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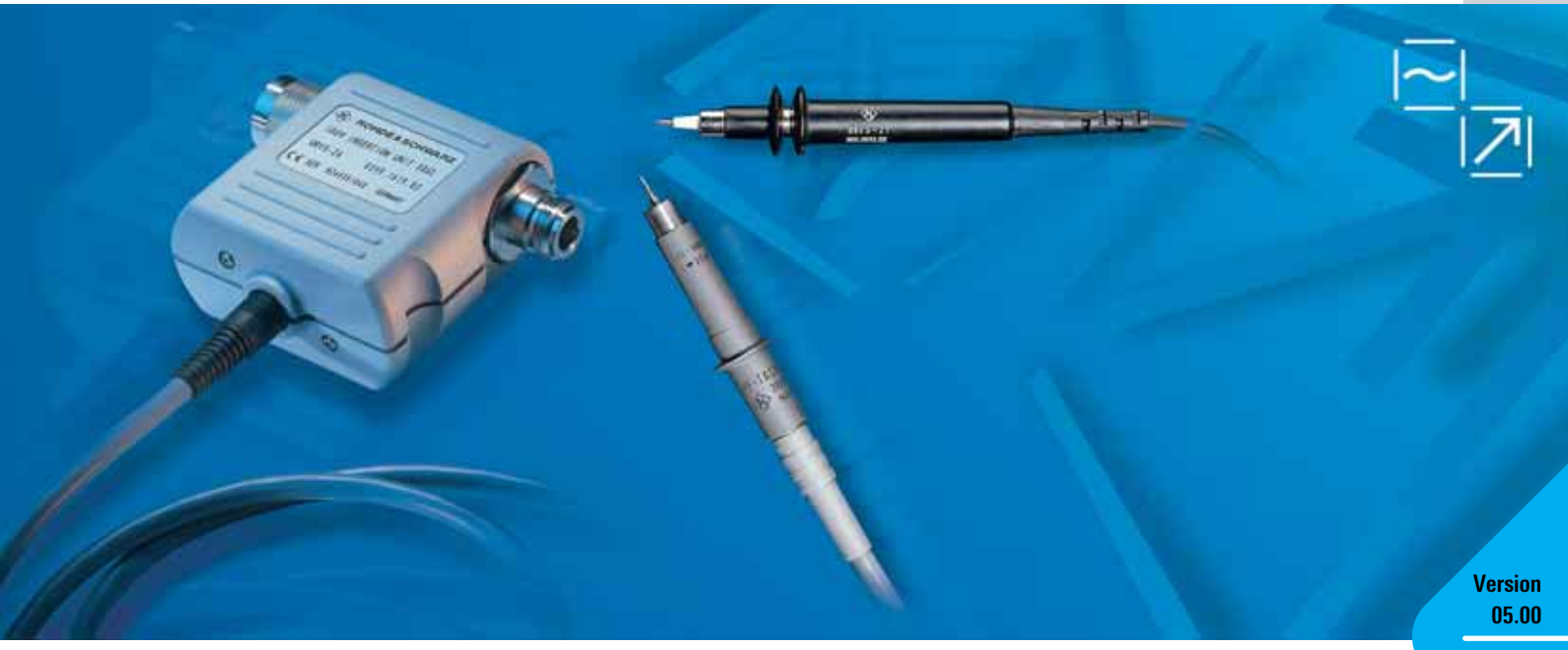
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Data sheet



Version 05.00

May 2005

Voltage Sensors R&S®URV5-Z

Universal voltage measurements from RF to microwaves

The voltage sensors of the R&S®URV5-Z series are indispensable tools in RF and microwave laboratories, test departments and service. They cover a frequency range from 9 kHz to 3 GHz and thus close the gap between low-frequency voltage measurements and microwave power measurements.

Consequently they may be used for the following measurements:

- High-impedance DC and AC voltage measurements in non-coaxial circuits
- Level measurements in 50 Ω lines
- Terminated power measurements

Voltage sensors are the right tools for everyday use. They permit the measurement of voltages from 200 µV to 1000 V and of powers from 1 nW (–60 dBm) up to 200 W (+53 dBm).

ROHDE&SCHWARZ

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Sensors

R&S®URV5-Z7 **0395.2615.02**	**RF Probe** 200 µV to 10 (1000) V, 20 kHz to 1 GHz
R&S®URV-Z6 **0292.5364.02**	**Accessory Set** 20/40 dB plug-on dividers and 50 Ω BNC adapter for RF probe
R&S®URV-Z50 **0394.9816.50**	**50 Ω Adapter** for power measurements with RF probe at 50 Ω sources
R&S®URV-Z3 **0243.9118.70**	**75 Ω Adapter** for power measurements with RF probe at 75 Ω sources
R&S®URV5-Z1 **0395.0512.02**	**DC Probe** 1 mV to 400 V
R&S®URV5-Z2 **0395.1019.02/05**	**Insertion Unit 50 Ω** 200 µV to 10 V, 9 kHz to 3 GHz
R&S®URV5-Z4 **0395.1619.02/05**	**Insertion Unit 50 Ω** 2 mV to 100 V, 100 kHz to 3 GHz



Low-load voltage measurement with the RF Probe R&S®URV5-Z7

Measurement accuracy

Voltage sensors and measuring devices have a long tradition in RF measurements but for a long time they were not considered very accurate. Since 1989, Rohde&Schwarz has set standards with its voltage sensors: state-of-the-art zero-bias Schottky diodes ensuring highly stable, reproducible measurements. Instead of using analog methods for linearization and compensating temperature errors of the rectifier in the sensors, correction values are calculated. Each sensor has a built-in calibration data memory which holds all individual parameters to be taken into account by the meter.

This numerical correction offers high accuracy over the entire dynamic range of >90 dB and at the same time simplifies operation: the meter identifies the type of sensor connected and automatically adapts to it. When a test frequency is entered by the user, the frequency response determined during calibration may be selected for increasing the measurement accuracy.

Waveform weighting

All R&S®URV5-Z AC sensors are calibrated so that the rms value is indicated for a sinewave voltage. With other waveforms, e.g. squarewaves, the peak value is decisive for the type of weighting employed. Below about 30 mV, the RF probe and the 10 V insertion unit measure rms values. Above 1 V, the peak-to-peak value V_{pp} is measured and $V_{pp}/(2\sqrt{2})$ is indicated, which corresponds to the rms value of a sinewave voltage. Between 30 mV and 1 V the type of weighting is determined by the waveform.

The measurement of modulated sinewave voltages follows a pattern similar to that of non-sinusoidal waveforms. Up to a peak value of 30 mV at the envelope´s maximum (corresponding to 10 µW PEP in 50 Ω systems), the true rms value is measured. With power indication in W or dBm, the average power is displayed. Above 1 V (10 mW PEP) and with a modulation frequency of at least 10 kHz, the peak value is measured again. In the case of power measurements, the peak envelope power PEP is indicated without any calculations being required, and for voltages the value $V_{PP}/(2\sqrt{2})$.

Limit values specified for the 100 V Insertion Unit R&S®URV5-Z4 are 20 dB higher than for the 10 V insertion unit, i.e. by a factor of 10 for voltages and by a factor of 100 for power levels. When a plug-on divider is used with the RF probe, limit values are to be increased by the amount of the preceding attenuation.



The Level Meter R&S®URV35 with the Insertion Unit R&S®URV5-Z2 in mobile use

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Four types of meters are available for voltage and power measurements.

Meters

R&S®URV35
compact voltmeter and power meter for use in service, testshops and labs. unique combination of analog and digital display in the form of moving-coil meter plus LCD. Many measurement functions, display in all standard units, choice of battery or AC supply operation, RS-232-C interface. All sensors are suitable.

R&S®URV55
Attractively priced, single-channel voltmeter. Many measurement functions, display of results in all standard units, analog output comes as standard, IEC/IEEE bus connector. All sensors are suitable.

R&S®NRVD
Modern dual-channel power meter with menu operation and IEC/IEEE bus connector (SCPI). Ideal for relative measurements in two test channels (attenuation, reflection). Large variety of measurement functions, display of results in all standard units. Many extras like 1 mW test generator, indication of measurement uncertainty, etc. All sensors are suitable.

R&S®NRVS
Attractively priced, single-channel power meter, similar to the R&S®URV 55. All sensors are suitable.









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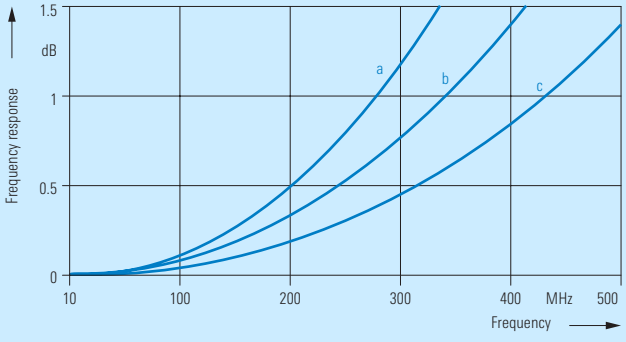
RF Probe R&S®URV5-Z7

The RF probe is a universal tool for measuring RF voltages. The low input capacitance of 2.5 pF makes it virtually non-loaded and ideally suitable for measurements on non-coaxial circuits up to 500 MHz or up to 1 GHz when appropriate accessories are used. A plug-on divider extends the voltage measurement range from 10 V to 1000 V and at the same time reduces the input capacitance to 0.5 pF.

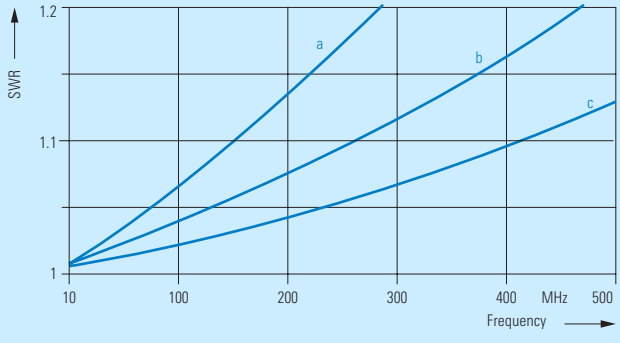
Compared to active, high-impedance probes, the dynamic range of the R&S®URV5-Z7 is greater by a factor of 10 to 100, i.e. higher voltages can be measured with the same sensitivity. With a dynamic range from 200 µV to 10 V without the use of a plug-on divider, the probe covers all voltage levels common in state-of-the-art electronic equipment.



The RF Probe R&S® URV5-Z7, 200 µV to 10 (1000) V, 20 kHz to 1 GHz



Typical frequency response of the RF Probe R&S® URV5-Z7 with voltage measurements on a matched 50 Ω line (without adapter, short ground connection); a) direct, b) with 20 dB plug-on divider, c) with 40 dB plug-on divider



Typical SWR of a matched 50 Ω line after connecting the RF Probe R&S® URV5-Z7 (without adapter, short ground connection); a) direct, b) with 20 dB plug-on divider, c) with 40 dB plug-on divider

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Accessories for RF probe



20/40 dB plug-on dividers and BNC adapter

Accessory Set R&S®URV-Z6

20 dB and 40 dB plug-on dividers for extending the voltage measurement range and reducing the input capacitance to 100 V/1 pF or 1000 V/0.5 pF. BNC adapter for level measurements in 50 Ω coaxial lines (see also Insertion Units R&S®URV5-Z2/-Z4).



R&S®URV-Z50: 50 Ω, 20 kHz to 1 GHz, 1 nW to 2 W

Adapters R&S®URV-Z50 and R&S®URV-Z3

With integrated termination for power measurements on matched sources, the adapters make the probe a power sensor with an extremely wide dynamic range of 93 dB. For increasing the measurement accuracy with the 50 Ω adapter connected, frequency response correction data is stored in each probe.



R&S®URV-Z3: 75 Ω, 20 kHz to 500 MHz, 0.5 nW to 1.3 W

DC Probe R&S®URV5-Z1

The low input capacitance of the DC Probe R&S®URV5-Z1 makes it particularly suitable for measurements in RF circuits. Since the probe is virtually non-loaded, the circuit under test remains largely unaffected. This prevents the operating point of active circuits from being shifted, which can occur with high capacitive loading.



The DC Probe R&S®URV5-Z1, 1 mV to 400 V, 3 pF // 9 MΩ

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Insertion Units R&S®URV5-Z2 and R&S®URV5-Z4

The Insertion Units R&S®URV5-Z2 and R&S®URV5-Z4 are used for uninterrupted level measurements between source and load and for terminated power measurements. Due to their wide frequency range they are ideal especially for the measurement of EMC test levels as well as many general-purpose applications.

Compared to the terminating power sensors of the R&S®NRV family, the R&S®URV5-Z2 and R&S®URV5-Z4 insertion units offer a larger dynamic range, a much lower frequency limit (9 kHz with the R&S®URV5-Z2) and the possibility of using them during operation of the load.

Both units are made up of a short, coaxial line between the two RF connectors, in the middle of which the voltage is tapped: directly with the R&S®URV5-Z2, and via a capacitive 20 dB divider with the R&S®URV5-Z4. If the insertion units are match-terminated, the voltage is constant over the whole length of the line, so a fixed relationship is obtained between applied RF power and test voltage: $P = V_{rms}^2 / 50\,\Omega$. In this configuration, the insertion units provide precise absolute power and level measurements.

The insertion units are calibrated so that the power incident upon them is indicated. With a poorly matched load, precise absolute-value measurements are not possible, but relative measurements can be performed and system applications implemented in which subsequent calibration of the complete test setup takes place. Switchover between voltage, level and power indication is made at the base unit.



The Insertion Unit R&S®URV5-Z2, 200 µV to 10 V, 9 kHz to 3 GHz
The Insertion Unit R&S®URV5-Z4, 2 mV to 100 V, 100 kHz to 3 GHz

The built-in detectors offer a dynamic range of more than 90 dB for spectrally pure sinusoidal signals with an unmodulated envelope (CW, FM, φM, GMSK, FSK, etc). This yields a voltage measurement range of 200 µV to 10 V (–60 dBm to +33 dBm into 50 Ω) for the R&S®URV5-Z2, and of 2 mV to 100 V (–40 dBm to +53 dBm into 50 Ω) for the R&S®URV5-Z4. With modulated envelope or high harmonic content, the insertion units should be operated only within the square-law region of the detectors, which for the R&S®URV5-Z2 ends at approx. 22 mV (–20 dBm into 50 Ω) and for the R&S®URV5-Z4 at 220 mV (0 dBm into 50 Ω). In this region, the behavior of the insertion units is similar to that of a thermal power meter, i.e. the rms voltage or the equivalent average power is measured.

Owing to the high decoupling of the detector from the RF connectors, insertion loss of the R&S®URV5-Z4 is very low, i.e. not exceeding that of a line of equivalent length. The R&S®URV5-Z4 is therefore truly transparent and can be inserted into any test circuit without influencing the parameters to be measured.

Both insertion units are equipped with a calibration data memory that contains information about the individual sensor characteristics such as frequency response, linearity, temperature coefficient, etc. The stored data is automatically considered by the base unit during operation so that the user can plug the sensor in and immediately start measuring.

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Power sensors

Power sensors of the R&S®NRV-Z series listed in the table below are available for further applications. (For more detailed information, refer to the R&S®NRV-Z data sheet, PD 0758.2248.32.)



R&S®NRV-Z1 **0828.3018.02**	**Diode Power Sensor 50 Ω** 10 MHz to 18 GHz, 200 pW to 20 mW	Power measurements of highest sensitivity up to 18 GHz in 50 Ω systems
R&S®NRV-Z2 **0828.3218.02**	**Diode Power Sensor 50 Ω** 10 MHz to 18 GHz, 20 nW to 500 mW	Power measurements with minimum mismatch, for high powers in 50 Ω systems
R&S®NRV-Z3 **0828.3418.02**	**Diode Power Sensor 75 Ω** 1 MHz to 2.5 GHz, 100 pW to 13 mW	Power measurements in 75 Ω systems
R&S®NRV-Z4 **0828.3618.02**	**Diode Power Sensor 50 Ω** 100 kHz to 6 GHz, 100 pW to 20 mW	Power measurements of highest sensitivity in the frequency range 100 kHz to 6 GHz, very large dynamic range
R&S®NRV-Z5 **0828.3818.02**	**Diode Power Sensor 50 Ω** 100 kHz to 6 GHz, 10 nW to 500 mW	Same as R&S®NRV-Z4, but for high powers and minimum mismatch
R&S®NRV-Z6 **0828.5010.02**	**Diode Power Sensor 50 Ω** 50 MHz to 26.5 GHz, 400 pW to 20 mW	Power measurements up to 26.5 GHz with high sensitivity and dynamic range in 50 Ω systems (PC 3.5 connector)
R&S®NRV-Z15 **1081.2305.02**	**Diode Power Sensor 50 Ω** 50 MHz to 40 GHz, 400 pW to 20 mW	Power measurements up to 40 GHz with high sensitivity and dynamic range in 50 Ω systems (2.92 mm connector)
R&S®NRV-Z31 **0857.9604.02/03/04**	**Peak Power Sensor 50 Ω** 30 MHz to 6 GHz, 1 µW to 20 mW	Peak power measurements, pulse width ≥2 (200) µs, pulse repetition rate ≥10 (100) Hz, 3 models
R&S®NRV-Z32 **1031.6807.04/05**	**Peak Power Sensor 50 Ω** 30 MHz to 6 GHz, 100 µW to 2 (4) W	Peak power measurements, pulse width ≥2 (200) µs, pulse repetition rate ≥25 (100) Hz, 2 models
R&S®NRV-Z33 **1031.6507.03/04**	**Peak Power Sensor 50 Ω** 30 MHz to 6 GHz, 1 mW to 20 W	Peak power measurements up to 20 W, pulse width ≥2 (200) µs, pulse repetition rate ≥100 Hz, 2 models
R&S®NRV-Z51 **0857.9004.02**	**Thermal Power Sensor 50 Ω** DC to 18 GHz, 1 µW to 100 mW	High-precision power measurements also with non-sinusoidal signals
R&S®NRV-Z52 **0857.9204.02**	**Thermal Power Sensor 50 Ω** DC to 26.5 GHz, 1 µW to 100 mW	Same as R&S®NRV-Z51, but with PC 3.5 connector for measurements up to 26.5 GHz
R&S®NRV-Z53 **0858.0500.02**	**Thermal Power Sensor 50 Ω** DC to 18 GHz, 100 µW to 10 W	High-power measurements up to 10 W also with non-sinusoidal signals
R&S®NRV-Z54 **0858.0800.02**	**Thermal Power Sensor 50 Ω** DC to 18 GHz, 300 µW to 30 W	High-power measurements up to 30 W also with non-sinusoidal signals
R&S®NRV-Z55 **1081.2005.02**	**Thermal Power Sensor 50 Ω** DC to 40 GHz, 1 µW to 100 mW	Same as R&S®NRV-Z51, but with 2.92 mm connector for measurements up to 40 GHz

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Specifications

Type	Frequency range Impedance	Voltage measurement range Max. rating	Power /level measurement range	SWR (reflection coefficient) max.	Ins. loss in dB (max.)[8]	RF connector
RF Probe R&S®URV5-Z7	20 kHz to 500 MHz[5] 2.5 pF || 80 kΩ[1]	200 µV to 10 V 15 V (rms) 22 V (pk), 60 V (DC)[15]	1 nW to 2 W –60/+33 dBm	—	—	BNC (female/ female)
With 20 dB plug-on divider (R&S®URV-Z6)	1 MHz to 500 MHz[5] 1 pF || 1 MΩ[1]	2 mV to 100 V 150 V (rms)[2] 220 V (pk), 1000 V (DC)	100 nW to 20 W[4] –40/+43 dBm	—	—	BNC (female/ female)
With 40 dB plug-on divider (R&S®URV-Z6)	0.5 MHz to 500 MHz[5] 0.5 pF || 10 MΩ[1]	20 mV to 1000 V 1050 $V_{(rms)}$[2][3] 1500 V(pk), 1000 V(DC)	10 µW to 20 W[4] –20/+43 dBm	—	—	BNC (female/ female)
With 50 Ω Adapter R&S®URV-Z50	20 kHz to 1 GHz 50 Ω	200 µV to 10 V 10 V (rms) 22 V (pk)	1 nW to 2 W –60/+33 dBm	0.02 MHz to 50 MHz: 1.03 (0.015) >50 MHz to 100 MHz: 1.06 (0.03) >100 MHz to 500 MHz: 1.11 (0.05) >500 MHz to 700 MHz: 1.22 (0.10) >700 MHz to 1 GHz: 1.44 (0.18)	—	BNC (female or male)
With 75 Ω Adapter R&S®URV-Z3	20 kHz to 500 MHz 75 Ω	200 µV to 10 V 12 V (rms) 22 V (pk)	500 pW to 1.3 W –62/+31 dBm	0.02 MHz to 100 MHz: 1.03 (0.015) >100 MHz to 200 MHz: 1.06 (0.03) >200 MHz to 500 MHz: 1.22 (0.10)	—	BNC (male) 2.5/6 1.6/5.6
DC Probe R&S®URV5-Z1	— 3 pF || 9 MΩ	1 mV to 400 V 400 V (pk)	—	—	—	BNC (male)
10 V Insertion Unit R&S®URV5-Z2	9 kHz to 3 GHz 50 Ω	200 µV to 10 V[6] 15 V (rms) to 1 GHz $\frac{15V(rms)}{f/GHz}$ from 1 GHz to 3 GHz 22 V (pk), 50 V (DC)	1 nW to 2 W[6] –60/+33 dBm[6]	9 kHz to 200 MHz: 1.04 (0.02) >200 MHz to 500 MHz: 1.10 (0.048) >500 MHz to 1 GHz: 1.22 (0.10) >1 GHz to 1.6 GHz: 1.35 (0.15) >1.6 GHz to 2 GHz: 1.35 (0.15) >2 GHz to 2.4 GHz: 1.35 (0.15) >2.4 GHz to 3 GHz: 1.35 (0.15)	0.07 0.2 0.5 1.0 1.5 2.5 3.5	N (female/ male)
100 V Insertion Unit R&S®URV5-Z4	100 kHz to 3 GHz 50 Ω	2 mV to 100 V[7] 150 V (rms) to 1 GHz $\frac{150V(rms)}{\sqrt{f/(GHz)}}$ from 1 GHz to 3 GHz 220 V (pk), 600 V (DC)	100 nW to 200 W[7] –40/+53 dBm[7]	0.1 MHz to 500 MHz: 1.04 (0.02) >500 MHz to 1.6 GHz: 1.07 (0.035) >1.6 GHz to 2 GHz: 1.07 (0.035) >2 GHz to 3 GHz: 1.10 (0.048)	0.05 0.1 0.15 0.15	N (female/ male)

Measurement uncertainties

In the temperature range 18 °C to 28 °C for spectrally pure sinewave signals and DC voltage (DC Probe R&S®URV5-Z1 only). Values in dB and in % (in parentheses; referenced to measured voltage). The effects of base unit, zero offset, display noise and ambient temperature (out of specified range) are to be considered separately.

Type	Frequency range	Without frequency response correction[9]		With frequency response correction[10]
RF Probe R&S®URV5-Z7[12]	20 kHz to 50 kHz	–0.2/+0.9[11]	(–2.3/+10)[11]	–
	>50 kHz to 100 kHz	±0.2	(±2.3)	–
	>100 kHz to 200 kHz	±0.11	(±1.3)	–
	>0.2 MHz to 32 MHz	±0.07	(±0.8)	–
	>32 MHz to 100 MHz	±0.16	(±1.8)	–
	>100 MHz to 200 MHz	±0.29	(±3.3)	–
	>200 MHz to 500 MHz	–1/+1.1	(±12)	–
With 20 dB plug-on divider (R&S®URV-Z6)[12]	1 MHz to 2 MHz	–1/+1.9[11]	(–12/+20)[11]	–
	>2 MHz to 100 MHz	–1/+1.1	(±12)	–
	>100 MHz to 200 MHz	–1.2/+1.4	(±15)	–
	>200 MHz to 500 MHz	–1.6/+1.9	(±20)	–
With 40 dB plug-on divider (R&S®URV-Z6)[12]	0.5 MHz to 1 MHz	–0.6/+1.9[11]	(–7/+20)[11]	–
	>1 MHz to 100 MHz	±0.6	(±7)	–
	>100 MHz to 200 MHz	–0.8/+0.9	(±10)	–
	>200 MHz to 500 MHz	–1.2/+1.4	(±15)	–
With 50 Ω Adapter R&S®URV-Z50[13]	20 kHz to 50 kHz	–0.2/+0.9[11]	(–2.3/+10)[11]	–
	>50 kHz to 100 kHz	±0.2	(±2.3)	–
	>100 kHz to 200 kHz	±0.16	(±1.8)	–
	>0.2 MHz to 32 MHz	±0.11	(±1.3)	–
	>32 MHz to 100 MHz	±0.2	(±2.3)	0.2 (2.3)
	>100 MHz to 200 MHz	±0.38	(±4.3)	0.29 (3.3)
	>200 MHz to 500 MHz	–0.8/+0.9	(±10)	0.66 (7.3)
	>0.5 GHz to 1 GHz	–1.6/+1.9	(±20)	1.0 (12) 200 µV to 1 V
		–1.6/+1.9	(±20)	1.2 (14) >1 V to 10 V

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Type	Frequency range	Without frequency response correction[9]		With frequency response correction[10]
With 75 Ω Adapter R&S®URV-Z3[13]	20 kHz to 50 kHz	–0.2/+0.9[11]	(–2.3/+10)[11]	–
	>50 kHz to 100 kHz	±0.2	(±2.3)	–
	>100 kHz to 200 kHz	±0.16	(±1.8)	–
	>0.2 MHz to 32 MHz	±0.11	(±1.3)	–
	>32 MHz to 100 MHz	±0.2	(±2.3)	–
	>100 MHz to 200 MHz	±0.38	(±4.3)	–
	>200 MHz to 500 MHz	–1/+1.1	(±12)	–

Measurement uncertainties

Values in dB and in % (in parentheses; referenced to measured voltage)

Type	Frequency range	With frequency response correction[10] up to1 V (20 mW/+13 dBm)		With frequency response correction[10] above 1 V (20 mW/+13 dBm)	
10 V Insertion Unit R&S®URV5-Z2[14] at R&S®URV35, R&S®URV55, R&S®NRVS, R&S®NRVD	9 kHz to 20 kHz	0.35[11]	(4.0)[11]	0.20[11]	(2.3)[11]
	>20 kHz to 50 kHz	0.20[11]	(2.3)[11]	0.17[11]	(2.0)[11]
	>50 kHz to 100 kHz	0.17	(2.0)	0.17	(2.0)
	>100 kHz to 100 MHz	0.13	(1.5)	0.13	(1.5)
	>100 MHz to 200 MHz	0.17	(2.0)	0.17	(2.0)
	>200 MHz to 500 MHz	0.20	(2.3)	0.25	(2.9)
	>0.5 GHz to 1.0 GHz	0.25	(2.9)	0.30	(3.5)
	>1.0 GHz to 1.6 GHz	0.30	(3.5)	0.40	(4.6)
	>1.6 GHz to 2.0 GHz	0.35	(4.0)	0.50	(5.8)
	>2.0 GHz to 2.4 GHz	0.40	(4.6)	0.60	(6.9)
	>2.4 GHz to 3.0 GHz	0.50	(5.8)	0.75	(8.6)
10 V Insertion Unit R&S®URV5-Z2[14] at R&S®URV5, R&S®NRV	>9 kHz to 20 kHz	0.45[11]	(5.2)[11]	0.30[11]	(3.5)[11]
	>20 kHz to 50 kHz	0.20[11]	(2.3)[11]	0.20[11]	(2.3)[11]
	>50 kHz to 100 kHz	0.17	(2.0)	0.17	(2.0)
	>100 kHz to 100 MHz	0.13	(1.5)	0.13	(1.5)
	>100 MHz to 200 MHz	0.20	(2.3)	0.20	(2.3)
	>200 MHz to 500 MHz	0.25	(2.9)	0.30	(3.5)
	>0.5 GHz to 1.0 GHz	0.35	(4.0)	0.40	(4.6)
	>1.0 GHz to 1.6 GHz	0.45	(5.2)	0.55	(6.3)
	>1.6 GHz to 2.0 GHz	0.55	(6.3)	0.65	(7.5)
	>2.0 GHz to 2.4 GHz	0.65	(7.5)	0.80	(9.2)
	>2.4 GHz to 3.0 GHz	0.85	(9.8)	1.05	(12)
		Up to 10 V (2 W/+33 dBm)		**Above 10 V (2 W/+33 dBm)**	
100 V Insertion Unit R&S®URV5-Z4[14] at R&S®URV35, R&S®URV55, R&S®NRVS, R&S®NRVD	100 kHz to 200 kHz	1.50[11]	(18)[11]	0.50[11]	(5.8)[11]
	>200 kHz to 500 kHz	0.60[11]	(6.9)[11]	0.25[11]	(2.9)[11]
	>500 kHz to 1 MHz	0.20[11]	(2.3)[11]	0.17[11]	(2.0)[11]
	>1 MHz to 3 MHz	0.17	(2.0)	0.13	(1.5)
	>3 MHz to 200 MHz	0.13	(1.5)	0.13	(1.5)
	>200 MHz to 500 MHz	0.17	(2.0)	0.20	(2.3)
	>0.5 GHz to 1 GHz	0.20	(2.3)	0.25	(2.9)
	>1.0 GHz to 1.6 GHz	0.30	(3.5)	0.40	(4.6)
	>1.6 GHz to 2.0 GHz	0.35	(4.0)	0.50	(5.8)
	>2.0 GHz to 2.4 GHz	0.45	(5.2)	0.70	(8.1)
	>2.4 GHz to 3.0 GHz	0.65	(7.5)	1.05	(12)
100 V Insertion Unit R&S®URV5-Z4[14] at R&S®URV5, R&S®NRV	100 kHz to 200 kHz	2.20[11]	(26) [11]	0.80[11]	(9.2)[11]
	>200 kHz to 500 kHz	0.80[11]	(9.2)[11]	0.40[11]	(4.6)[11]
	>500 kHz to 1 MHz	0.25[11]	(2.9)[11]	0.20[11]	(2.3)[11]
	>1 MHz to 3 MHz	0.17	(2.0)	0.13	(1.5)
	>3 MHz to 200 MHz	0.13	(1.5)	0.13	(1.5)
	>200 MHz to 500 MHz	0.17	(2.0)	0.20	(2.3)
	>0.5 GHz to 1.0 GHz	0.25	(2.9)	0.30	(3.5)
	>1.0 GHz to 1.6 GHz	0.45	(5.2)	0.55	(6.3)
	>1.6 GHz to 2.0 GHz	0.60	(6.9)	0.70	(8.1)
	>2.0 GHz to 2.4 GHz	0.80	(9.2)	1.00	(12)
	>2.4 GHz to 3.0 GHz	1.15	(14)	1.50	(18)

Type	Voltage measurement range	Measurement uncertainty[9]
DC Probe R&S®URV5-Z1	1 mV to 100 V	±0.013 (±0.15)
	>100 V to 400 V	±0.030 (±0.35)

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[1] Applies to 10 MHz. For impedance at higher frequencies see SWR diagram on page 4.

[2] Not with BNC adapter.

[3] Up to 40 MHz.

$V_{(rms)} \leq \frac{210V}{\sqrt{\left(\frac{f}{GHz}\right)}}$ applies at higher frequencies.

[4] With BNC adapter (50 Ω). Maximum power limited by losses in the adapter.

[5] Upper limit frequency depending on adapter and source impedance.

[6] Up to 1.5 GHz. At higher frequencies the upper limit of the measurement range is to be reduced according to max.rating.

[7] Up to 2 GHz. At higher frequencies the upper limit of the measurement range is to be reduced according to max.rating.

[8] The insertion loss of the Insertion Unit R&S®URV5-Z2 is level-dependent above 0.5 GHz. The specified values refer to low test voltages at which the highest loss is obtained.

[9] Measurement uncertainty limits without consideration of correction values for the frequency-dependent response of RF probes. Measurement uncertainty limits are identical with error limits, but with opposite sign.

[10] Expanded uncertainty with a coverage factor k = 2, with the frequency-dependent correction values stored in the probe being taken into account. An expanded uncertainty with k=2 corresponds to a coverage probability of approx. 95% for a normal distribution of combined errors.

[11] In this frequency range the measurement accuracy is strongly voltage- and temperature-dependent. Therefore, at temperatures above 28 °C an increase in the measurement uncertainty is to be expected that is far above the value specified for the temperature effect. In the worst case it can be assumed that the measurement uncertainty will double with every temperature increase of 5 K, i.e. at 33 °C, 38 °C etc, for the R&S®URV5-Z7 without plug-on divider between 20 kHz and 30 kHz, for the R&S®URV5-Z2 between 9 kHz and 15 kHz and for the R&S®URV5-Z4 between 100 kHz and 300 kHz.

[12] In BNC adapter terminated with 50 Ω load. Specifications referenced to incident wave at source terminal. With mismatched load, measurement uncertainty limits may rise due to standing waves by about ±4 dB (SWR-1). The approximation refers to SWR of up to 1.25; for SWR = 1.2 the increase would be ±0.8 dB.

[13] Specifications referenced to incident wave.

[14] With reflection-free load at the female connector, frequency correction switched on, specifications referenced to incident wave at male connector. Due to standing waves, mismatch of the load can lead to an additional measurement uncertainty that can be approximated by 2.8 dB x (SWR-1) for the standard uncertainty (formula valid for SWR of up to 1.25).

[15] Limited to the specified value for reasons of conformity with international safety standards. Deviating specifications on the type plates of older sensors are to be regarded as the maximum possible physical rating.



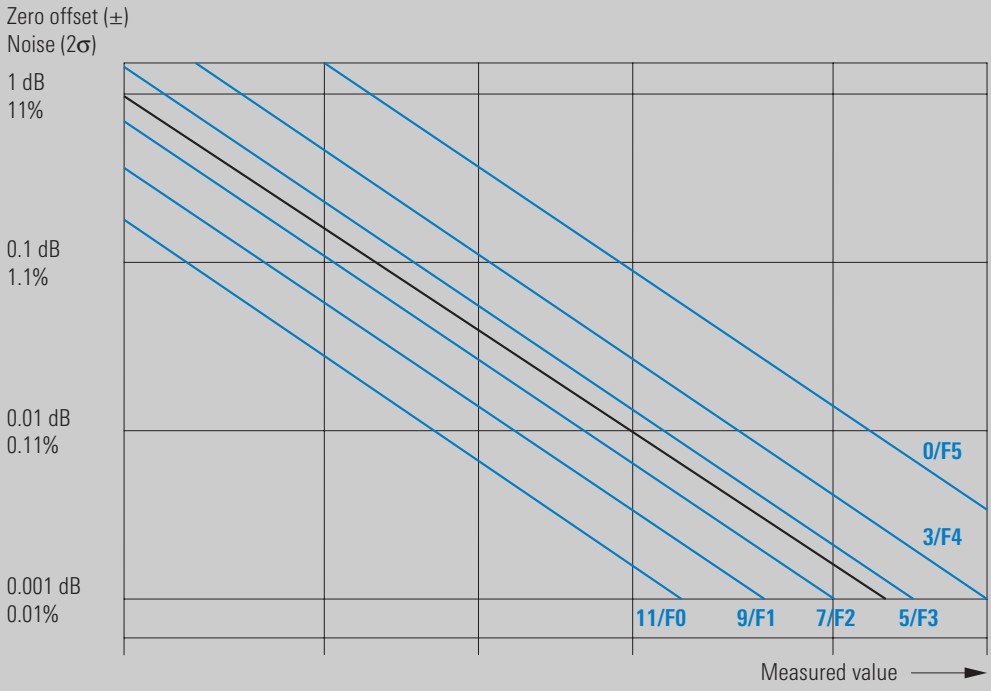
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Zero offset and display noise (relevant with small voltages/powers only)
DC probe: zero offset ±0.5 mV, display noise negligible. All other probes: see diagram. For display noise of the Level Meter R&S®URV35 see relevant specifications.

Black curve:
Zero offset (within 1 h after zero adjustment; temperature variation <1°C; meter with probe run in for about 2 hours)

Blue curves:
Display noise (2 standard deviations, monitoring time 1 min, probe temperature 18°C to 28°C, values about double at 0°C)

Filter designations:
0 to 11 for the R&S®URV55, R&S®NRVS and R&S®NRVD,
F0 to F5 for the R&S®URV5 and R&S®NRV



RF probe without plug-on divider	200 µV	500 µV	1 mV	2 mV	5 mV	10 mV
RF probe in 50 Ω/75 Ω adapter	–60 dBm	–53 dBm	–47 dBm	–40 dBm	–33 dBm	–27 dBm
10 V Insertion Unit R&S®URV5-Z2	1 nW	5 nW	20 nW	100 nW	500 nW	2 µW
RF probe with 20 dB plug-on divider	2 mV	5 mV	10 mV	20 mV	50 mV	100 mV
100 V Insertion Unit R&S®URV5-Z4	–40 dBm	–33 dBm	–27 dBm	–20 dBm	–13 dBm	–7 dBm
	100 nW	500 nW	2 µW	10 µW	50 µW	200 µW
RF probe with 40 dB plug-on divider	20 mV	50 mV	100 mV	200 mV	500 mV	1 V
	–20 dBm	–13 dBm	–7 dBm	0 dBm	+7 dBm	+13 dBm
	10 µW	50 µW	200 µW	1 mW	5 mW	20 mW

All level and power values refer to 50 Ω. Values for 75 Ω differ slightly.

Temperature effect[1)]	RF Probe R&S®URV5-Z7 without/with accessories	Insertion Units R&S®URV5-Z2/-Z4	DC Probe R&S®URV5-Z1
18°C to 28°C		included in measurement uncertainty	
10°C to 40°C	0.17 dB (2%)	0.17 dB (2%)	0.02 dB (0.25%)
0°C to 50°C	0.44 dB (5%)	0.44 dB (5%)	0.04 dB (0.5%)

1) Residual uncertainty (approx. two standard deviations) after internal temperature correction taking into account the temperature characteristic of the sensor and its temperature. The specified temperature effect does not apply to the frequency ranges specified in footnote 11 (page 10).

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Specifications

Temperature range	meets EN 60068
Operating temperature range	0 °C to +50 °C
Storage temperature range	–40 °C to +70 °C
Permissible humidity	max. 80 %, without condensation
Vibration, sinusoidal	5 Hz to 55 Hz, max. 2 g; 55 Hz to 150 Hz, 0.5 g const. (meets EN 60068, EN 61010 and MIL-T-28800 D, class 5)
Vibration, random	10 Hz to 500 Hz, acceleration 1.9 g rms (meets EN 60068)
Shock	40 g shock spectrum (meets MIL-STD-810 D, EN 60068)
EMC	meets EN 50081-1 and 50082-1, EMC directive of EC (89/336/EEC), EMC law of the Federal Republic of Germany and MIL-STD-461 C (RE 02, CE 03, RS 03, CS 02)
Safety	meets EN 61010
Length of connecting cable	approx. 1.2 m for R&S®URV5-Z1 and R&S®URV5-Z7, 1.3 m or 5 m for R&S®URV5-Z2 and R&S®URV5-Z4 (depending on model), other lengths on request

Certified Quality System ISO 9001 DQS REG. NO 1954 QM

Certified Environmental System ISO 14001 DQS REG. NO 1954 UM

More information at
www.rohde-schwarz.com
(search term: URV5-Z)

Ordering information

Designation	Type	Order No.
RF Probe with case, ground cable, ground sleeve and strip, hook and solder tip	R&S®URV5-Z7	0395.2615.02
DC Probe with ground cable, clip-on tip and BNC adapter	R&S®URV5-Z1	0395.0512.02
10 V Insertion Unit 50 Ω, 3 GHz with 1.3 m cable	R&S®URV5-Z2	0395.1019.02
10 V Insertion Unit 50 Ω, 3 GHz with 5 m cable	R&S®URV5-Z2	0395.1019.05
100 V Insertion Unit 50 Ω, 3 GHz with 1.3 m cable	R&S®URV5-Z4	0395.1619.02
100 V Insertion Unit 50 Ω, 3 GHz with 5 m cable	R&S®URV5-Z4	0395.1619.05
Recommended extras		
For RF probe		
Accessory Set including 20/40 dB plug-on dividers, 50 Ω BNC adapter with sleeve for plug-on divider, ground sleeve and strip	R&S®URV-Z6	0292.5364.02
50 Ω Adapter (BNC female) with adapter to BNC male	R&S®URV-Z50	0394.9816.50
75 Ω Adapter with adapters to BNC male, 2.5/6 and 1.6/5.6 connector	R&S®URV-Z3	0243.9118.70
For Insertion Units R&S®URV5-Z2, R&S®URV5-Z4		
Precision Termination 1 W, 50 Ω, 0 GHz to 18 GHz (SWR <1.02 to 1 GHz)	R&S®RNA	0272.4510.50
Termination 1 W, 50 Ω, 0 GHz to 4 GHz, (SWR <1.05 to 1 GHz)	R&S®RNB	0272.4910.50

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