ROHDE&SCHWARZ

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# R&S®AREG800A AUTOMOTIVE RADAR ECHO GENERATOR

## Specifications

Data Sheet | Version 01.00

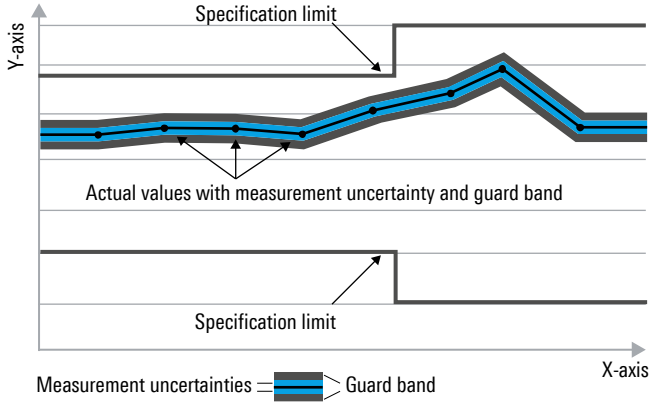
# CONTENTS

# Definitions

**General**
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

**Specifications with limits**
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.




**Non-traceable specifications with limits (n. trc.)**
Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

**Specifications without limits**
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

**Typical data (typ.)**
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

**Nominal values (nom.)**
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

**Measured values (meas.)**
Characterize expected product performance by means of measurement results gained from individual samples.

**Uncertainties**
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP/3GPP2 standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bits per second (Gbps), million bits per second (Mbps), thousand bits per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

# Specifications

## R&S®AREG800A

### Remote frontends and echo generation concept

| | | |
|---|---|---|
| Echo generator type | | dynamic artificial object generation |
| Echo generation concept | | hybrid – analog stepped delay line for short object distances < 17 m; larger distances with fully digital implementation |
| Supported remote frontends | R&S®AREG8-24S/-24D/-77S/-77D/ -81S/-81D [1] | classical mmWave remote frontends |
| | R&S®QAT100 | innovative R&S®QAT100 electronically controllable antenna array |
| Maximum number of remote frontends per R&S®AREG800A base unit | R&S®AREG8-24S/-24D/-77S/-77D/ -81S/-81D [1] | up to 4 classical mmWave frontends |
| | R&S®QAT100 | up to 8 R&S®QAT100 |

### Frequency range

| | | |
|---|---|---|
| Instantaneous RF bandwidth | R&S®AREG8-B9 | 1 GHz |
| | R&S®AREG8-B9 with R&S®AREG8-K527 | 2 GHz |
| | R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528 [1] | 4 GHz |
| RF frequency bands | with R&S®AREG8-24S/-24D [1] | 24 GHz to 24.25 GHz |
| | with R&S®AREG8-77S/-77D [1] | 76 GHz to 77 GHz |
| | with R&S®AREG8-81S/-81D [1] | 76 GHz to 81 GHz |
| | with R&S®QAT100 | 76 GHz to 81 GHz |

### IF paths

| | | |
|---|---|---|
| Maximum number of R&S®AREG8-B9 digital baseband boards | | 4 |
| Maximum number of R&S®AREG8-B63 [1] analog stepped delay lines | 1 × R&S®AREG8-B9 | 1 |
| | 2 × R&S®AREG8-B9 | 2 |
| | 3 × R&S®AREG8-B9 | 3 |
| | 4 × R&S®AREG8-B9 | 4 |
| Maximum number of individual IF paths | for 1 × R&S®AREG8-B9 | 1 |
| | 1 × R&S®AREG8-B9 + R&S®AREG8-K570 | 2 |
| | for 4 × R&S®AREG8-B9 | 4 |
| | 4 × R&S®AREG8-B9 + 4 × R&S®AREG8-K570 | 8 |
| | for 1 × R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528 [1] | 1 |
| | for 4 × R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528 [1] | 4 |

[1] Will be available soon.

## Artificial objects

| | | |
|---|---|---|
| Object type | | dynamic |
| Minimum artificial object distance | R&S®AREG8-B9 | < 17 m + air gap (meas.) |
| | R&S®AREG-B9 with R&S®AREG-B63 [1] | < 4 m + air gap (meas.) |
| Covered distance range of artificial objects | R&S®AREG8-B9 | < 17 m to > 500 m (meas.) |
| | R&S®AREG-B9 with R&S®AREG-B63 [1] | < 4 m to > 500 m (meas.) |
| Maximum number of artificial objects per R&S®AREG800A | with R&S®QAT100 | |
| | artificial object distance < 4 m to 17 m + air gap [1] | up to 4 with individual azimuth, distance, RCS, Doppler |
| | artificial object distance > 17 m + air gap | up to 8 with individual azimuth, distance, RCS, Doppler |
| | with R&S®AREG8-24S/-24D/-77S/-77D/-81S/-81D [1] | |
| | artificial object distance < 4 m to 17 m + air gap [1] | up to 4 (1 per frontend) |
| | artificial object distance > 17 m + air gap [1] | up to 32 (up to 8 per frontend) |
| Object distance accuracy | with R&S®AREG8-B9 option | ±5 cm (meas.) |
| Object distance step size | with R&S®AREG8-B9 option | < 2.5 cm (nom.) |
| Air gap | Object distances and resulting object radar cross sections will change according to the distance between frontend reference plane and DUT. | recommendation: air gap should be large enough to match far field condition of radar under test |

## Radial velocity

| | | |
|---|---|---|
| Individual Doppler frequency shift for each artificial object | | yes |
| Velocity setting range | R&S®AREG8-B9 | ±500 km/h |
| Velocity step size | R&S®AREG8-B9 | 0.001 km/h |

## Level

| | | |
|---|---|---|
| Dynamic RCS range for all artificial objects on one IF path together | with R&S®AREG8-24S/-24D/-77S/-77D/ -81S/-81D [1] | 90 dB |
| | with R&S®QAT100 | > 60 dB |
| Dynamic RCS range for multiple objects per IF path | with R&S®AREG8-24S/-24D/-77S/-77D/ -81S/-81D [1] | 60 dB |
| | with R&S®QAT100 | – |
| RCS control step size | | 0.5 dB |

## IF input/IF output interface

| | | |
|---|---|---|
| IF output port for radar signal analysis and EIRP measurements | R&S®AREG8-K740 | IF output ports available on base unit |
| IF input port for superimposing interferers | R&S®AREG8-K741 | IF input ports available on base unit |

## Hardware-in-the-loop (HiL) interface

| | | |
|---|---|---|
| Dedicated HiL interface | R&S®AREG8-K109 | HiL coprocessor |
| HiL interface scenario update rate | R&S®AREG8-K109 | 20 ms (meas.) |
| Open-standard protocol support | | open simulation interface (OSI) |

## User interface and remote controls

| | | |
|---|---|---|
| Graphical user interface with touch controls | | yes |
| Web interface | | yes |
| Remote control interfaces | | Ethernet |
| | R&S®AREG8-K986 [1] | GPIB |
| Remote control command set | | SCPI |

# R&S®QAT100 together with R&S®AREG800A

## Frequency

| R&S®AREG800A with R&S®QAT100 | | |
|---|---|---|
| RF frequency range | with R&S®QAT100 | 76 GHz to 77 GHz |
| | | 77 GHz to 81 GHz |
| RF instantaneous bandwidth | with R&S®QAT100 | 4 GHz |
| Required bandwidth at R&S®AREG800A | with R&S®QAT100 | R&S®AREG8-B9 with 1 GHz instantaneous bandwidth due to 4 × multiplication concept of the R&S®QAT100 |

## Number of individual angular directions

| | | |
|---|---|---|
| Number of individual angular directions (Number of supported R&S®AREG800A IF paths) | with R&S®QAT100 | 4 |
| | with R&S®QAT100 and R&S®QAT-B2 option | 8 |

## Number of individual artificial objects per independent angular direction

| | | |
|---|---|---|
| Maximum number of individual artificial objects per R&S®AREG800A IF path | | 1 |

## Number of R&S®QAT100 per R&S®AREG800A base unit

| | | |
|---|---|---|
| Maximum number of supported R&S®QAT100 | with one individual IF path per R&S®QAT100 and one individual angular direction | 8 |

## RF level

| | | |
|---|---|---|
| Maximum ratings | RX power at frontend | +60 dBm EIRP at 0.5 m distance to sensor |
| | TX power at frontend | +10 dBm EIRP (at 0 dBm TX input power) |
| | max. deviation | ±3 dB between TX |
| Minimum input power | 76.0 GHz to 77.0 GHz | +20 dBm EIRP at 0.5 m distance to sensor |
| | 77.0 GHz to 81.0 GHz | +25 dBm EIRP at 0.5 m distance to sensor |
| Total RX to TX attenuation range | with R&S®AREG800A base unit and R&S®QAT100 | RX antenna to TX antenna (incl. antennas) 0 dB to –80 dB (nom.) |

## IF level

| | | |
|---|---|---|
| Maximum output power at IF RX ports | R&S®QAT100 | –6 dBm (nom.) |
| Maximum input power at IF TX ports | R&S®QAT100 | 0 dBm |
| Minimum input power at IF TX ports | R&S®QAT100 | –25 dBm |

## RF transfer characteristic

| | | |
|---|---|---|
| Amplitude flatness | with R&S®QAT100 RX antenna to TX antenna | < ±5 dB (R&S®QAT100 standalone) in 4 GHz bandwidth |

## Antennas

| | | |
|---|---|---|
| Antenna configuration | R&S®QAT100 | signal distribution:<br>one central receive antenna connected to all 4 segments; 96 transmit antennas in total<br><br>4 individual receive antennas each connected to an individual segment; up to 4 segments; each segments contains 24 transmit antennas |
| | with R&S®QAT-B2 | same as above; additional 4 segments; up to 8 individual segments in total |
| Antenna type and gain | R&S®QAT100 | waveguide antennas<br>6 dBi gain at 77 GHz center frequency (nom.) |
| Antenna polarization | R&S®QAT100 | 45° linear polarization |

## Angle range – field of view

| | | |
|---|---|---|
| Single R&S®QAT100 antenna array | air gap = 0.5 m | ±19° field of view of RUT covered |
| | air gap = 1.0 m | ±10° field of view of RUT covered |
| | air gap = 2.1 m | ±5° field of view of RUT covered |

## Angular resolution

| | | |
|---|---|---|
| Single R&S®QAT100 antenna array | air gap = 0.5 m | 0.4° |
| | air gap = 1.0 m | 0.2° |
| | air gap = 2.1 m | 0.1° |

# General data of R&S®AREG800A

| | | |
|---|---|---|
| **Environmental conditions** | | |
| Temperature | operating temperature range | +15 °C to +45 °C |
| | storage temperature range | –10 °C to +60 °C |
| Damp heat | | +40 °C, 95 % rel. humidity, steady state<br>in line with EN 60068-2-78 |
| Altitude | operating | 4600 m |
| | transport | 4600 m |
| **Mechanical resistance** | | |
| Vibration | sinusoidal | 5 Hz to 55 Hz, 0.15 mm amplitude const.,<br>55 Hz to 150 Hz, 0.5 g const.,<br>in line with EN 60068-2-6 |
| | random | 10 Hz to 300 Hz, acceleration 1.2 g RMS,<br>in line with EN 60068-2-64 |
| Shock | | 40 g shock spectrum, in line with<br>MIL-STD-810E, method 516.4,<br>procedure I |
| **Power rating** | | |
| Rated voltage | | 100 V to 240 V AC (± 10 %) |
| Rated frequencies | | 50 Hz to 60 Hz (± 5 %) |
| Rated current | | 5.8 A to 15 A (50 Hz to 60 Hz) |
| Rated power | when fully equipped | < 1000 W |
| Power factor correction | | in line with EN 61000-3-2 |
| **Product conformity** | | |
| Measurement environment | for OTA testing | a shielded environment is required |
| Electromagnetic compatibility | EU: in line with EMC Directive<br>2014/30/EU | applied harmonized standards:<br>• EN 61326-1 (industrial environment)<br>• EN 61326-2-1<br>• EN 55011 (class A)<br>• EN 61000-3-2<br>• EN 61000-3-3 |
| Electrical safety | EU: in line with<br>Low Voltage Directive 2014/35/EU | applied harmonized standard:<br>EN 61010-1 |
| | USA | UL 61010-1 |
| | Canada | CAN/CSA-C22.2 No. 61010-1 |
| International safety approvals | VDE – Association for Electrical,<br>Electronic and Information Technologies | GS mark 40046635 |
| | CSA – Canadian Standards Association | $CSA_{UL}$ mark 70133349 |
| **Dimensions (W × H × D)** | base unit | 462 mm × 240 mm × 504 mm<br>(18.15 in × 9.44 in × 19.81 in) |
| | R&S®AREG8-xx frontend modules | 120 mm ×115 mm × 30 mm<br>(4.72 in × 4.53 in × 1.18 in),<br>not including antennas and circulator |
| **Weight** | base unit (depends on options) | 15 kg to 26 kg (33.07 lb to 57.32 lb) |
| | R&S®AREG8-xx frontend modules | 1 kg (2 lb) |
| **Display** | | 7" TFT color display with capacitive touch<br>functionality |

# Ordering information

| Designation | Type | Order No. |
|---|---|---|
| **Base unit** | | |
| Automotive radar echo generator<br>Including power cable, quick start guide | R&S®AREG800A | 1437.4400.02 |
| **Hardware options** | | |
| Baseband | | |
| Digital baseband with 1 GHz IF bandwidth, 1 IF path, and 1 individual artificial object | R&S®AREG8-B9 | 1437.8011.02 |
| Analog stepped delay line, for short object generation with 1 IF path and 1 individual artificial object [1] | R&S®AREG8-B63 | 1437.8205.02 |
| **Software options** | | |
| Bandwidth upgrade | | |
| Baseband extension from 1 GHz to 2 GHz IF bandwidth for 1 IF path | R&S®AREG8-K527 | 1437.9882.02 |
| Baseband extension from 2 GHz to 5 GHz IF bandwidth for 1 IF path 1 [1] | R&S®AREG8-K528 | 1437.9799.02 |
| Baseband enhancements | | |
| Activation of second IF path for one R&S®AREG8-B9 baseband with 1 GHz bandwidth and 1 individual object | R&S®AREG8-K570 | 1437.9899.02 |
| One additional artificial object for all IF paths | R&S®AREG8-K812 | 1437.9853.02 |
| Extended Doppler frequency shift up to 10 MHz [1] | R&S®AREG8-K813 | 1437.9901.02 |
| Intermediate frequency ports and control interfaces | | |
| Analog IF output interfaces | R&S®AREG8-K740 | 1437.9830.02 |
| Analog IF input interface | R&S®AREG8-K741 | 1437.9847.02 |
| Hardware-in-the-loop control interface | R&S®AREG8-K109 | 1437.9860.02 |
| Synchronization interface for multiple R&S®AREG800A units [1] | R&S®AREG8-K549 | 1437.9876.02 |
| Remote control GPIB [1] | R&S®AREG8-K986 | 1437.9818.02 |
| **Remote frontends** | | |
| mmWave remote frontends | | |
| 24 GHz to 24.25 GHz, single antenna, 250 MHz RF bandwidth [1] | R&S®AREG8-24S | 1437.8611.02 |
| 24 GHz to 24.25 GHz, two antennas, 250 MHz RF bandwidth [1] | R&S®AREG8-24D | 1437.8640.02 |
| 76 GHz to 77 GHz, single antenna, 1 GHz RF bandwidth [1] | R&S®AREG8-77S | 1437.8670.02 |
| 76 GHz to 77 GHz, two antennas, 1 GHz RF bandwidth [1] | R&S®AREG8-77D | 1437.8705.02 |
| 76 GHz to 81 GHz, single antenna, 4 GHz RF bandwidth [1] | R&S®AREG8-81S | 1437.8734.02 |
| 76 GHz to 81 GHz, two antennas, 4 GHz RF bandwidth [1] | R&S®AREG8-81D | 1437.8763.02 |
| **R&S®QAT100 advanced antenna array** | | |
| Advanced antenna array, from 76 GHz to 81 GHz | R&S®QAT100 | 1341.0004.02 |
| Second TX/RX antenna line, for advanced antenna array | R&S®QAT-B2 | 1341.0162.02 |
| Shielding system, for one R&S®QAT100 | R&S®QAT-Z50 | 1341.0156.02 |

| **Warranty** | | |
|---|---|---|
| Base unit and all frontends (mmWave frontends and R&S®QAT100) | | 3 years |
| All other items [2] | | 1 year |
| Service options | | |
| Extended warranty, one year | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended warranty, two years | R&S®WE2 | |
| Extended warranty with calibration coverage, one year | R&S®CW1 | |
| Extended warranty with calibration coverage, two years | R&S®CW2 | |

**Extended warranty with a term of one and two years (WE1 and WE2)**
Repairs carried out during the contract term are free of charge [3]. Necessary calibration and adjustments carried out during repairs are also covered.

**Extended warranty with calibration coverage (CW1 and CW2)**
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [3] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

[2] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

[3] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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