

R&S®SZU100A

IQ Upconverter

Specifications



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Key Features

The R&S®SZU100A is an I/Q upconverter for use with the R&S®SMW200A vector signal generator. It effectively extends the frequency range of the R&S®SMW200A for vector modulation at mmWave frequencies.

High performance

- Center frequency 58.32 GHz to 64.80 GHz
- RF modulation bandwidth ± 1 GHz around center frequency
- High output power and wide dynamic range of -80 dBm to $+5$ dBm (PEP)
- RF head with waveguide connector WR15
- For use with R&S®SMW200A vector signal generator
(with R&S®SMW-B9 wideband baseband option)

Reliable results due to outstanding signal quality

- Flat frequency response of < 2.0 dB
- Fully characterized in factory; no need for external frequency response correction
- Harmonics, nonharmonics and subharmonics better than -50 dBc (level > -40 dBm)
- Wideband noise -146 dBm/Hz or better (CW, level = 10 dBm, carrier offset > 30 MHz)
- EVM for WLAN IEEE 802.11ad at 60.48 GHz better than -31 dB

Convenient and fast operation

- R&S®SZU100A seamlessly integrated into R&S®SMW200A operating concept
- Operation like a one-box signal generator
- Fully remote controllable
- Internal level detector for automatic leveling supersedes external recalibration during operation
(e.g. when changing signal content, level or frequency)
- Time efficient measurements

Definitions

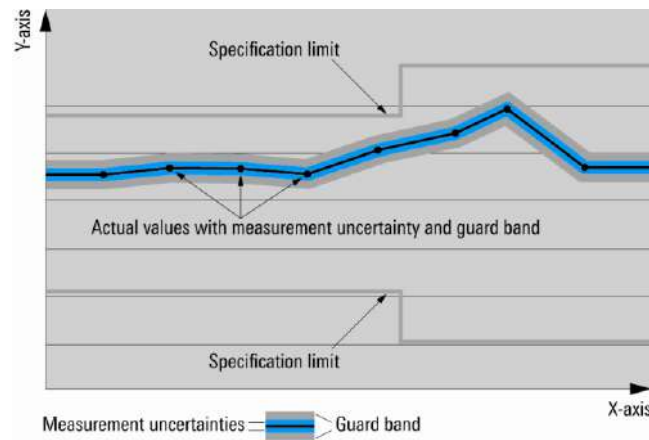
General

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 $<$, $\leq$, $>$, $\geq$, $\pm$, 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.



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 indicated as follows: "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Frequency options

One of the following frequency options must be installed.

R&S®SZU-B1066	58.32 GHz to 64.80 GHz $\pm$ ½ occupied modulation bandwidth
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RF characteristics

Frequency

Range	R&S®SZU-B1066	58.32 GHz to 64.80 GHz $\pm$ ½ occupied modulation bandwidth
Resolution of setting		0.1 Hz
Setting time		5 ms
Resolution of phase offset setting		0.1°
Input for external LO frequency		
Connector type		SMA female
Input frequency	automatically set by controlling instrument	1.944 GHz to 2.16 GHz
Input level range	automatically set by controlling instrument	–1.5 dBm to +8 dBm, nom. +5 dBm
Input impedance		nom. 50 Ω

Level

Setting range		–100 dBm to +15 dBm
Specified range		–80 dBm to +5 dBm (PEP), –90 dBm to +10 dBm (PEP, typ.)
Resolution of setting		nom. 0.01 dB
Level error	level setting characteristic: auto, less than 5 degree temperature drift after internal adjustment	< 2 dB
Setting time		5 ms
Interruption-free level setting range	level setting characteristic: uninterrupted level setting	> 10 dB (nom.)
Measurement range	internal detector	–50 dBm to +15 dBm (meas.)

Spectral purity

Harmonics		< –50 dBc
Nonharmonics		< –50 dBc
Subharmonics	level > –40 dBm	< –50 dBc
Wideband noise	carrier offset > 30 MHz, measurement bandwidth = 1 Hz	
	CW, level = 10 dBm	
	Pa switched on	–146 dBm/Hz (meas.)
	Pa switched off	thermal noise floor (approx. –174 dBm/Hz (meas.))
SSB phase noise	I/Q, carrier offset = 20 kHz, measurement bandwidth = 1 Hz	
	f = 60.48 GHz	< –93 dBc, –97 dBc (nom.)
SSB phase noise with R&S®SMW-B22 option installed in the R&S®SMW200A	I/Q, carrier offset = 20 kHz, measurement bandwidth = 1 Hz	
	f = 60.48 GHz	< –98 dBc, –102 dBc (nom.)

I/Q modulation

I/Q modulation performance

RF modulation bandwidth	fc = 58.32 GHz to 64.80 GHz	2 GHz
RF frequency response in specified RF modulation bandwidth		< 2.0 dB
Carrier leakage ¹	referenced to baseband full-scale input	< -45 dBc
Suppression of image sideband for entire instrument in modulation bandwidth		> 30 dB, > 45 dB (nom.)
Two-tone IMD (2 carriers)	PEP = 0 dBm up to 2000 MHz carrier spacing	< -34 dBc (typ.)
I/Q impairments (analog)	These impairments are set within the analog I/Q modulator section.	
	I offset, Q offset	
	setting range	-10 % to +10 %
	resolution	0.01 %
	gain imbalance	
	setting range	-1.0 dB to +1.0 dB
	resolution	0.01 dB
	quadrature offset	
	setting range	-10° to +10°
	resolution	0.01°

Analog I/Q inputs

Input mode		single-ended or differential
Connector types		SMA female
Input impedance		nom. 50 Ω
VSWR	up to 1000 MHz	< 1.3
	up to 2000 MHz	< 1.5 (typ.)
Nominal input voltage for full-scale input		$\sqrt{V_i^2 + V_q^2} = 0.5 \text{ V}$
Damage voltage		±1.6 V

Signal performance for digital standards

WLAN IEEE 802.11ad (with R&S®SMW-K141 option)

EVM with BPSK, QPSK, 16QAM	60.48 GHz, WLAN IEEE 802.11ad signal, 1.76 GHz bandwidth	
	time domain power = 0 dBm	
	MCS 5 (BPSK)	< -30 dB, < -32 dB (meas.)
	MCS 9 (QPSK)	< -30 dB, < -32 dB (meas.)
	MCS 12 (16QAM)	< -30 dB, < -32 dB (meas.)
with R&S®SMW-B22 option installed in the R&S®SMW200A	time domain power = 0 dBm	
	MCS 5 (BPSK)	< -31 dB, < -34 dB (meas.)
	MCS 9 (QPSK)	< -31 dB, < -34 dB (meas.)
	MCS 12 (16QAM)	< -31 dB, < -34 dB (meas.)

General data

Environmental conditions		
Temperature	operating temperature range	+5 °C to +40 °C
	storage temperature range	-10 °C to +60 °C
Damp heat		+25 °C/+40 °C, 90 % rel. humidity, const. in line with EN 60068-2-78
Altitude	operating	2000 m
	transport	10000 m

¹ Value applies after 1 hour warm-up time and recalibration for 4 hours of operation and temperature variations of less than +5 °C.

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 ($\pm 10\%$)
Rated frequency		50 Hz to 60 Hz ($\pm 5\%$)
Rated current		1.8 A
Rated power		60 W
Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2004/108/EC	applied harmonized standards: EN 61326-1 (industrial environment), EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3
Electrical safety	EU: in line with Low Voltage Directive 2006/95/EC	applied harmonized standard: EN 61010-1
Calibration interval	recommended for highest accuracy	12 months
	for general test and measurement applications	36 months
Dimensions	W × H × D	125 mm × 90 mm × 300 mm (4.92 in × 3.54 in × 11.81 in)
Weight		5 kg (11 lb)

Ordering information

Designation	Type	Order No.
IQ upconverter, base unit, (including combined differential IQ/USB cable)	R&S®SZU100A	1425.3003.02
Frequency option 57 GHz to 66 GHz, WR15	R&S®SZU-B1066	1425.3110.02
Recommended extras		
USB+IQ cable for R&S®SZU100A (length: 2 m), combined differential IQ/USB cable (accessory)	R&S®SZU-Z1	1425.4851.02
Waveguide-to-waveguide adapter WR15, HP/A compatible (as test port saver)		1314.5780.00
Waveguide-coax-adapter WR15-1.85 mm	R&S®WCA70	1324.5001.02

Warranty		
Base unit		3 years
All other items		1 year
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 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.

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

Service that adds value

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

About Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. 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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