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R&S®AREG800A AUTOMOTIVE RADAR ECHO GENERATOR

Specifications

Specifications | Version 05.00

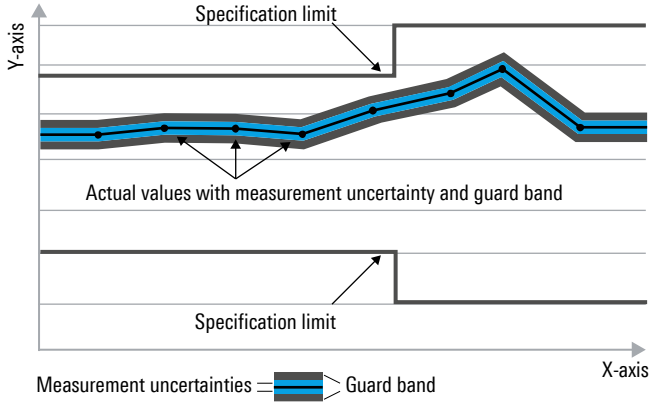
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours of storage at ambient temperature followed by 30 minutes of 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 standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit 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; longer distances up to 3000 m with fully digital implementation • digital: for FMCW radars, the minimum generated distance is equal to the air gap value of the radar under test, and the maximum generated distance is 3000 m
Supported remote frontends	R&S®AREG8-24S/-24D/-81S/-81D/ -81WS/-81WD	conventional mmWave remote frontends
	R&S®QAT100	innovative R&S®QAT100 electronically controllable antenna array
	R&S®FE44S	external frontends
Maximum number of remote frontends per R&S®AREG800A base unit	R&S®AREG8-24S/-81S/-81D/-81WS/ -81WD	up to 4 conventional mmWave frontends
	R&S®QAT100	up to 8 R&S®QAT100
	R&S®FE44S	up to 8 external frontends, 4 for TX and 4 for RX (4 pairs)

Frequency range

Instantaneous IF bandwidth	R&S®AREG8-B9	1 GHz, overrange: 1.2 GHz (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	2 GHz, overrange: 2.2 GHz (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	5 GHz, overrange: 5.2 GHz (meas.)
IF frequency range for R&S®AREG800A base unit	R&S®AREG8-B9	1.1 GHz to 2.1 GHz
	R&S®AREG8-B9 with R&S®AREG8-K527	0.7 GHz to 2.7 GHz
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	0.7 GHz to 5.7 GHz
RF frequency bands	with R&S®AREG8-24S/-24D	24 GHz to 24.25 GHz
	with R&S®AREG8-81S/-81D	76 GHz to 81 GHz
	with R&S®QAT100	76 GHz to 81 GHz
	with R&S®FE44S	24 GHz to 44 GHz

IF paths

Maximum number of R&S®AREG8-B9 digital baseband boards		4
Maximum number of R&S®AREG8-B63 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
	for 4 × R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	4

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	< 4 m + air gap (meas.)
	R&S®AREG-B9 with R&S®AREG-BK814	≥ air gap (meas.)
	R&S®AREG-B9 with R&S®AREG-B63 and R&S®AREG-BK814	≥ air gap (meas.)
Covered distance range of artificial objects	R&S®AREG8-B9	< 17 m to 3000 m (meas.)
	R&S®AREG-B9 with R&S®AREG-B63	< 4 m to 3000 m (meas.)
	R&S®AREG-B9 with R&S®AREG-BK814	≥ air gap to 3000 m (meas.)
	R&S®AREG-B9 with R&S®AREG-B63 and R&S®AREG-BK814	≥ air gap to 3000 m (meas.)
Maximum number of artificial objects per R&S®AREG800A	with R&S®QAT100	
	artificial object distance < 4 m to 3000 m + air gap	up to 8 with individual azimuth/elevation, distance, RCS, Doppler (up to 4 objects between 4 m and 17 m and up to 4 objects between 17 m and 3000 m)
	artificial object distance > 17 m to 3000 m + air gap	up to 8 with individual azimuth/elevation, distance, RCS, Doppler
	artificial object distance ≥ air gap to 3000 m	up to 8 with individual azimuth/elevation, distance, RCS, Doppler
	with R&S®AREG8-24S/-24D/-81S/-81D/-81WS/-81WD or with R&S®FE44S	
	artificial object distance < 4 m to 3000 m + air gap	up to 32 (8 per frontend (up to 4 objects between 4 m and 17 m and up to 28 objects between 17 m and 3000 m))
	artificial object distance > 17 m to 3000 m + air gap	up to 32 (up to 8 per frontend)
	artificial object distance ≥ air gap to 3000 m	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	1 cm
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 and R&S®AREG8-B63	±500 km/h
Velocity step size	R&S®AREG8-B9 and R&S®AREG8-B63	0.001 km/h
Doppler frequency offset accuracy	measured with a spectrum analyzer in IF domain as frequency offset between base unit IF input and IF output signal, without frontend	< 1 Hz
Velocity accuracy	The Doppler shift velocity error is determined from the measured Doppler shift frequency error by using the equation: $f_{error} = 3.6 \times (f_{error}/f_{center}) \times ½ \times 299\,700\,000$ m/s, with f_{center} being 78 GHz or 79 GHz (for R&S®AREG8-81S and R&S®AREG8-81D).	< 0.05 km/h

Level

Dynamic RCS range for all artificial objects on one IF path together	with R&S®AREG8-24S/-24D/-81S/-81D	90 dB
	with R&S®QAT100	> 60 dB
Dynamic RCS range for multiple objects per IF path	with R&S®AREG8-24S/-24D/-81S/-81D	60 dB
	with R&S®QAT100	–
RCS control step size		0.1 dB
Maximum input power at RX IF in connector of R&S®AREG800A base unit		10 dBm (meas.)
Recommended input power at RX IF in connector of R&S®AREG800A base unit		≤ 0 dBm (meas.)
Maximum output power at TX IF out connector of R&S®AREG800A base unit		–3 dBm (meas.)
IF attenuation accuracy of R&S®AREG800A base unit		±2 dB (meas.)

IF transfer characteristics

Amplitude flatness	measured from IF input to IF output connector at R&S®AREG800A base unit	
	measured by vector network analyzer: • frequency step size: 2.5 MHz • measurement bandwidth: 1 kHz • span: from 1.1 GHz to 2.1 GHz, for 1 GHz bandwidth, from 0.7 GHz to 2.7 GHz, for 2 GHz bandwidth, from 0.7 GHz to 5.7 GHz, for 5 GHz bandwidth • source power: –10 dBm	
	R&S®AREG8-B9	
	with equalization	< ±1 dB in 1 GHz bandwidth (meas.)
	without equalization	< ±3 dB in 1 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	
	with equalization	< ±1.5 dB in 2 GHz bandwidth (meas.)
	without equalization	< ±3.5 dB in 2 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	
	with equalization	< ±2.5 dB in 5 GHz bandwidth (meas.)
	without equalization	< ±5 dB in 5 GHz bandwidth (meas.)
Group delay flatness	R&S®AREG8-B9	
	with equalization	< ±0.5 ns in 1 GHz bandwidth (meas.)
	without equalization	< ±1 ns in 1 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	
	with equalization	< ±0.5 ns in 2 GHz bandwidth (meas.)
	without equalization	< ±1 ns in 2 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	
	with equalization	< ±1.5 ns in 5 GHz bandwidth (meas.)
	without equalization	< ±2 ns in 5 GHz bandwidth (meas.)

IF spectral purity

Spurious free dynamic range (spurs in frequency domain)	RX IF input to TX IF output connector at R&S®AREG800A base unit; measured at –10 dBm signal level	
	R&S®AREG8-B9	> 35 dBc (typ.)
	R&S®AREG8-B9 with R&S®AREG8-K527	> 35 dBc (typ.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	> 30 dBc (typ.)
Suppression of ghost objects	measured from IF input to IF output connector at R&S®AREG800A base unit	
	measured by vector network analyzer in time domain: • frequency step size: 125 kHz • measurement bandwidth: 100 kHz span: from 1.1 GHz to 2.1 GHz, for 1 GHz bandwidth, from 0.7 GHz to 2.7 GHz, for 2 GHz bandwidth from 0.7 GHz to 5.7 GHz, for 5 GHz bandwidth • source power: –10 dBm • distance to wanted artificial object: 2 m	
	R&S®AREG8-B9	> 40 dBc (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	> 40 dBc (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	> 40 dBc (meas.)

AUX IF input/AUX IF output interface (R&S®AREG8-K740 and R&S®AREG8-K741 options)

AUX IF output port for radar signal analysis and EIRP measurements	R&S®AREG8-K740	IF output ports available on base unit
AUX IF output frequency range	R&S®AREG8-B9	1.1 GHz to 2.1 GHz
	R&S®AREG8-B9 with R&S®AREG8-K527	0.7 GHz to 2.7 GHz
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	0.7 GHz to 5.7 GHz
AUX IF output measurement port output gain	from RX IF input to AUX IF output at R&S®AREG800A base unit	0 dB (nom.); max. 0 dBm
AUX IF input port for superimposing interferers	R&S®AREG8-K741	IF input ports available on base unit
AUX IF input maximum level	from AUX IF input to TX IF output at R&S®AREG800A base unit	10 dBm (meas.)
AUX IF input recommended level	from AUX IF input to TX IF output at R&S®AREG800A base unit	–3 dBm (meas.)
AUX IF input frequency range	R&S®AREG8-B9	0.7 GHz to 5.7 GHz
	R&S®AREG8-B9 with R&S®AREG8-K527	0.7 GHz to 5.7 GHz
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	0.7 GHz to 5.7 GHz

Hardware-in-the-loop (HiL) interface

Dedicated HiL interface	R&S®AREG8-K109	HiL co-processor
HiL interface scenario update rate	with R&S®AREG8-K109 and open simulation interface	
	with 1 artificial object	< 0.15 ms (meas.)
	with 8 artificial objects	< 0.2 ms (meas.)
	with R&S®AREG8-K109 and UDP open simulation interface	
	with 1 artificial object	< 0.15 ms (meas.)
	with 8 artificial objects	< 0.2 ms (meas.)
	with R&S®AREG8-K109 and UDP RAW interface	
	with 1 artificial object	< 0.03 ms (meas.)
	with 8 artificial objects	< 0.1 ms (meas.)
Open-standard protocol support		open simulation interface (OSI)
Time synchronization protocol		gPTP, NTP
Physical interfaces		Ethernet/LAN

User interface and remote controls

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

Reference frequency

Reference frequency input

Connector type	REF IN on rear panel	BNC female
Input frequency		10 MHz
Input level range		0 dBm to + 13 dBm
Input impedance		50 Ω (nom.), AC coupled

Reference frequency output

Connector type	REF OUT on rear panel	BNC female
Output frequency	square wave	
	output with source mode: internal	10 MHz ± 5 ppm (nom.) derived from internal oscillator
	output with source mode: external	amplified input signal from REF IN routed to REF OUT
Output level		+10 dBm (meas.)
Source impedance		50 Ω (nom.), AC coupled

R&S®AREG8-81S/-81D together with R&S®AREG800A base unit

Frequency

RF frequency range	R&S®AREG8-81S/-81D	76.0 GHz to 81.0 GHz
RF instantaneous bandwidth	R&S®AREG8-81S/-81D with R&S®AREG8-B9	1 GHz
	R&S®AREG8-81S/-81D with R&S®AREG8-B9 and R&S®AREG8-K527	2 GHz
	R&S®AREG8-81S/-81D with R&S®AREG8-B9 and R&S®AREG8-K527 and R&S®AREG8-K528	4 GHz
RF center frequency step size	R&S®AREG8-81S/-81D	100 MHz
IF center frequency	R&S®AREG8-81S/-81D	
	for 1 GHz bandwidth	1.6 GHz
	for 2 GHz bandwidth	1.7 GHz
	for 4 GHz bandwidth	2.7 GHz

Number of R&S®AREG800A frontend options per base unit

Maximum number of supported R&S®AREG8-81S/-81D options	one IF path per R&S®AREG8-81S/-81D option required	4

RF level

Absolut maximum RX power at frontend RX waveguide port	R&S®AREG8-81S/-B181D	–7 dBm
Maximum TX power at frontend TX waveguide port	R&S®AREG8-81S/-81D	≥ 15 dBm (meas.)

RF transfer characteristics

Amplitude flatness	**RF amplitude flatness**	
	measured by vector network analyzer: • with diplexer between RX and TX • frequency step size: 2.5 MHz • measurement bandwidth: 1 kHz • window function: normal gate (Hann) • type: bandpass filter	
	R&S®AREG8-81S/-81D frontend together with R&S®AREG800A base unit measured from RX waveguide input to waveguide TX output connector at R&S®AREG8-81S/-81D and	
	R&S®AREG8-B9	< ±1 dB, in 1 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	< ±2 dB, in 2 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	< ±5 dB, in 4 GHz bandwidth (meas.)
Group delay flatness	**R&S®AREG8-81S/-81D frontend together with R&S®AREG800A base unit** measured from RX waveguide input to waveguide TX output connector at R&S®AREG8-81S/81D and	
	R&S®AREG8-B9	< ±0.5 ns, in 1 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	< ±1 ns, in 2 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	< ±1 ns, in 4 GHz bandwidth (meas.)

Antennas

Antenna configuration	with R&S®AREG8-81S	1 combined TX/RX antenna (circulator integrated into frontend module)
	with R&S®AREG8-81D	1 TX and 1 RX antenna, lateral antenna spacing (center to center): 32 mm
Antenna type and gain	with R&S®AREG8-81S/-81D	WR12 rectangular horn antenna, 10 dBi (nom.)
Antenna polarization		linear, vertical polarization, horizontal polarization possible by rotating frontend module

Auxiliary IF output interface (R&S®AREG8-K740 option)

Auxiliary receive signal IF output at R&S®AREG800A base unit for optional signal analysis:
connect to a spectrum analyzer or oscilloscope

AUX IF output measurement port maximum output level	R&S®AREG8-81S/-81D	max. 0 dBm
AUX IF output gain	from RX waveguide input (at RF frequency) to auxiliary RX IF out port (at IF frequency)	
	R&S®AREG8-81S/-81D	12 dB (nom.)
AUX IF output frequency range	R&S®AREG8-81S/-81D	0.7 GHz to 4.7 GHz

Power measurement output (R&S®AREG8-K740 option)

RX power connector at R&S®AREG800A mmWave frontend module for optional power and EIRP measurements:
connect to a power sensor

RX power output measurement port maximum output level	R&S®AREG8-81S/-81D	max. 0 dBm
RX power output gain	from RX waveguide input (at RF frequency) to RX power port (at IF frequency)	
	R&S®AREG8-81S/-81D	12 dB (nom.)
RX power output frequency range	R&S®AREG8-81S/-81D	0.7 GHz to 4.7 GHz

Auxiliary IF input interface (R&S®AREG8-K741 option)

Auxiliary transmit signal IF input allows transmitting additional signals to the radar under test at RF frequency (example: interference signals)

AUX IF input maximum level	R&S®AREG8-81D	10 dBm (meas.)
	R&S®AREG8-81S, to prevent R&S®AREG800A receiver damage due to TX/RX isolation with circulator	–10 dBm (meas.)
AUX IF input recommended maximum level	to prevent R&S®AREG800A receiver saturation due to TX/RX isolation with circulator	
	R&S®AREG8-81S	< –18 dBm (meas.)
	R&S®AREG8-81D	< –5 dBm (meas.)
AUX IF input frequency range	R&S®AREG8-81S/-81D	0.7 GHz to 5.7 GHz with 4 GHz instantaneous bandwidth
AUX IF input gain	from AUX IF input to TX waveguide output, R&S®AREG8-81S/-81D	20 dB (nom.)

Connectors AREG8-81S/-81D options

RX IF OUT	receiver IF signal output to base unit	SMA female
TX IF IN	transmitter IF signal and reference input from base unit	SMA female
Control	power and control connection to frontend module	26-pin ODU Mini-Snap® series L, coding A, push-pull connector
RX power	receiver IF signal output for power measurements, connect an R&S®NRP power sensor	SMA female

R&S®AREG8-81WS/-81WD together with R&S®AREG800A base unit

Frequency

RF frequency range	R&S®AREG8-81WS/-81WD	76.0 GHz to 81.0 GHz
RF instantaneous bandwidth	R&S®AREG8-81WS/-81WD with R&S®AREG8-B9	1 GHz
	R&S®AREG8-81WS/-81WD with R&S®AREG8-B9 and R&S®AREG8-K527	2 GHz
	R&S®AREG8-81WS/-81WD with R&S®AREG8-B9 and R&S®AREG8-K527 and R&S®AREG8-K528	5 GHz
RF center frequency step size	R&S®AREG8-81WS/-81WD	100 MHz
IF center frequency	R&S®AREG8-81WS/-81WD	
	for 1 GHz bandwidth	1.6 GHz
	for 2 GHz bandwidth	1.7 GHz
	for 5 GHz bandwidth	3.2 GHz

Number of R&S®AREG800A frontend options per base unit

Maximum number of supported R&S®AREG8-81WS/-81WD options	one IF path per R&S®AREG8-81WS/ -81WD option required	4

RF level

Absolut maximum RX power at frontend RX waveguide port	R&S®AREG8-81WS/-81WD	–7 dBm
Maximum TX power at frontend TX waveguide port	R&S®AREG8-81WS/-81WD	≥ 15 dBm (meas.)

RF transfer characteristics

Amplitude flatness	**RF amplitude flatness**	
	measured by vector network analyzer: • with diplexer between RX and TX • frequency step size: 2.5 MHz • measurement bandwidth: 1 kHz • window function: normal gate (Hann) • type: bandpass filter	
	R&S®AREG8-81WS/-81WD frontend together with R&S®AREG800A base unit measured from RX waveguide input to waveguide TX output connector at R&S®AREG8-81WS/-81WD and:	
	R&S®AREG8-B9	< ±1 dB, in 1 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	< ±2 dB, in 2 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	< ±5 dB, in 5 GHz bandwidth (meas.)
Group delay flatness	**R&S®AREG8-81WS/-81WD frontend together with R&S®AREG800A base unit** measured from RX waveguide input to waveguide TX output connector at R&S®AREG8-81WS/81WD and:	
	R&S®AREG8-B9	< ±0.5 ns, in 1 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527	< ±1 ns, in 2 GHz bandwidth (meas.)
	R&S®AREG8-B9 with R&S®AREG8-K527 and R&S®AREG8-K528	< ±1 ns, in 5 GHz bandwidth (meas.)

Antennas

Antenna configuration	with R&S®AREG8-81WS	1 combined TX/RX antenna (circulator integrated into frontend module)
	with R&S®AREG8-81WD	1 TX and 1 RX antenna, lateral antenna spacing (center to center): 32 mm
Antenna type and gain	with R&S®AREG8-81WS/-81WD	WR12 rectangular horn antenna, 10 dBi (nom.)
Antenna polarization		linear, vertical polarization, horizontal polarization possible by rotating frontend module

Auxiliary IF output interface (R&S®AREG8-K740 option)

Auxiliary receive signal IF output at R&S®AREG800A base unit for optional signal analysis:
connect to a spectrum analyzer or oscilloscope

AUX IF output measurement port maximum output level	R&S®AREG8-81WS/-81WD	max. 0 dBm
AUX IF output gain	from RX waveguide input (at RF frequency) to auxiliary RX IF out port (at IF frequency)	
	R&S®AREG8-81WS/-81WD	12 dB (nom.)
AUX IF output frequency range	R&S®AREG8-81WS/-81WD	0.7 GHz to 5.7 GHz

Power measurement output (R&S®AREG8-K740 option)

RX power connector at R&S®AREG800A mmWave frontend module for optional power and EIRP measurements:
connect to a power sensor

RX power output measurement port maximum output level	R&S®AREG8-81WS/-81WD	max. 0 dBm
RX power output gain	from RX waveguide input (at RF frequency) to RX power port (at IF frequency)	
	R&S®AREG8-81WS/-81WD	10 dB (nom.)
RX power output frequency range	R&S®AREG8-81WS/-81WD	0.7 GHz to 5.7 GHz

Auxiliary IF input interface (R&S®AREG8-K741 option)

Auxiliary transmit signal IF input allows transmitting additional signals to the radar under test at RF frequency (example: interference signals)

AUX IF input maximum level	R&S®AREG8-81WD	10 dBm (meas.)
	R&S®AREG8-81WS, to prevent R&S®AREG800A receiver damage due to TX/RX isolation with circulator	–10 dBm (meas.)
AUX IF input recommended maximum level	to prevent R&S®AREG800A receiver saturation due to TX/RX isolation with circulator	
	R&S®AREG8-81WS	< –18 dBm (meas.)
	R&S®AREG8-81WD	< –5 dBm (meas.)
AUX IF input frequency range	R&S®AREG8-81WS/-81WD	0.7 GHz to 5.7 GHz with 5 GHz instantaneous bandwidth
AUX IF input gain	from AUX IF input to TX waveguide output, R&S®AREG8-81WS/-81WD	17 dB (nom.)

Connectors R&S®AREG8-81WS/-81WD options

RX IF OUT	receiver IF signal output to base unit	SMA female
TX IF IN	transmitter IF signal and reference input from base unit	SMA female
Control	power and control connection to frontend module	26-pin ODU Mini-Snap® series L, coding A, push-pull connector
RX power	receiver IF signal output for power measurements, connect an R&S®NRP power sensor	SMA female

R&S®AREG8-24S/-24D together with R&S®AREG800A base unit

Frequency

RF frequency range	R&S®AREG8-24S/-24D	24.0 GHz to 24.25 GHz
RF instantaneous bandwidth	R&S®AREG8-24S/-24D with R&S®AREG8-B9	250 MHz
IF center frequency	R&S®AREG8-24S/-24D	825 MHz, for 250 MHz bandwidth

Number of R&S®AREG800A frontend options per base unit

Maximum number of supported R&S®AREG8-24S/-24D options	one IF path per R&S®AREG8-24S/-24D option required	4

RF level

Absolut maximum RX power at frontend RX waveguide port	R&S®AREG8-24S/-24D	0 dBm (nom.)
Maximum TX power at frontend TX waveguide port	R&S®AREG8-24S/-24D	≥ 15 dBm (meas.)

RF transfer characteristics

Amplitude flatness	**RF amplitude flatness**	
	measured by vector network analyzer: • with diplexer between RX and TX • frequency step size: 2.5 MHz • measurement bandwidth: 1 kHz • window function: normal gate (Hann) • type: bandpass filter	
	R&S®AREG8-24S/-24D frontend together with R&S®AREG800A base unit measured from RX waveguide input to waveguide TX output connector at R&S®AREG8-24S/-24D and:	
	R&S®AREG8-B9	< ±2 dB, in 250 MHz bandwidth (meas.)
Group delay flatness	**R&S®AREG8-24S/-24D frontend together with R&S®AREG800A base unit** measured from RX waveguide input to waveguide TX output connector at R&S®AREG8-24S/24D and:	
	R&S®AREG8-B9	< ±1.0 ns, in 250 MHz bandwidth (meas.)

Antennas

Antenna configuration	with R&S®AREG8-24S	1 combined TX/RX antenna (circulator integrated into frontend module)
	with R&S®AREG8-24D	1 TX and 1 RX antenna, lateral antenna spacing (center to center): 32 mm
Antenna type and gain	with R&S®AREG8-24S/-24D	WR42 rectangular horn antenna 10 dBi (nom.)
Antenna polarization		linear, vertical polarization, horizontal polarization possible by rotating frontend module

Auxiliary IF output interface (R&S®AREG8-K740 option)

Auxiliary receive signal IF output at AREG800A base unit for optional signal analysis:
connect to a spectrum analyzer or oscilloscope

AUX IF output measurement port maximum output level	R&S®AREG8-24S/-24D	max. 0 dBm
AUX IF output gain	from RX waveguide input (at RF frequency) to auxiliary RX IF out port (at IF frequency)	
	R&S®AREG8-24S/-24D	12 dB (nom.)
AUX IF output frequency range	R&S®AREG8-24S/-24D	700 MHz to 950 MHz

Power measurement output (R&S®AREG8-K740 option)

RX power connector at R&S®AREG8xx mmW frontend module for optional power and EIRP measurements: connect to a power sensor

RX power output measurement port maximum output level	R&S®AREG8-24S/-24D	max. 0 dBm
RX power output gain	from RX waveguide input (at RF frequency) to RX power port (at IF frequency)	
	R&S®AREG8-24S/-24D	12 dB (nom.)
RX power output frequency range	R&S®AREG8-24S/-24D	700 MHz to 950 MHz

Auxiliary IF input interface (R&S®AREG8-K741 option)

Auxiliary transmit signal IF input allows transmitting additional signals to the radar under test at RF frequency (example: interference signals)

AUX IF input max level	R&S®AREG8-24D	10 dBm (meas.)
	R&S®AREG8-24S to prevent R&S®AREG receiver damage due to TX/RX isolation with circulator	–5 dBm (meas.)
AUX IF input recommended maximum level	to prevent R&S®AREG receiver saturation due to TX/RX isolation with circulator	
	R&S®AREG8-24S	< –17 dBm (meas.)
	R&S®AREG8-24D	< –5 dBm (meas.)
AUX IF input frequency range	R&S®AREG8-24S/-24D	700 MHz to 950 MHz, with 250 MHz instantaneous bandwidth
AUX IF input gain	from AUX IF input to TX waveguide output, R&S®AREG8-24S/-24D	20 dB (nom.)

Connectors R&S®AREG8-24S/-24D options

RX IF OUT	receiver IF signal output to base unit	SMA female
TX IF IN	transmitter IF signal and reference input from base unit	SMA female
Control	power and control connection to frontend module	26-pin ODU Mini-Snap® series L, coding A, push-pull connector
RX power	receiver IF signal output for power measurements, connect an R&S®NRP power sensor	SMA female

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 characteristics

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: • 1 central receive antenna connected to all 4 segments; 96 transmit antennas in total • 4 individual receive antennas, each connected to an individual segment; up to 4 segments; each segment 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 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, 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., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g RMS, in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E, method 516.4, 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 2014/30/EU	applied harmonized standards: • EN 61326-1 (industrial environment) • EN 61326-2-1 • EN 55011 (class A) • EN 61000-3-2 • EN 61000-3-3
Electrical safety	EU: in line with Low Voltage Directive 2014/35/EU	applied harmonized standard: EN 61010-1
	USA	UL 61010-1
	Canada	CAN/CSA-C22.2 No. 61010-1
International safety approvals	VDE – Association for Electrical, 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 (18.15 in × 9.44 in × 19.81 in)
	R&S®AREG8-xx frontend modules	120 mm ×115 mm × 30 mm (4.72 in × 4.53 in × 1.18 in), 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 functionality

Ordering information

Designation	Type	Order No.
Base unit		
Automotive radar echo generator, 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	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	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	R&S®AREG8-K813	1437.9901.02
Near object range for FMCW	R&S®AREG8-K814	1437.9776.02
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	R&S®AREG8-K549	1437.9876.02
Remote control GPIB	R&S®AREG8-K986	1437.9818.02
System alignment backend		
System alignment	R&S®AREG8-B97	1437.9001.02
Rackmount kit backend		
Rackmount kit	R&S®ZZA-KNP51	1177.8855.00
Remote frontends		
mmWave remote frontends		
24 GHz to 24.25 GHz, single antenna, 250 MHz RF bandwidth	R&S®AREG8-24S	1437.8611.02
24 GHz to 24.25 GHz, two antennas, 250 MHz RF bandwidth	R&S®AREG8-24D	1437.8640.02
76 GHz to 81 GHz, single antenna, 4 GHz RF bandwidth	R&S®AREG8-81S	1437.8734.02
System alignment, for R&S®AREG8-81S/-81D	R&S®AR81S-B97	1437.9053.02
76 GHz to 81 GHz, two antennas, 4 GHz RF bandwidth	R&S®AREG8-81D	1437.8763.02
System alignment, for R&S®AREG8-81D	R&S®AR81D-B97	1437.9060.02
76 GHz to 81 GHz, single antenna, 5 GHz RF bandwidth	R&S®AREG8-81WS	1437.9153K02
System alignment, for R&S®AREG8-81WS	R&S®AR81WS-B97	1437.9247.02
76 GHz to 81 GHz, two antennas, 5 GHz RF bandwidth	R&S®AREG8-81WD	1437.9160K02
System alignment, for R&S®AREG8-81WD	R&S®AR81WD-B97	1437.9230.02
24 GHz to 44 GHz, single antenna, 1 GHz RF bandwidth	R&S®FE44S	1338.7001K02
Frontend control, for R&S®FE44S	R&S®AREG8-K553	1437.9782.02
R&S®QAT100 advanced antenna array		
Advanced antenna array, from 76 GHz to 81 GHz	R&S®QAT100	1341.0004.02
Second line of 96 transmit antennas, for the R&S®QAT100	R&S®QAT-B2	1341.0162.02
Shielding system, for one R&S®QAT100, length: 50 cm	R&S®QAT-Z50	1341.0156.02

Warranty		
Base unit and all frontends (mmWave frontends and R&S®QAT100)		3 years
All other items [1]		1 year
Service options		
Extended warranty, one year	R&S®WE1	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 accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [2]. 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 [2] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

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

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

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