs	N female, 50 Ω	up to 4 inputs, 20 MHz to 6 GHz optional 1 input (for future extensions)
<b>General data</b>		
Power supply		22 V to 26 V DC, max. 300 W
Operating temperature range	without direct sunlight	-20°C to +55°C
Storage temperature range		-30°C to +70°C
Relative humidity		95% cyclic test, +25°C/+55°C
Degree of protection		IPx5
Shock		in line with EN 60068-2-27, MIL-STD-810-E method 516.4, procedure 1
Vibration	sinusoidal	in line with EN 60068-2-6
	noise	in line with EN 60068-2-64
EMC		in line with EN 55022, ETSI EN 301489-1, ETSI EN 301489-22
Dimensions	W × H × D, without wall bracket	365 mm × 765 mm × 275 mm (14.37 in × 30.12 in × 10.83 in)
Weight		30 kg (66.14 lb)

# Ordering information

Designation	Type	Order No.
<b>Compact monitoring and radiolocation system</b> The base unit includes waterproof housing with receiver (20 MHz to 3.6 GHz), control PC, power supply, heater, communications and GPS.	R&S®UMS300	3051.7701.04
<b>Options</b>		
Switch 1-out-of-2	R&S®UMS30-B1	3051.7801.02
Switch 1-out-of-4	R&S®UMS30-B2	3051.7818.02
Switch 1-out-of-2 (fast switching during scanning)	R&S®UMS30-B3	3051.7824.02
DC feed, DC to 8 GHz	R&S®UMS30-B4	3051.7830.02
Wireless module GSM/3G/4G	R&S®UMS30-B5	3051.7847.02
External AC power supply	R&S®UMS30-H1	3051.7799.02
DF control cable	R&S®UMS30-H2	3051.7782.05
Outdoor DF control splitter	R&S®UMS30-H3	3059.7700.02
Outdoor amplifier	R&S®UMS30-H4	3059.8007.02
R&S®ARGUS 6.0 monitoring software (basic package), includes basic module, audio recording and replay, and drivers for the receiver and switch	R&S®UMS30-SWB	3052.0000.60
R&S®ARGUS 6.1 monitoring software (basic package), includes basic module, audio recording and replay, and drivers for the receiver and switch	R&S®UMS30-SWB	3052.0000.61
R&S®ARGUS 6.0 monitoring software (extension package), includes driver for one direction finder	R&S®UMS30-SWE	3052.0017.60
R&S®ARGUS 6.1 monitoring software (extension package), includes driver for one direction finder	R&S®UMS30-SWE	3052.0017.61
Panorama scan	R&S®UMS30-PS	3051.9810.02
HF frequency range extension	R&S®UMS30-HF	3051.9885.02
SHF frequency range extension	R&S®UMS30-FE	3051.9827.02
ITU measurements	R&S®UMS30-IM	3051.9804.02
Selective call option	R&S®UMS30-SL	3051.9879.02
Digital downconverter	R&S®UMS30-DDC	3051.9840.02
Direction finder upgrade kit	R&S®UMS30-DF	3051.9833.02
Wideband direction finder	R&S®UMS30-WDF	3051.9862.02
DF error correction	R&S®UMS30-COR	3051.9856.02

**For further R&S®ARGUS options, see R&S®ARGUS product brochure (PD 3607.1013.12).**

**When the R&S®UMS300 is used in COMINT applications, the R&S®RAMON software modules can be deployed.**

**The R&S®RAMON product brochure (PD 5214.3152.12) provides an overview of available modules and their functions.**

**Monitoring antennas and cables are not included in the scope of delivery and can be ordered separately in line with project-specific requirements.**

**Other options and accessories are available upon request.**

The R&S®ARGUS 6 TDOA option is not to be made, used, sold or offered for sale in the USA or imported into the USA.

## Service that adds value

- | Worldwide
- | Local and 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.

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

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

Certified Quality Management  
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**ISO 14001**

## Rohde & Schwarz GmbH & Co. KG

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

## Regional contact

- | Europe, Africa, Middle East | +49 89 4129 12345  
[customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)
- | North America | 1 888 TEST RSA (1 888 837 87 72)  
[customer.support@rsa.rohde-schwarz.com](mailto:customer.support@rsa.rohde-schwarz.com)
- | Latin America | +1 410 910 79 88  
[customersupport.la@rohde-schwarz.com](mailto:customersupport.la@rohde-schwarz.com)
- | Asia Pacific | +65 65 13 04 88  
[customersupport.asia@rohde-schwarz.com](mailto:customersupport.asia@rohde-schwarz.com)
- | China | +86 800 810 82 28 | +86 400 650 58 96  
[customersupport.china@rohde-schwarz.com](mailto:customersupport.china@rohde-schwarz.com)

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