

# R&S® SZV100A

## Q/V BAND RF UPCONVERTER

### Specifications



Data Sheet  
Version 01.02

**ROHDE & SCHWARZ**

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# Definitions

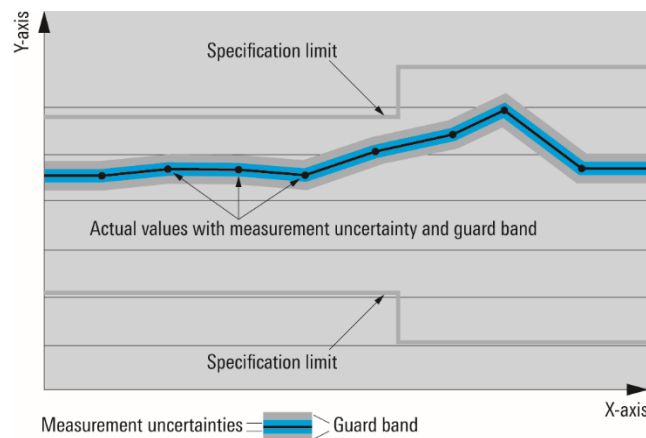
## General

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.



## 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 Mcps (million chips per second), whereas bit rates and symbol rates are specified in Gbps (billion bits per second), Mbps (million bits per second), kbps (thousand bits per second), Msps (million symbols per second) or ksp/s (thousand symbols per second), and sample rates are specified in Msample/s (million samples per second). Gbps, Mcps, Mbps, Msps, kbps, ksp/s and Msample/s are not SI units.

## Introduction

The R&S®SZV100A is a Q/V band upconverter. The R&S®SZV100A uses an LO signal to convert a modulated IF signal into an RF signal. With the R&S®SZV-B1056 frequency option, the converter covers an output frequency range of 36 GHz to 56 GHz.

The R&S®SMW200A equipped with the R&S®SMW-B1020 and R&S®SMW-B13XT options can generate an up to 2 GHz wide IF signal. For more information, refer to the R&S®SMW200A specifications at [www.rohde-schwarz.com/product/smw200a](http://www.rohde-schwarz.com/product/smw200a)

The R&S®SZV100A requires up to 20 GHz IF-IN and LO-IN signals.

The LO-IN signal is provided by the R&S®SMA100B with the R&S®SMAB-B120 option.

For more information, refer to the R&S®SMA100B specifications at [www.rohde-schwarz.com/product/sma100b](http://www.rohde-schwarz.com/product/sma100b)

The maximum distance between the IF/LO source and the R&S®SZV100A is 10 meters.

The cable losses were considered in the system design and the gain of the upconverter can be switched to a high gain mode.

The upconverter's IMD output performance does not depend on the input mixer. It is mainly determined by the output power amplifier.

The R&S®SZV100A is also equipped with four LEDs on the rear panel to indicate the currently active filter band.

The instrument is operable in any mounting position and provides fastening points.

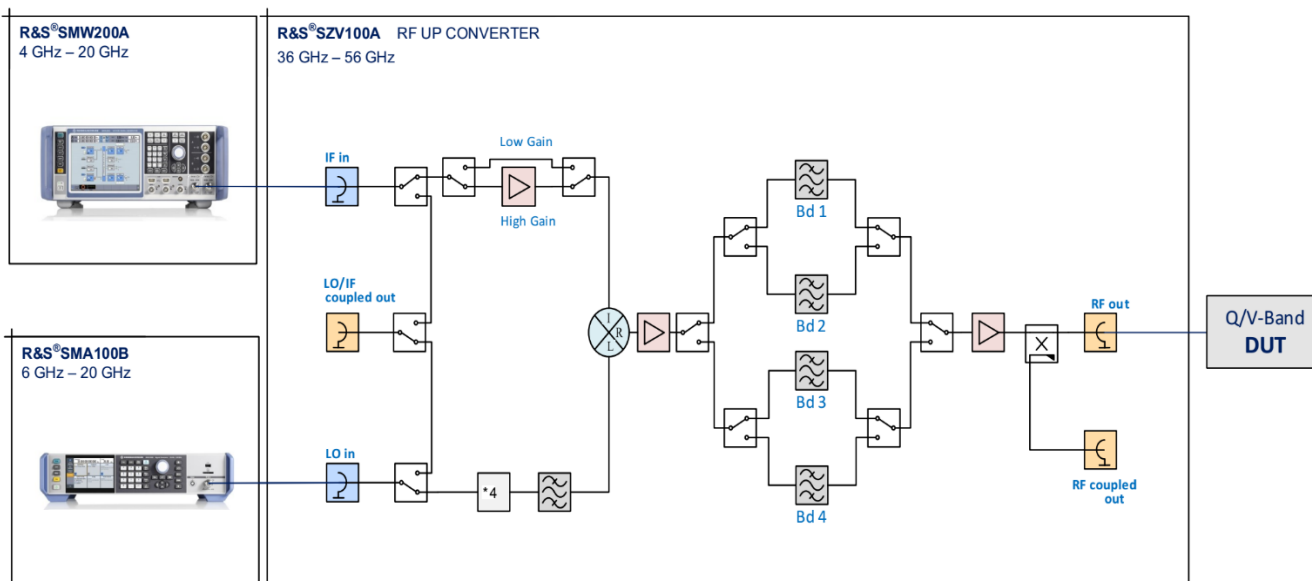
The converter setup can be remote controlled over LAN using the R&S®SZV100A control PC software.

Two control modes are available:

- Output control mode: controls the setup automatically at the RF output of the R&S®SZV100A
- IF, LO control mode: controls the setup manually via the IF and the LO sources

Using R&S®SZV100A control software, the user is able to:

- Connect over LAN all set up instruments (IF source, LO source, R&S®SZV100A and power sensors)
- Automatically set the RF frequency and the output level based on the factory frequency calibration data
- Manually select the RF band and gain mode of the R&S®SZV100A
- Manually control the setup via the LO and IF sources
- Compensate the frequency response/attenuation of the IF/LO/RF connection cables (as s2p) and exactly set the RF output level at the DUT's input
- Download the factory calibration data from the instrument's Eeprom
- Read out the instrument's temperature sensors



Connections for the Rohde & Schwarz Q/V band upconverter setup with a detailed block diagram of the R&S®SZV100A

## Frequency option (mandatory option)

The following frequency option must be installed.

R&S®SZV-B1056	36 GHz to 56 GHz, 2 GHz instantaneous modulation bandwidth
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# Specifications

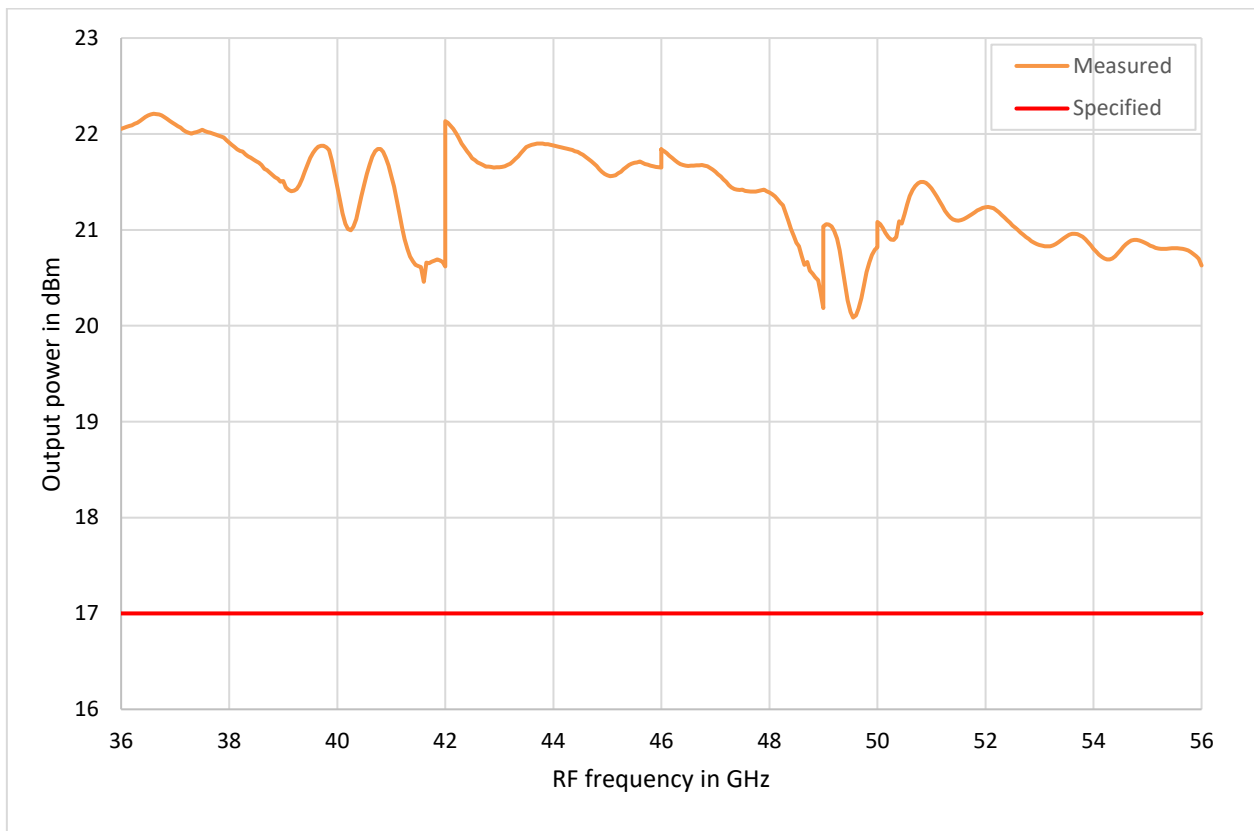
## RF characteristics

### Frequency

Range	R&S®SZV-B1056 option	36 GHz to 56 GHz, set by LO multiplier, LO-IN and IF-IN frequencies
Instantaneous modulation bandwidth		2 GHz
Setting time		5 ms

### Level

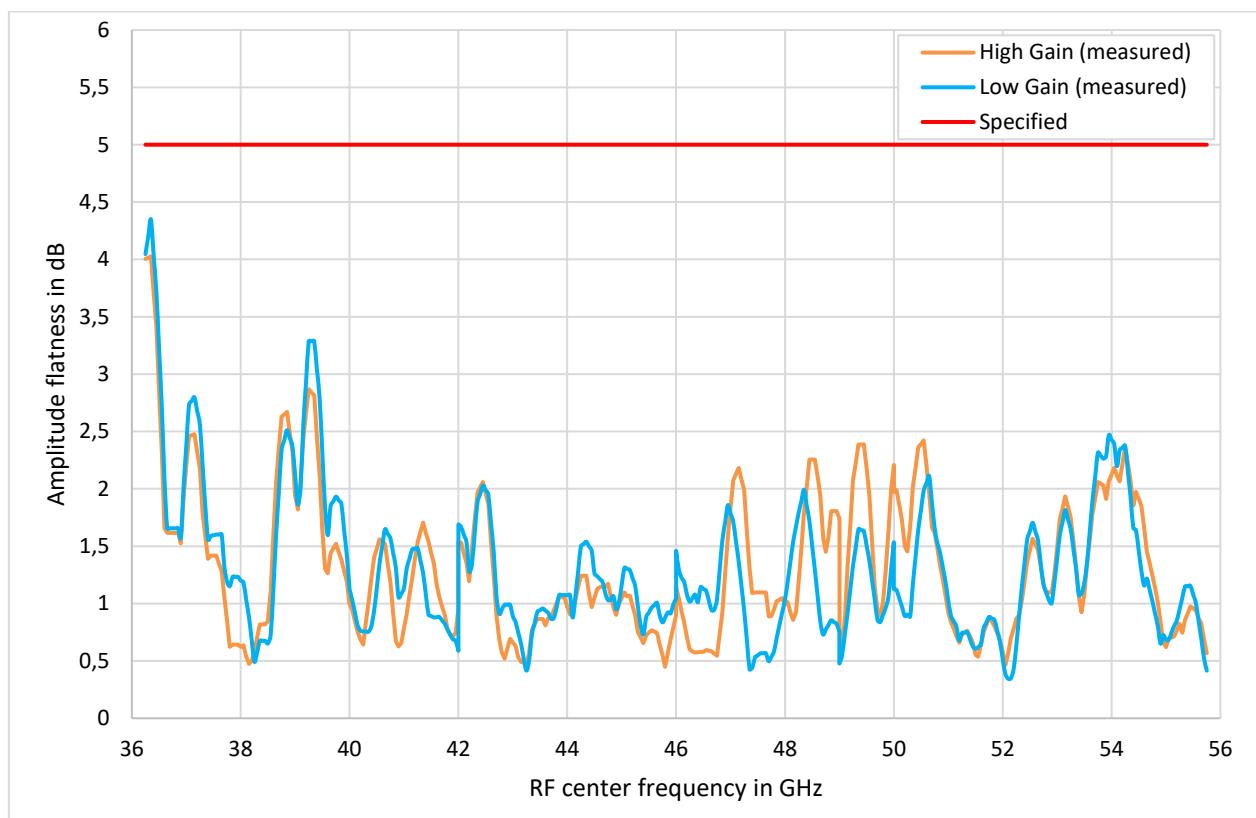
1 dB compression point	at +25 °C	≥ +16 dBm
Third order intercept (TOI) output	10 MHz tone spacing, output level < +5 dBm	> +18 dBm
Intermodulation distortion (IMD)	10 MHz tone spacing, single tone output power	
	+5 dBm	< -26 dBc
	-5 dBm	< -46 dBc
Setting time	switching IF amplifier on/off	5 ms
RF out VSWR	output impedance in 50 Ω system	< 2.1:1



Specified and measured maximum available output power (median) at +25 °C versus the RF frequency

## Upconversion transfer characteristics

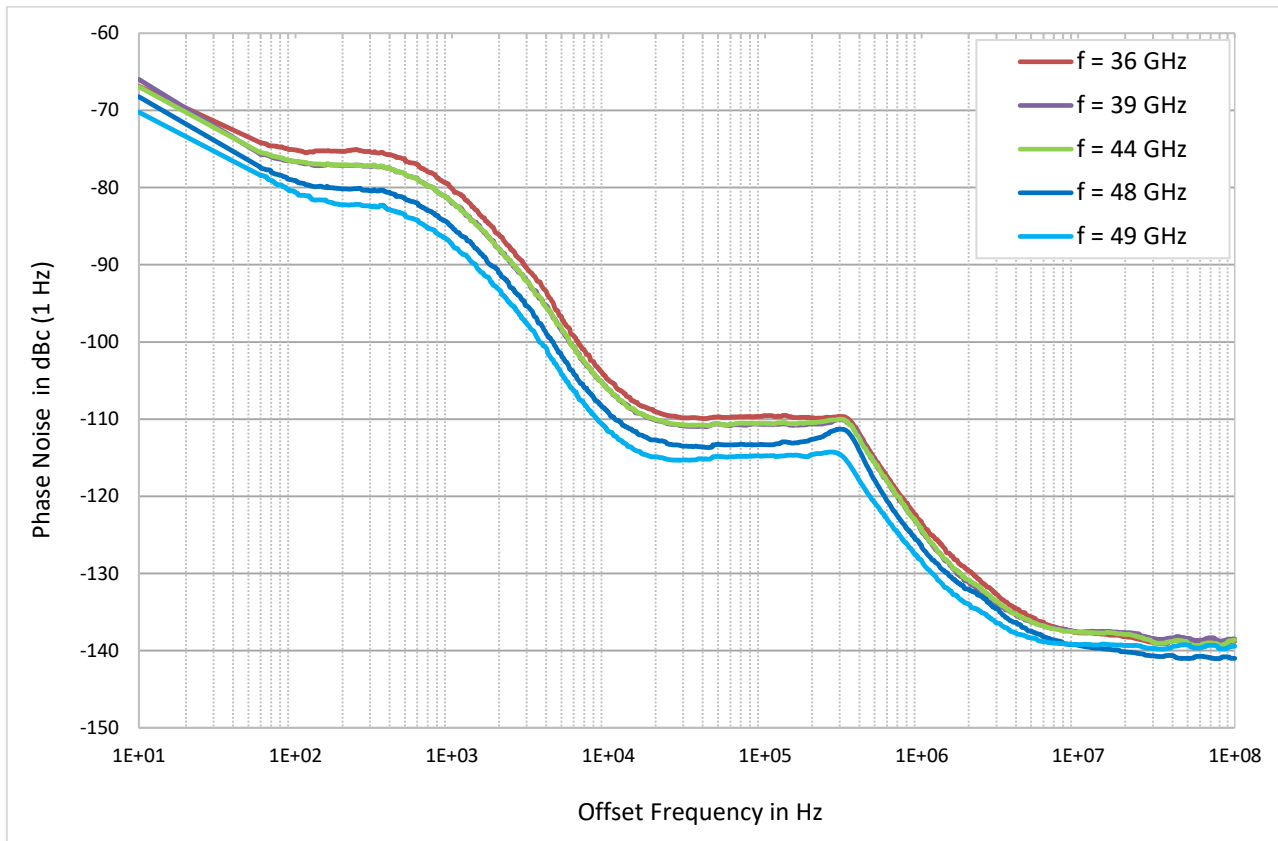
Conversion gain	IF-IN to RF out	
	low gain mode	+8 dB $\pm$ 5.0 dB
	high gain mode	+33 dB $\pm$ 5.0 dB
Temperature drift of gain	from +18 °C to +33 °C, within 2 GHz modulation bandwidth, after 30 min settling time	< 3.5 dB
Amplitude flatness	500 MHz modulation bandwidth	$\pm$ 2.5 dB
	2 GHz modulation bandwidth	$\pm$ 4.0 dB
Group delay flatness	500 MHz modulation bandwidth	$\pm$ 1.5 ns
	2 GHz modulation bandwidth	$\pm$ 4.5 ns



Specified and measured RF amplitude flatness (median) versus the RF center frequency at a modulation bandwidth of 500 MHz, for low and high gain modes

## Spectral purity

Nonharmonics	in-band nonharmonics (e.g. LO feedthrough, IF feedthrough and all mixer products), output level from -5 dBm to +5 dBm	< -55 dBc, < -65 dBc (meas.)
Harmonics	output level = +5 dBm	< -30 dBc
Wideband noise	including LO source R&S®SMA100B with -B711 option and IF source R&S®SMW200A, in I/Q modulation mode, level > -5 dBm, carrier offset > 30 MHz, measurement bandwidth = 1 Hz	
	high gain mode	< -120 dBc (1 Hz)
	low gain mode	< -123 dBc (1 Hz)
	high gain mode without IF signal	< -129 dBm (1 Hz)
SSB phase noise	including R&S®SMA100B (with -B711 option) as a LO source and R&S®SMW200A as an IF source, CW, output level = +5 dBm, carrier offset = 20 kHz, measurement bandwidth = 1 Hz	< -105 dBc (1 Hz), (< -108 dBc (1 Hz), typ.)



Measured setup SSB phase noise versus the RF frequency in low gain mode  
using the R&S®SMA100B with the -B711 option as a LO source

### Signal performance for digital standards

<b>Presettings</b>		
LO signal source		R&S®SMA100B with R&S®SMAB-B711 and -B120 options
IF signal source		R&S®SMW200A with R&S®SMW-B1020, -K544 and -B13XT options
IF digital standard	standard	5G NR FR2
	test model	NR-FR2-TM3_1__TDD_100MHz_120KHz
	modulation	64QAM
	signal bandwidth	100 MHz
IF-IN level	2 dB attenuation to IF signal source	-5 dBm
LO-IN level	1 dB attenuation to LO signal source	+6 dBm
RF frequency		47.5 GHz
<b>Specifications</b>		
Error vector magnitude	low gain mode	-41 dB (meas.)
Adjacent channel leakage ratio (ACLR)	low gain mode	-43 dBc (meas.)



Measured setup error vector magnitude of a 100 MHz wide 5G signal at 47.5 GHz

### LO-IN

LO-IN frequency range	R&S®SMA100B with R&S®SMAB-B120 option	6 GHz to 20 GHz
LO-IN level		+6 dBm to +9 dBm
LO-IN connector	50 Ω system	2.92 mm female
LO-IN VSWR	input impedance in 50 Ω system, in low and high gain mode	< 2.1:1
LO-IN damage level		> 12 dBm

### IF-IN

IF-IN frequency range	R&S®SMW200A with R&S®SMW-B1020 option	4 GHz to 20 GHz
IF-IN VSWR	input impedance in 50 Ω system, in low and high gain mode	< 1.7:1
IF-IN connector	50 Ω system	2.92 mm female
IF-IN damage level		> 20 dBm

### IF/LO coupled out

IF/LO coupled out attenuation	relative to IF-IN relative to LO-IN	5 dB to 13 dB 3 dB to 9 dB
IF/LO coupled out connector	50 Ω system	2.92 mm female
IF/LO coupled VSWR	output impedance in 50 Ω system	< 2.0:1

### RF out/coupled out

RF out connector	50 Ω system	1.85 mm female
RF coupled out connector	50 Ω system	1.85 mm female
RF coupled out attenuation	relative to RF out	15 dB to 30 dB
RF coupled VSWR	output impedance in 50 Ω system	< 2.1:1
Temperature drift of coupling factor	from +18 °C to +33 °C	< 0.6 dB
Reverse power	maximum permissible RF power from a 50 Ω source	0.25 W



## Calibration data

Stored nonvolatile in module, accessible through remote interface

Frequency calibration data	algorithm for LO and IF settings	required LO frequency, LO multiplying factor, filter/mixer bands and the IF frequency for a RF frequency set (yaml format)
Conversion gain calibration data	IF-IN to RF out gain, low and high gain mode, over ambient temperature (+5 °C, +25 °C and +45 °C)	gain in dB, phase = 0 degree (s2p format)
Detector calibration data	IF-IN to IF/LO coupled out (+25 °C)	attenuation in dB, phase in degree (s2p format)
	LO-IN to IF/LO coupled out (+25 °C)	attenuation in dB, phase in degree (s2p format)
	RF out to RF coupled out (+25 °C)	attenuation in dB, phase = 0 degree (s2p format)

## Temperature sensors

Available temperature sensors	readout through remote control interface or using the R&S®SZV control software, in °C	2 sensors in the RF modules 1 sensor in the ambient air module
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## Remote control

Interfaces	Ethernet/LAN	10/100BASE-T
Command set		SCPI 1999.0 or compatible command sets
Ethernet/LAN protocols and services		<ul style="list-style-type: none"> <li>Telnet/Raw Ethernet (remote control)</li> <li>FTP (file transfer protocol)</li> </ul>
Ethernet/LAN addressing		DHCP, static
Remote control software	set up remote control via PC software, Windows operating system	R&S®SZV control

## Additional mechanical characteristics

Signal output		micro-D, 15-pin connector with jackpost
Number of LEDs	indicate the currently active filter band	4

## Power supply

External DC power adapter	1 adapter included in R&S®SZV100A delivery	Franmar International Inc. FRA060-S12-4 54731 (Rohde & Schwarz order no.: 3588.2266.00)
	AC input	100 V to 240 V AC ( $\pm 10\%$ ) 50 Hz to 60 Hz ( $\pm 5\%$ )
	DC output	+12V DC, 60 W
Power supply connector on R&S®SZV100A		CUI PJ-064B (Rohde & Schwarz order no.: 3588.1924.00), DC power jack with 2.5 mm center pin, locking mechanism needed

## General data

<b>Environmental conditions</b>		
Temperature	operating temperature range	+5 °C to +45 °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
<b>Mechanical resistance</b>		
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
<b>Power rating (AC/DC adapter)</b>		
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
<b>Product conformity</b>		
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 B), 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: 2010 + Cor.: 2011
Use of specific hazardous materials		RoHS compliant (Directive 2011/65/EU)
<b>Calibration interval</b>	recommended for highest accuracy	12 months
<b>Dimensions</b>	W x H x D, with feet height adjustable	126 mm x 94 mm x 312 mm (4.96 in x 3.7 in x 12.28 in)
<b>Weight</b>		< 5.9 kg (< 13 lb)

## Ordering information

Designation	Type	Order No.
<b>Base unit</b>		
Q/V band RF upconverter (R&S <sup>®</sup> SMW200A and R&S <sup>®</sup> SMA100B required)	R&S <sup>®</sup> SZV100A	1431.0002.02
<b>Mandatory option</b>		
Frequency option, 36 GHz to 56 GHz, 2 GHz bandwidth, 1.85 mm female	R&S <sup>®</sup> SZV-B1056	1431.0025.02

## 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.

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

## 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**

## Rohde & Schwarz training

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

## Rohde & Schwarz customer support

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

