R&S®ZVH
CABLE AND ANTENNA ANALYZER

Specifications

Specifications
Version 11.00

ROHDE&SCHWARZ
Make ideas real

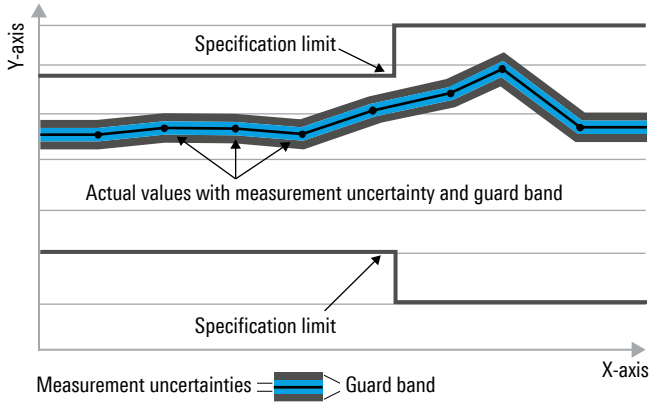
CONTENTS

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

Frequency

Frequency range	R&S®ZVH4	100 kHz to 3.6 GHz
	R&S®ZVH8	100 kHz to 8 GHz
Frequency resolution		1 Hz

Reference frequency, internal		
Total reference accuracy		± (time since last adjustment × aging rate) + temperature drift + calibration accuracy
Aging per year		$\pm 1 \times 10^{-6}$
Temperature drift	0 °C to +50 °C [1]	$\pm 1 \times 10^{-6}$
Achievable initial calibration accuracy		$\pm 5 \times 10^{-7}$
Reference frequency, with R&S®HA-Z240 GPS receiver option		
Frequency accuracy	GPS on, ≥ 1 min after satellite lock	$\pm 2.5 \times 10^{-8}$
	up to 30 min after losing satellite lock	$\pm 5 \times 10^{-8}$
Reference frequency, with R&S®FSH-Z114 precision frequency reference option		
Aging per year		3.6×10^{-9}
Temperature drift	0 °C to +50 °C	4×10^{-10}
Achievable initial calibration accuracy		1×10^{-9}
Total reference uncertainty	R&S®FSH-Z114 connected	
	≥ 30 s after oscillator lock	(time since last adjustment × aging rate) + temperature drift + 3 × calibration accuracy (nominal)
	≥ 2 min after oscillator lock	(time since last adjustment × aging rate) + temperature drift + calibration accuracy

Frequency readout		
Marker resolution		0.1 Hz
Accuracy		± (marker frequency × reference accuracy) + 10 % × measurement bandwidth + ½ $((f_{stop} - f_{start})/(\text{data points} - 1) + 1$ Hz)

Measurements

Individual measurements		reflection (S_{11}, S_{22})
	with R&S® ZVH-K39 option	transmission (S_{21}, S_{12})
		one-port cable loss
		distance-to-fault
Measurement wizard		
Guides the user through a sequence of individual measurements, uses the R&S®InstrumentView PC software to configure the measurement sequence including hints displayed on the screen; R&S®InstrumentView is also used to combine the measurement results into user-configurable reports.		

Measurement setup		
Port output power	controlled via tracking generator attenuation	0 dBm to –40 dBm (nom.), in 1 dB steps
Receive path RF attenuation		0 dB to 30 dB in 5 dB steps
Data points	selectable	101, 201, 401, 601, 631, 801, 1001, 1201
Measurement bandwidth	range	100 Hz to 100 kHz in 1/3 sequence
Trace modes		clear/write, average, interference suppression
DC bias		
DC source	selectable	internal or external
Output port	selectable	port 1 or 2
Output voltage	mode: internal	+12 V to +32 V in 1 V steps
Maximum output power	mode: internal	
	operated with battery	4 W
	operated with AC mains	10 W
Maximum continuous output current	mode: internal	500 mA

[1] For serial number < 115000: +30 °C to +50 °C: 3×10^{-6}.

Trigger		
Trigger source		free run, external rise, external fall
External trigger level		TTL level

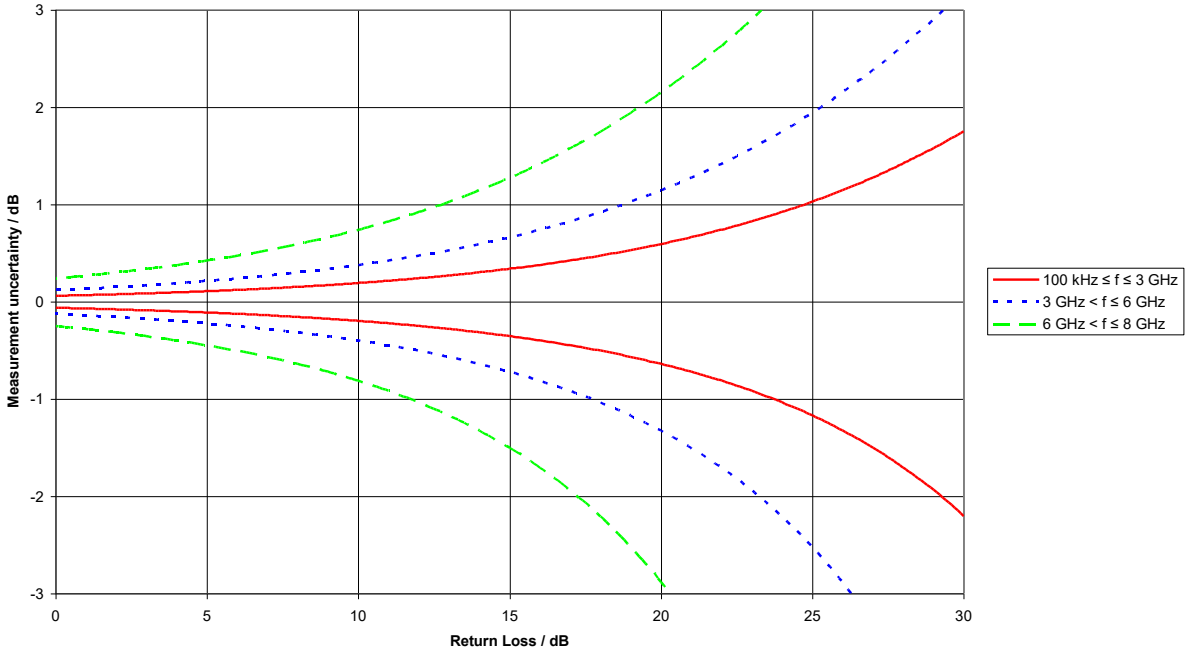
Reflection measurement S_{11}, S_{22}		
Result formats		magnitude, VSWR
Magnitude		
Range		1/2/5/10/20/50/100/120/150 dB, linear 100 %
Resolution		0.01 dB
VSWR		
Range	selectable	1 to 1.5, 2, 6, 11, 21 or 71
Corrected directivity	100 kHz ≤ f ≤ 3 GHz	> 43 dB (nom.)
	3 GHz < f ≤ 6 GHz	> 37 dB (nom.)
	6 GHz < f ≤ 8 GHz	> 31 dB (nom.)
Corrected test port match	100 kHz ≤ f ≤ 3 GHz	> 40 dB (nom.)
	3 GHz < f ≤ 6 GHz	> 37 dB (nom.)
	6 GHz < f ≤ 8 GHz	> 30 dB (nom.)
Measurement uncertainty		see figure “Uncertainty of reflection measurement”

Transmission measurement S_{21}, S_{12} (with R&S®ZVH-K39 option)		
Result format		magnitude
Measurement range		–120 dB to +80 dB
Display range	selectable	1/2/5/10/20/50/100/120/150 dB, linear 100 %
Resolution		0.01 dB
Dynamic range	RF attenuation = 5 dB, tracking generator level = –10 dBm, RBW = 1 kHz	
	100 kHz ≤ f < 300 kHz	> 50 dB (nom.)
	300 kHz ≤ f < 2.5 GHz	> 80 dB, 100 dB (typ.)
	2.5 GHz ≤ f < 6 GHz	> 70 dB, 90 dB (typ.)
	6 GHz ≤ f < 8 GHz	> 50 dB (nom.)
Test port match		as specified for test port input/output
Measurement uncertainty	calibration method = full two port high accuracy	see figure “Transmission magnitude uncertainty”

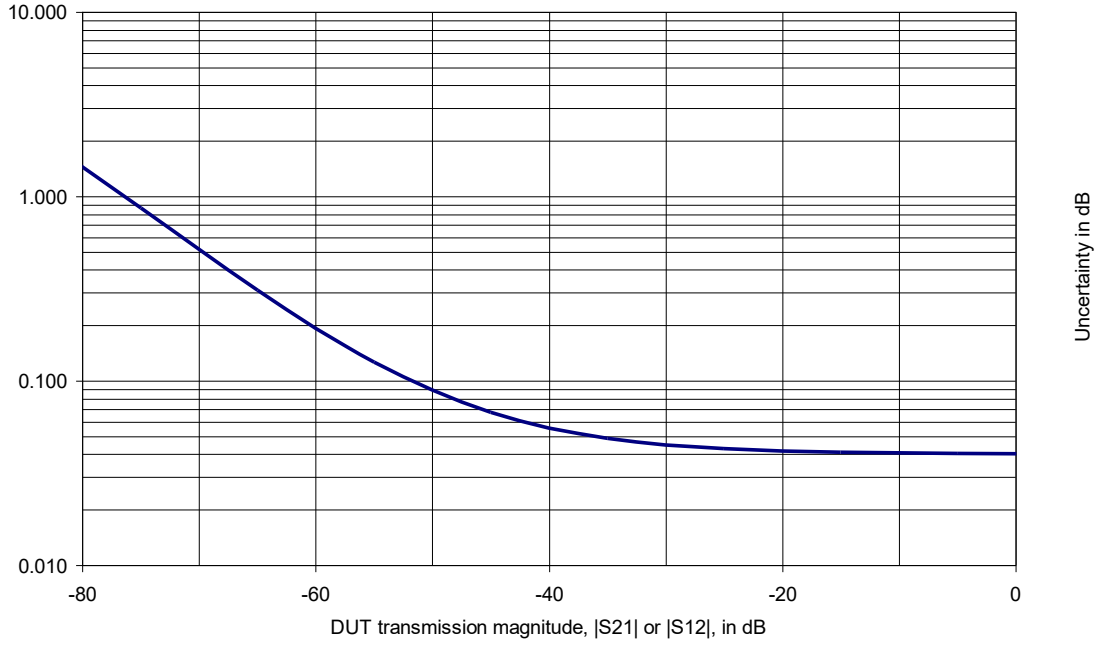
One-port cable loss measurement		
Result format		magnitude
Range	selectable	1/2/5/10/20/50/100/120/150 dB
Resolution		0.01 dB

Distance-to-fault analysis		
Result formats		return loss, VSWR (average and maximum indication)
Return loss		
Range		1/2/5/10/20/50/100/120/150 dB, linear 100 %
Resolution		0.01 dB
VSWR		
Range	selectable	1 to 1.5, 2, 6, 11, 21 or 71
Fault resolution in meters		(1.5×10^8 × velocity factor/span)
Maximum cable length	depending on cable loss	1500 m (nom.)
Cable type		coaxial, waveguide

Immunity to interference		
Maximum permissible spurious signal	measurement = reflection (S_{11})/one-port cable loss/distance-to-fault analysis	
	RF attenuation = 5 dB	+10 dBm (nom.)
	RF attenuation = 30 dB	+17 dBm (nom.)



Uncertainty of reflection measurement



Transmission magnitude uncertainty
with calibration method full two port high accuracy, f = 1 GHz, IF bandwidth = 100 Hz

Maximum rated input levels

Maximum rated input level with RF attenuation ≥ 10 dB		
DC voltage		50 V
CW RF power		30 dBm (= 1 W)
Peak RF power	duration < 3 s	33 dBm (= 2 W)
Maximum pulse voltage		150 V
Maximum pulse energy	pulse width 10 µs	10 mWs

Maximum rated input level with RF attenuation < 10 dB		
DC voltage		50 V
CW RF power		20 dBm (= 100 mW)
Peak RF power	duration < 3 s	23 dBm (= 200 mW)
Maximum pulse voltage		50 V
Maximum pulse energy	pulse width 10 µs	1 mWs

Maximum rated input level, external DC bias		
DC voltage		50 V
Input current		600 mA
Connector type		BNC

Inputs and outputs

Test port input		
Impedance		50 Ω
Connector		N female
VSWR	100 kHz ≤ f ≤ 300 kHz	< 2 (nom.)
	300 kHz ≤ f ≤ 1 GHz	< 1.5 (nom.)
	1 GHz < f ≤ 6 GHz	< 2 (nom.)
	6 GHz < f ≤ 8 GHz	< 3 (nom.)
Input attenuator	receive path	0 dB to 40 dB in 5 dB steps
Power sensor		
Connector		7-contact female (type Binder 712) or USB type A
Power sensors supported		see “Accessories”
Test port output		
Frequency range	R&S®ZVH4	100 kHz to 3.6 GHz
	R&S®ZVH8	100 kHz to 8 GHz
Connector		N female, 50 Ω
VSWR	100 kHz ≤ f ≤ 300 kHz	< 2 (nom.)
	300 kHz ≤ f ≤ 1 GHz	< 1.5 (nom.)
	1 GHz < f ≤ 6 GHz	< 2 (nom.)
	6 GHz < f ≤ 8 GHz	< 3 (nom.)
Output level		0 dBm to –40 dBm in 1 dB steps
Reverse power	maximum rated levels	
DC voltage		50 V
CW RF power		+20 dBm (= 0.1 W)
Maximum pulse voltage		50 V
Maximum pulse energy (10 µs)		1 mWs
External reference, external trigger, external DC bias port 2 (BNC 1)		
Connector		BNC, 50 Ω
Mode	selectable	external reference, external trigger, DC bias port 2
External reference	required level	0 dBm
	frequency	10 MHz
External trigger threshold	low → high transition	2.4 V (nom.)
	high → low transition	0.7 V (nom.)
External DC bias port 2	maximum rated input voltage	50 V
	maximum rated input current	600 mA
IF out, external DC bias port 1 (BNC 2)		
Connector		BNC, 50 Ω
Mode	selectable	IF out, DC bias port 1
IF out frequency		54.4 MHz (nom.)
External DC bias port 1	maximum rated input voltage	50 V
	maximum rated input current	600 mA
AUX		
Connector		7-pole female (type Binder 712)

General data

Manual operation		
Languages		English, French, German, Italian, Hungarian, Chinese, Japanese, Korean, Portuguese, Russian, Spanish
Remote control (R&S®ZVH-K40 option)		
Command set		SCPI 1997.0
LAN interface		10 BASE-T/100BASE-T, RJ-45
USB		mini B plug, version 1.1
Display		
Resolution		640 × 480 pixel
Audio		
Speaker		internal
USB interface		type A plug, version 1.1
Mass memory		flash memory (internal), SD card (not supplied), size ≤ 32 Gbyte
		USB flash drive (not supplied), USB version 1.1 or 2.0
Data storage	internal	> 256 instrument settings and traces
	on SD card/USB flash drive, ≥ 1 Gbyte	> 5000 instrument settings and traces
Temperature range	operating	–10 °C to +55 °C
	storage	–20 °C to +50 °C
	battery charging mode	0 °C to +40 °C
Climatic loading	relative humidity	+25 °C/+40 °C at 85 % relative humidity, in line with EN 60068-2-30
	class of protection	IP51
	with R&S®HA-Z222 carrying holster and rain cap	IP54
Mechanical resistance		
Vibration	sinusoidal	in line with EN 60068-2-6, MIL-PRF-28800F class 2
	random	in line with EN 60068-2-64, MIL-PRF-28800F class 2
Shock		40 g shock spectrum, in line with MIL-STD-810F, method 516.4 procedure 1, EN 60068-2-27, MIL-PRF-28800F class 2
Power supply		
R&S®HA-Z201 plug-in AC power supply	AC input voltage range	100 V to 240 V, ±10 % (nom.)
	AC supply frequency	50 Hz to 60 Hz
	maximum input current	700 mA
	output specifications	15 V DC (nom.), 2 A (nom.)
	operating temperature range	0 °C to +40 °C
	storage temperature range	–40 °C to +70 °C
	test mark	VDE or SIQ, CE, UL, PSE
External DC voltage		14 V to 16 V
Internal battery		lithium-ion battery
Capacity	R&S®HA-Z204 (standard)	4.2 Ah (nom.)
	R&S®HA-Z206 (option)	6.3 Ah (nom.)
Voltage		7.2 V (nom.)
Operating time with new, fully charged battery	R&S®HA-Z204 (standard)	3 h (nom.)
	R&S®HA-Z206 (option)	4.5 h (nom.)
Charging time	instrument switched off or R&S®HA-Z203 battery charger	
	R&S®HA-Z204 (standard)	2.5 h (nom.)
	R&S®HA-Z206 (option)	3.5 h (nom.)
	instrument switched on	
	R&S®HA-Z204 (standard)	3.5 h (nom.)
	R&S®HA-Z206 (option)	4.5 h (nom.)
Lifetime	charging cycles	> 500 (nom.)

Power consumption		12 W (nom.)
Safety		IEC 61010-1, EN 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010.1-04
EU legislation	for details, see user documentation	EU: in line with Data Act – Regulation (EU) 2023/2854
EMC	in line with European EMC Directive 2004/108/EC	EN 61326 class B (emission)
		CISPR 11/EN 55011/group 1 class B (emission)
		EN 61326 table 2 (immunity, industrial) field strength: 30 V/m: 30 MHz to 2 GHz, 3 V/m: 2 GHz to 2.7 GHz
Dimensions (W × H × D)	with handle	194 mm × 300 mm × 144 mm (7.6 in × 11.8 in × 5.7 in)
	without handle	194 mm × 300 mm × 69 mm (7.6 in × 11.8 in × 2.7 in)
Weight		< 3 kg (6.6 lb)
Recommended calibration interval		1 year

Options

Spectrum analysis R&S®ZVH-K1 option

Frequency

Frequency range	R&S®ZVH4	100 kHz to 3.6 GHz
	R&S®ZVH8	100 kHz to 8 GHz

Frequency readout		
Marker resolution		0.1 Hz
Accuracy		± (marker frequency × reference accuracy + 10 % × resolution bandwidth + ½ (span/(sweep points – 1) + 1 Hz)
Number of sweep (trace) points		631
Marker tuning frequency step size		span/630
Frequency counter resolution		0.1 Hz
Count accuracy	S/N > 25 dB	± (frequency × reference accuracy + ½ (last digit))
Frequency span		0 Hz, 10 Hz to 3.6 GHz/8 GHz
Maximum span deviation		±1 %

Spectral purity SSB phase noise		f = 500 MHz
Carrier offset	30 kHz	< –95 dBc (1 Hz), –105 dBc (1 Hz) (typ.)
	100 kHz	< –100 dBc (1 Hz), –110 dBc (1 Hz) (typ.)
	1 MHz	< –120 dBc (1 Hz), –127 dBc (1 Hz) (typ.)

Sweep time

Sweep time	span = 0 Hz	100 µs to 1000 s
	10 Hz ≤ span ≤ 600 MHz	20 ms to 1000 s
	span > 600 MHz	(20 ms × span/600 MHz) to 1000 s
Accuracy	span = 0 Hz	±1 %
	span ≥ 10 Hz	±3 %

Bandwidths

Resolution bandwidths (RBW)		
Range	–3 dB bandwidth	1 Hz to 3 MHz in 1/3 sequence
Bandwidth uncertainty	1 Hz ≤ RBW ≤ 300 kHz	< 5 % (nom.)
	RBW > 300 kHz	< 10 % (nom.)
Selectivity 60 dB:3 dB	Gaussian type filters	< 5 (nom.)
Video filters	–3 dB bandwidth	1 Hz to 3 MHz in 1/3 sequence

Level

Display range		displayed noise floor to +30 dBm
Maximum rated input level		see chapter “Specifications of the R&S®ZVH cable and antenna analyzer”
Intermodulation		
Third order intercept (TOI)	intermodulation-free dynamic range, signal level 2 × –20 dBm, RF attenuation = 0 dB, RF preamplifier = off	
	f_{in} < 300 MHz	> 54 dBc (TOI > +7 dBm) (nom.)
	300 MHz ≤ f_{in} < 3.6 GHz	> 60 dBc (TOI > +10 dBm) (nom.)
	3.6 GHz ≤ f_{in} ≤ 8 GHz	> 46 dBc (TOI > +3 dBm) (nom.)
	intermodulation-free dynamic range, signal level 2 × –40 dBm, RF attenuation = 0 dB, RF preamplifier = on	
	f_{in} < 300 MHz	> 50 dBc (TOI > –15 dBm), (nom.)
	300 MHz ≤ f_{in} ≤ 8 GHz	> 56 dBc (TOI > –12 dBm), (nom.)
Second harmonic intercept (SHI)	RF attenuation = 0 dB, RF preamplifier = off	
	f_{in} = 20 MHz to 1.5 GHz	+40 dBm (nom.)
	f_{in} = 1.5 GHz to 3 GHz	+30 dBm (nom.)
	f_{in} = 3 GHz to 4 GHz	+20 dBm (nom.)
	RF attenuation 0 dB, RF preamplifier = on	
	f_{in} = 100 MHz to 4 GHz	0 dBm (nom.)
Displayed average noise level	0 dB RF attenuation, termination 50 Ω, RBW = 100 Hz, VBW = 10 Hz, sample detector, log scaling, tracking generator off, normalized to 1 Hz	
	frequency	preamplifier = off
	100 kHz to 1 MHz	< –115 dBm, –125 dBm (typ.)
	1 MHz to 10 MHz	< –136 dBm, –144 dBm (typ.)
	10 MHz to 2 GHz	< –141 dBm, –146 dBm (typ.)
	2 GHz to 3.6 GHz	< –138 dBm, –143 dBm (typ.)
	3.6 GHz to 5 GHz	< –142 dBm, –146 dBm (typ.)
	5 GHz to 6.5 GHz	< –140 dBm, –144 dBm(typ.)
	6.5 GHz to 8 GHz	< –136 dBm, –141 dBm (typ.)
	frequency	preamplifier = on
	100 kHz to 1 MHz	< –133 dBm, –143 dBm (typ.)
	1 MHz to 10 MHz	< –157 dBm, –161 dBm (typ.)
	10 MHz to 1 GHz	< –161 dBm, –165 dBm (typ.)
	1 GHz to 2 GHz	< –159 dBm, –163 dBm (typ.)
	2 GHz to 5 GHz	< –155 dBm, –159 dBm (typ.)
	5 GHz to 6.5 GHz	< –151 dBm, –155 dBm (typ.)
	6.5 GHz to 8 GHz	< –147 dBm, –150 dBm (typ.)
Immunity to interference, nominal values		
Image frequencies	f_{in} – 2 × 54.4 MHz	< –70 dBc
	f_{in} – 2 × 860.8 MHz	< –70 dBc
	f_{in} – 2 × 4892.8 MHz	–60 dBc
Intermediate frequencies	54.4 MHz, 860.8 MHz, 4892.8 MHz	< –60 dBc
	8924.8 MHz	–50 dBc
Other interfering signals, signal level – RF attenuation < –20 dBm	f ≤ 3.6 GHz, spurious at f_{in} – 2446.4 MHz	< –60 dBc
	3.6 GHz < f ≤ 8 GHz, spurious at f_{in} – 4462.4 MHz	< –60 dBc
Other interfering signals, related to local oscillators (f = receive frequency)	f ≤ 3.6 GHz	
	Δf < 300 kHz	–60 dBc (typ.)
	Δf ≥ 300 kHz	< –60 dBc
	f > 3.6 GHz	
	Δf < 300 kHz	–54 dBc (typ.)
	Δf ≥ 300 kHz	< –54 dBc
Residual spurious response	input matched with 50 Ω, without input signal, RBW ≤ 30 kHz, f ≥ 3 MHz, RF attenuation = 0 dB, tracking generator off	< –90 dBm

Level display		
Logarithmic level axis		1/2/5/10/20/50/100/150 dB, 10 divisions
Linear level axis		0 % to 100 %, 10 divisions
Number of traces		2
Trace detectors		max. peak, min. peak, auto peak, sample, RMS
Trace functions		clear/write, max. hold, min. hold, average, view
Setting range of reference level		–200 dBm to +30 dBm
Units of level axis		dBm, dBmV, dBµV, V, W
Level measurement uncertainty		
Absolute level uncertainty at 100 MHz	+20 °C to +30 °C	< 0.3 dB
Frequency response (+20 °C to +30 °C)	100 kHz ≤ f < 10 MHz	< 1.5 dB (nom.)
	10 MHz ≤ f ≤ 3.6 GHz	< 1 dB
	3.6 GHz < f ≤ 8 GHz	< 1.5 dB
Attenuator uncertainty		< 0.3 dB
Uncertainty of reference level setting		< 0.1 dB (nom.)
Display nonlinearity	S/N > 16 dB, 0 dB to –50 dB, logarithmic level display	< 0.2 dB
Bandwidth switching uncertainty	reference: RBW = 10 kHz	< 0.1 dB (nom.)
Total measurement uncertainty	95 % confidence level, +20 °C to +30 °C, S/N > 16 dB, 0 dB to –50 dB below reference level, RF attenuation auto	
	10 MHz ≤ f ≤ 3.6 GHz	< 1 dB, 0.5 dB (typ.)
	3.6 GHz < f ≤ 8 GHz	< 1.5 dB, 1 dB (typ.)

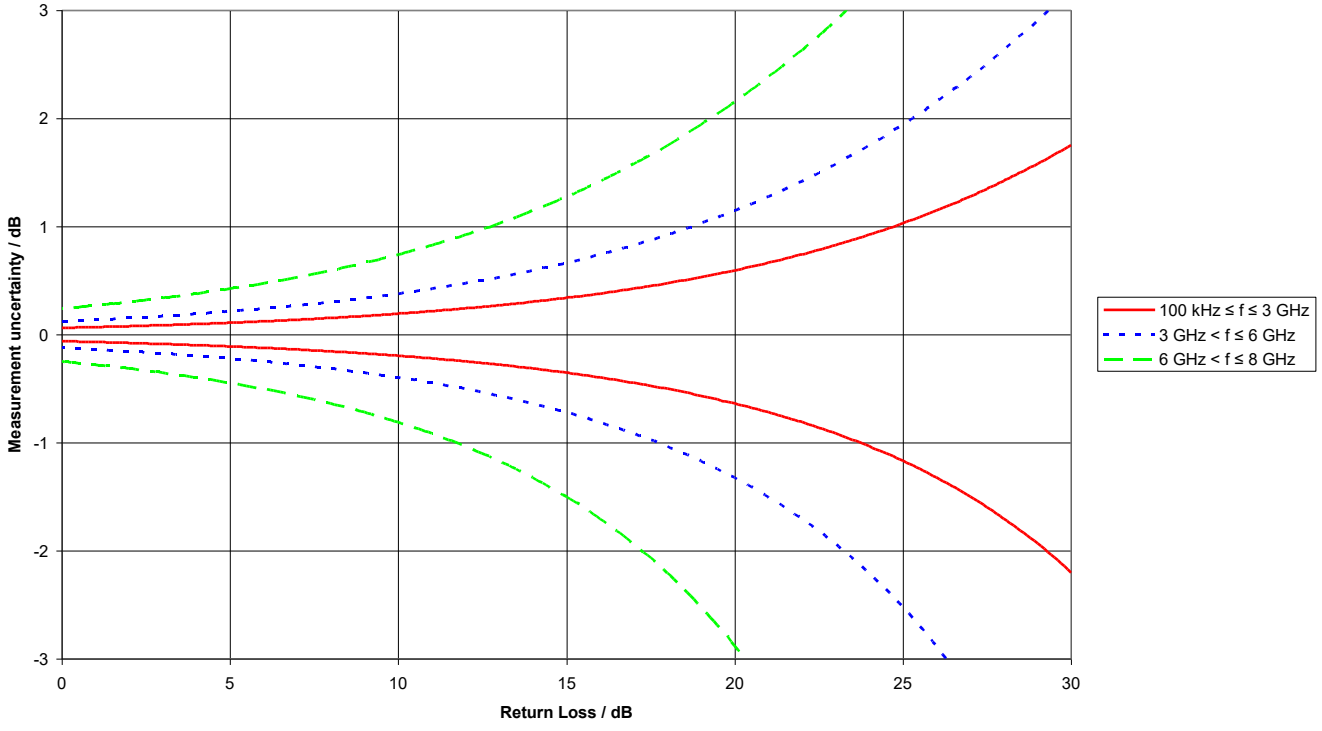
Trigger functions

Trigger		
Trigger source		free run, video, external
External trigger level threshold	low → high transition	2.4 V
	high → low transition	0.7 V
Gated trigger		
Gate source		external
Gate delay		10 µs to 100 s, min. resolution 10 µs (or 1 % of delay)
Gate length		10 µs to 100 s, min. resolution 10 µs (or 1 % of gate length)

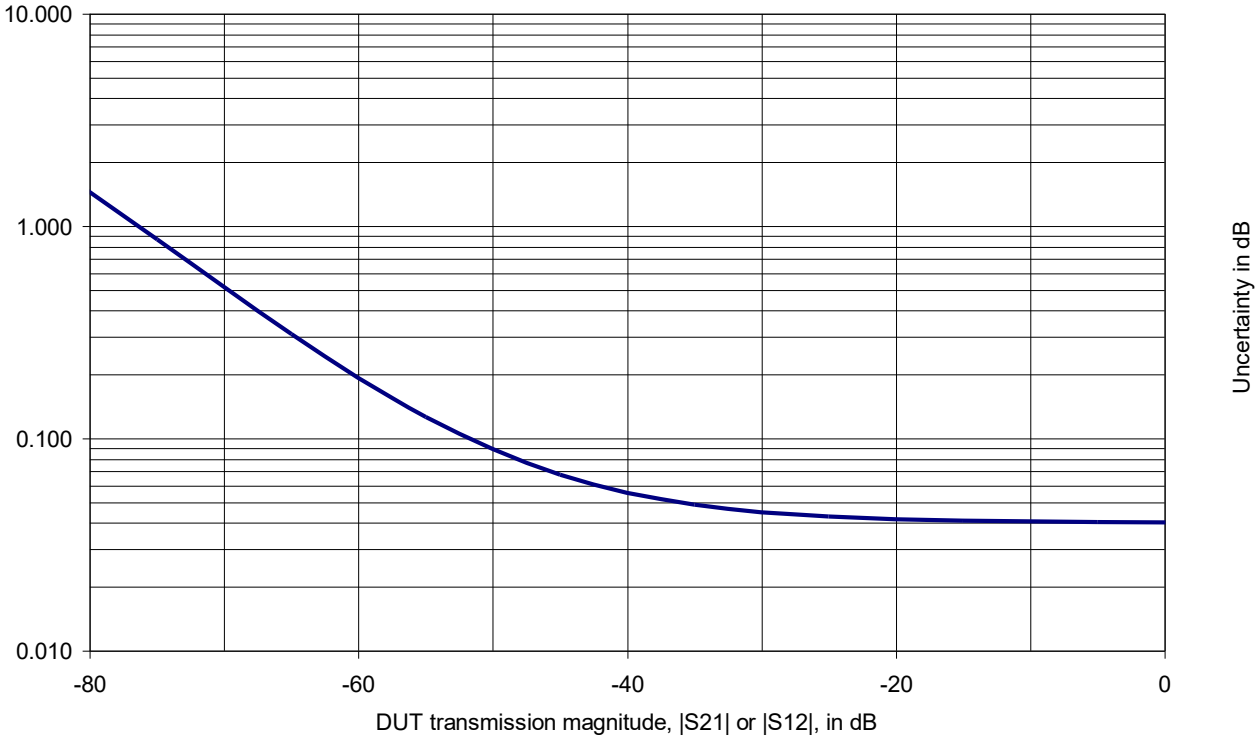
R&S®ZVH-K42 vector network analysis option/ R&S®ZVH-K45 vector voltmeter option

Frequency range	R&S®ZVH4	100 kHz to 3.6 GHz
	R&S®ZVH8	100 kHz to 8 GHz
Frequency resolution		1 Hz
Data points	selectable	101, 201, 401, 601, 631, 801, 1001, 1201
Port output power	controlled via tracking generator attenuation	0 dBm to –40 dBm (nom.), in 1 dB steps
Receive path RF attenuation		0 dB to 30 dB in 5 dB steps
Number of traces	split screen	4
Trace modes		clear/write, average, interference suppression
Reflection measurement		
Result formats	mode: network analyzer	magnitude, phase, VSWR, reflection coefficient, Smith chart, group delay, electrical length
	mode: vector voltmeter	magnitude + phase, VSWR + reflection
	mode: S-parameters	S_{22}, S_{11}
Return loss		
Range	selectable	1/2/5/10/20/50/100/120/150 dB, linear 100 %
Resolution		0.01 dB
Measurement uncertainty		see figure “Uncertainty of reflection measurement”
One-port phase		
Range	selectable	90/180/360/1000° to 10000° in 1/2/5 steps
Resolution		0.01°
Measurement uncertainty	specifications are based on a matched DUT, bandwidth = 100 Hz, receiver attenuation = 10 dB, nominal source power = –10 dBm, +20 °C to +30 °C	
	100 kHz ≤ f ≤ 3.6 GHz	
	0 dB ≤ return loss < 15 dB	< 3° (nom.)
	15 dB ≤ return loss < 25 dB	< 6° (nom.)
	25 dB ≤ return loss < 35 dB	< 20° (nom.)
	3.6 GHz < f ≤ 8 GHz (R&S®ZVH8 only)	
	0 dB ≤ return loss < 15 dB	< 3° (nom.)
	15 dB ≤ return loss < 25 dB	< 6° (nom.)
	25 dB ≤ return loss < 35 dB	< 20° (nom.)
VSWR		
Range	selectable	1 to 1.1, 1.5, 2, 6, 11, 21 or 71
Smith chart		
Range		1, zoom × 2, × 4, × 8
Reflection coefficient		
mRho	range	1 to 1000 in 1, 2, 5 steps
Corrected directivity	100 kHz ≤ f ≤ 3 GHz	> 43 dB (nom.)
	3 GHz < f ≤ 6 GHz	> 37 dB (nom.)
	6 GHz < f ≤ 8 GHz	> 31 dB (nom.)
Corrected test port match	100 kHz ≤ f ≤ 3 GHz	> 40 dB (nom.)
	3 GHz < f ≤ 6 GHz	> 37 dB (nom.)
	6 GHz < f ≤ 8 GHz	> 30 dB (nom.)
Transmission measurement		
Result formats	mode: network analyzer	magnitude, phase, group delay, electrical length
	mode: vector voltmeter	magnitude + phase
	mode: S-parameters	S_{12}, S_{21}
Gain		
Measurement range		–120 dB to +80 dB
Display range	selectable	1/2/5/10/20/50/100/120/150 dB, linear 100 %
Resolution		0.01 dB
Measurement uncertainty	calibration method: full two port high accuracy	see figure “Transmission magnitude uncertainty”

Phase		
Range	selectable	90/180/360/1000° to 10000° in 1/2/5 steps
Resolution		0.01°
Measurement uncertainty	specifications are based on a matched DUT, bandwidth = 100 Hz, RF attenuation = 10 dB, nominal source power = –10 dBm, +20 °C to +30 °C	
	100 kHz ≤ f ≤ 50 MHz	
	0 dB ≤ insertion loss < 40 dB	< 2° (nom.)
	50 MHz < f ≤ 3.6 GHz	
	0 dB ≤ insertion loss < 50 dB	< 2° (nom.)
	50 dB ≤ insertion loss < 70 dB	< 3° (nom.)
	3.6 GHz < f < 6 GHz (R&S®ZVH8 only)	
	0 dB ≤ insertion loss < 50 dB	< 2° (nom.)
	50 dB ≤ insertion loss < 70 dB	< 3° (nom.)
	6 GHz ≤ f < 8 GHz (R&S®ZVH8 only)	
	0 dB ≤ insertion loss < 50 dB	< 3° (nom.)
	50 dB ≤ insertion loss < 70 dB	< 5° (nom.)
Dynamic range	RF attenuation = 5 dB, tracking generator level = –10 dBm, RBW = 1 kHz	
	100 kHz ≤ f < 300 kHz	> 50 dB (nom.)
	300 kHz ≤ f < 2.5 GHz	> 80 dB, 100 dB (typ.)
	2.5 GHz ≤ f < 6 GHz	> 70 dB , 90 dB (typ.)
	6 GHz ≤ f < 8 GHz	> 50 dB (nom.)
Test port match		as specified for test port input/output



Uncertainty of reflection measurement



Transmission magnitude uncertainty
with calibration method full two port high accuracy, f = 1 GHz, IF bandwidth = 100 Hz

R&S®ZVH-K19 channel power meter

Frequency range	R&S®ZVH4	100 kHz to 3.6 GHz
	R&S®ZVH8	100 kHz to 8 GHz
Channel bandwidth		100 kHz to 1 GHz
Amplitude		offset, dB relative, zeroing
Unit		dBm, W
Limits		on/off, upper limit, lower limit, beep on fail
Measurement range		–120 dBm to +30 dBm
Level measurement uncertainty		
Absolute level uncertainty at 100 MHz	+20 °C to +30 °C	< 0.3 dB
Frequency response (+20 °C to +30 °C)	100 kHz ≤ f < 10 MHz	< 1.5 dB (nom.)
	10 MHz ≤ f ≤ 3.6 GHz	< 1 dB
	3.6 GHz < f ≤ 8 GHz	< 1.5 dB
Measurement port		port 1

R&S®ZVH-K29 pulse measurements with power sensor

In combination with one of the R&S®NRP-Z81, R&S®NRP-Z85, R&S®NRP-Z86, R&S®NRP18P, R&S®NRP40P or R&S®NRP50P power sensors, the R&S®ZVH4/ZVH8 supports measurements on pulsed signals [2]. The achievable RF performance is documented in the specifications document of the R&S®NRP-Z81, R&S®NRP-Z85, R&S®NRP-Z86, R&S®NRP18P, R&S®NRP40P and R&S®NRP50P power sensors. The list below shows which measurements are supported by the R&S®ZVH-K29.

Measurements	**R&S®ZVH-K29**
Pulse power parameters	●
Peak power	●
Pulse top power	●
Average power	●
Base power	●
Minimum power	●
Positive overshoot	●
Negative overshoot	●
Pulse timing parameters	●
Pulse duration	●
Pulse period	●
Pulse start/stop time	●
Rise/fall time	●
Duty cycle	●

Equivalence of specifications for different R&S®ZVH part numbers

- The specifications for part number 1309.6800.74 are equivalent to part number 1309.6000.24
- The specifications for part number 1309.6800.78 are equivalent to part number 1309.6000.28

Accessories

R&S®FSH-Z14 directional power sensor

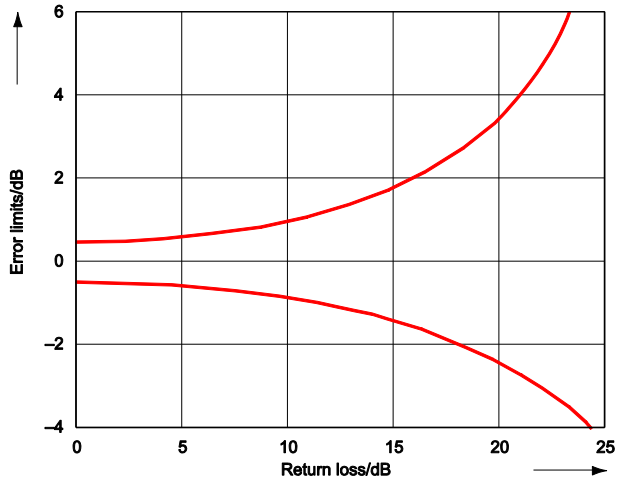
Frequency range		25 MHz to 1 GHz
Power measurement range		30 mW to 300 W
VSWR referenced to 50 Ω		< 1.06
Power-handling capacity	depending on temperature and matching (see diagram on next page)	100 W to 1000 W
Insertion loss		< 0.06 dB
Directivity		> 30 dB
Average power		
Power measurement range		
CW, FM, PM, FSK, GMSK	CF: ratio of peak envelope	30 mW to 300 W
Modulated signals	power to average power	30 mW to 300 W/CF

Measurement uncertainty		
25 MHz to 40 MHz	sine signal	4.0 % of measured value (0.17 dB)
40 MHz to 1 GHz	+18 °C to +28 °C, no zero offset	3.2 % of measured value (0.14 dB)
Zero offset	after zeroing	±4 mW
Range of typical measurement error with modulation	FM, PM, FSK, GMSK	0 % of measured value (0 dB)
	AM (80 %)	±3 % of measured value (±0.13 dB)
	two CW carriers with identical power	±2 % of measured value (±0.09 dB)
	EDGE, TETRA	±0.5 % of measured value (±0.02 dB) [3]
Temperature coefficient	25 MHz to 40 MHz	0.40 %/K (0.017 dB/K)
	40 MHz to 1 GHz	0.25 %/K (0.011 dB/K)

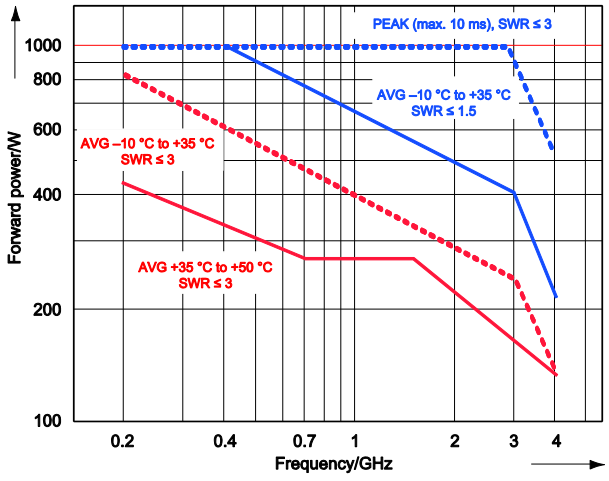
[2] The R&S®NRP-Z8x power sensors are supported by instruments with serial number ≥ 105000. The R&S®FSH-Z129 adapter cable is needed in addition for R&S®ZVH4 with serial number < 115340 and for R&S®ZVH8 with serial number <115240.

[3] If standard is selected on the R&S®ZVH.

Maximum peak envelope power		
Power measurement range		
Video bandwidth	4 kHz	0.4 W to 300 W
	200 kHz	1 W to 300 W
	600 kHz	2 W to 300 W
Measurement uncertainty	same as for average power plus effect of peak hold circuit	+18 °C to +28 °C
Error limits of peak hold circuit for burst signals	duty cycle ≥ 0.1 and repetition rate ≥ 100/s	
	video bandwidth 4 kHz	±(3 % of measured value + 0.05 W) starting from a burst width of 200 µs
	video bandwidth 200 kHz	±(3 % of measured value + 0.20 W) starting from a burst width of 4 µs
	video bandwidth 600 kHz	±(7 % of measured value + 0.40 W) starting from a burst width of 2 µs
	20/s ≤ repetition rate < 100/s	plus ±(1.6 % of measured value + 0.15 W)
	0.001 ≤ duty cycle < 0.1	plus ±0.10 W
Temperature coefficient	25 MHz to 40 MHz	0.50 %/K (0.022 dB/K)
	40 MHz to 1 GHz	0.35 %/K (0.015 dB/K)
Load matching		
Matching measurement range		
Return loss		0 dB to 23 dB
VSWR		> 1.15
Minimum forward power	specifications complied with ≥ 0.4 W	0.06 W
Dimensions (W × H × D)		120 mm × 95 mm × 39 mm (4.7 in × 3.7 in × 1.5 in)
	connecting cable	1.5 m (59 in)
Weight		0.65 kg (1.4 lb)



Error limits for matching measurements



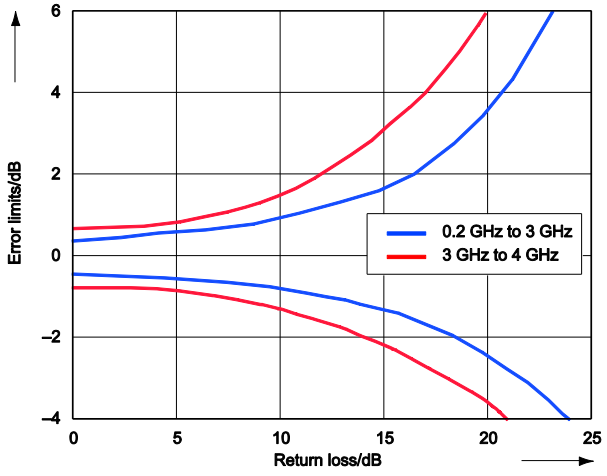
Power-handling capacity

R&S®FSH-Z44 directional power sensor

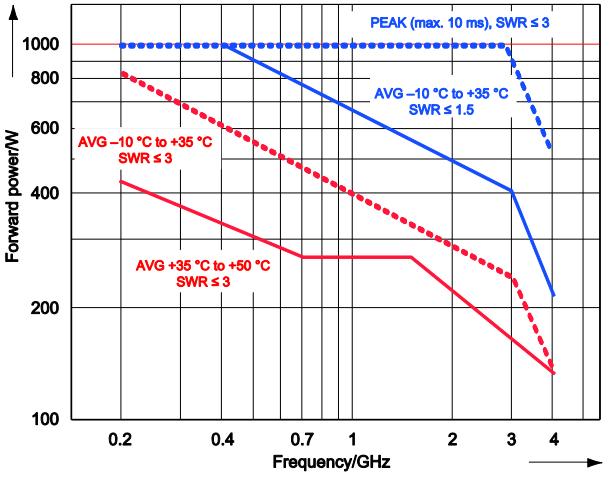
Frequency range		200 MHz to 4 GHz
Power measurement range		30 mW to 300 W
VSWR referenced to 50 Ω	200 MHz to 3 GHz	< 1.07
	3 GHz to 4 GHz	< 1.12
Power-handling capacity	depending on temperature and matching (see diagram on next page)	120 W to 1000 W
Insertion loss	200 MHz to 1.5 GHz	< 0.06 dB
	1.5 GHz to 4 GHz	< 0.09 dB
Directivity	200 MHz to 3 GHz	> 30 dB
	3 GHz to 4 GHz	> 26 dB
Average power		
Power measurement range	CF: ratio of peak envelope power to average power	
	CW, FM, PM, FSK, GMSK	30 mW to 300 W
	LTE, 3GPP WCDMA, cdmaOne, CDMA2000, DAB, DVB-T	30 mW to 120 W
	other modulated signals	30 mW to 300 W/CF
Measurement uncertainty	sine signal, +18 °C to +28 °C, no zero offset	
	200 MHz to 300 MHz	4.0 % of measured value (0.17 dB)
	300 MHz to 4 GHz	3.2 % of measured value (0.14 dB)
Zero offset	after zeroing	±4 mW
Range of typical measurement error with modulation	FM, PM, FSK, GMSK	0 % of measured value (0 dB)
	AM (80 %)	±3 % of measured value (±0.13 dB)
	two CW carriers with identical power	±2 % of measured value (±0.09 dB)
	π/4-DQPSK	±2 % of measured value (±0.09 dB)
	EDGE	±0.5 % of measured value (±0.02 dB) [4]
	cdmaOne, DAB	±1 % of measured value (±0.04 dB) [4]
	3GPP WCDMA, CDMA2000	±2 % of measured value (±0.09 dB) [4]
	DVB-T	±2 % of measured value (±0.09 dB) [4]
Temperature coefficient	200 MHz to 300 MHz	0.40 %/K (0.017 dB/K)
	300 MHz to 4 GHz	0.25 %/K (0.011 dB/K)
Maximum peak envelope power		
Power measurement range		
DAB, DVB-T, cdmaOne, CDMA2000, 3GPP WCDMA		4 W to 300 W
Other signals at video bandwidth	4 kHz	0.4 W to 300 W
	200 kHz	1 W to 300 W
	4 MHz	2 W to 300 W
Measurement uncertainty	+18 °C to +28 °C	same as for average power plus effect of peak hold circuit
Error limits of peak hold circuit for burst signals	duty cycle ≥ 0.1 and repetition rate ≥ 100/s	
	video bandwidth 4 kHz	±(3 % of measured value + 0.05 W) starting from a burst width of 100 µs
	video bandwidth 200 kHz	±(3 % of measured value + 0.20 W) starting from a burst width of 4 µs
	video bandwidth 4 MHz	±(7 % of measured value + 0.40 W) starting from a burst width of 1 µs
	20/s ≤ repetition rate < 100/s	plus ±(1.6 % of measured value + 0.15 W)
	0.001 ≤ duty cycle < 0.1	plus ±0.10 W
	burst width ≥ 0.5 µs	plus ±5 % of measured value
	burst width ≥ 0.2 µs	plus ±10 % of measured value
Range of typical measurement error of peak hold circuit	video bandwidth 4 MHz and standard selected on the R&S®FSH	
	cdmaOne, DAB	±(5 % of measured value + 0.4 W)
	DVB-T, CDMA2000, 3GPP WCDMA	±(15 % of measured value + 0.4 W)
Temperature coefficient	200 MHz to 300 MHz	0.50 %/K (0.022 dB/K)
	300 MHz to 4 GHz	0.35 %/K (0.015 dB/K)

[4] If standard is selected on the R&S®ZVH.

Load matching		
Matching measurement range		
Return loss	200 MHz to 3 GHz	0 dB to +23 dB
VSWR	3 GHz to 4 GHz	0 dB to +20 dB
VSWR	200 MHz to 3 GHz	> 1.15
	3 GHz to 4 GHz	> 1.22
Minimum forward power	specifications complied with ≥ 0.2 W	0.03 W
Dimensions	W × H × D	120 mm × 95 mm × 39 mm (4.7 in × 3.7 in × 1.5 in)
	connecting cable	1.5 m (59 in)
Weight		0.65 kg (1.4 lb)



Error limits for matching measurements



Power-handling capacity

R&S®HA-Z240 GPS receiver

GPS location indication		latitude, longitude
Reference frequency uncertainty	GPS on, ≥ 1 min after satellite lock	$\pm 2.5 \times 10^{-8}$
	up to 30 min after losing satellite lock	$\pm 5 \times 10^{-8}$
Temperature range	operating	–20 °C to +55 °C
	storage	–40 °C to +70 °C
Climatic loading	GPS receiver module	IEC 60529 IPX7 level
Connector		7-pole male (type Binder 712)
Power consumption		0.45 W (nom.)
Test marks		FCC, CE
Dimensions	Ø × H	61 mm × 19.5 mm (2.4 in × 0.8 in)
	cable length	5 m (16.4 ft)
Weight		200 g (0.4 lb)

Ordering information

Designation	Type	Order No.
Cable and antenna analyzer, 100 kHz to 3.6 GHz	R&S®ZVH4	1309.6800.24
Cable and antenna analyzer, 100 kHz to 8 GHz	R&S®ZVH8	1309.6800.28
Accessories supplied		
Lithium-ion battery pack, USB cable, LAN cable, AC power supply, CD-ROM with R&S®InstrumentView software and documentation, quick start guide, SD card reader for PC		

Options

Designation	Type	Order No.
Spectrum analysis	R&S®ZVH-K1	1309.6823.02
Power meter	R&S®ZVH-K9	1309.6852.02
Spectrogram measurement application	R&S®ZVH-K14	1309.7007.02
Channel power meter	R&S®ZVH-K19	1304.5987.02
Pulse measurements with power sensor [5]	R&S®ZVH-K29	1304.0491.02
Transmission measurement for cable and antenna mode	R&S®ZVH-K39	1309.6830.02
Remote control via LAN or USB	R&S®ZVH-K40	1309.7013.02
Vector network analysis	R&S®ZVH-K42	1309.6846.02
Vector voltmeter	R&S®ZVH-K45	1309.6998.02

Accessories

Designation	Type	Order No.
RF cable, DC to 8 GHz, armored, N male/N female connectors, length: 1 m	R&S®FSH-Z320	1309.6600.00
RF cable, DC to 8 GHz, armored, N male/N female connectors, length: 3 m	R&S®FSH-Z321	1309.6617.00
Precision frequency reference	R&S®FSH-Z114	1304.5935.02
Combined open/short/50 Ω load calibration standard, DC to 3.6 GHz	R&S®FSH-Z29	1300.7510.03
Combined open/short/50 Ω load calibration standard, DC to 8 GHz	R&S®FSH-Z28	1300.7810.03
Combined open/short/50 Ω load/through calibration standard, DC to 15 GHz, 3.5 mm male	R&S®ZV-Z135	1317.7677.02
Combined open/short/50 Ω load/through calibration standard, DC to 15 GHz, 3.5 mm female	R&S®ZV-Z135	1317.7677.03
Combined open/short/50 Ω load/through calibration standard, DC to 9 GHz, N male	R&S®ZV-Z170	1317.7683.02
Combined open/short/50 Ω load/through calibration standard, DC to 9 GHz, N female	R&S®ZV-Z170	1317.7683.03
Matching pad 50/75 Ω, L section	R&S®RAM	0358.5414.02
Matching pad 50/75 Ω, series resistor 25 Ω	R&S®RAZ	0358.5714.02
Matching pad 50/75 Ω, L section, N to BNC	R&S®FSH-Z38	1300.7740.02
Adapter N (m) – BNC (f)		0118.2812.00
Adapter N (m) – N (m)		0092.6581.00
Adapter N (m) – SMA (f)		4012.5837.00
Adapter N (m) – 7/16 (f)		3530.6646.00
Adapter N (m) – 7/16 (m)		3530.6630.00
Adapter N (m) – FME (f)		4048.9790.00
Adapter BNC (m) – banana (f)		0017.6742.00
Attenuator 50 W, 20 dB, 50 Ω, DC to 6 GHz, N (f) – N (m)	R&S®RDL50	1035.1700.52
Attenuator 100 W, 20 dB, 50 Ω, DC to 2 GHz, N (f) – N (m)	R&S®RBU100	1073.8495.20
Attenuator 100 W, 30 dB, 50 Ω, DC to 2 GHz, N (f) – N (m)	R&S®RBU100	1073.8495.30
12 V car adapter for cigarette lighter [6]	R&S®HA-Z202	1309.6117.00

[5] Requires a power sensor R&S®NRP-Z81/-Z85/-Z86. Wideband power sensors require the adapter cable R&S®FSH-Z129 for R&S®ZVH4 with serial number < 115340 and for R&S®ZVH8 with serial number < 115240. Otherwise, R&S®NRP-Z4 is suitable.

[6] The car adapter is suitable for both the instrument and the R&S®HA-Z203 external battery charger.

Lithium-ion battery pack, 6.3 Ah	R&S®HA-Z206	1309.6146.00
Battery charger for R&S®HA-Z204 and R&S®HA-Z206 lithium-ion battery pack [7]	R&S®HA-Z203	1309.6123.00
Soft carrying bag	R&S®HA-Z220	1309.6175.00
Hard case	R&S®HA-Z321	1321.1357.02
Carrying holster, including chest harness and rain cover	R&S®HA-Z222	1309.6198.00
Shoulder strap for R&S®HA-Z222 carrying holster	R&S®HA-Z223	1309.6075.00
SD memory card, 4 Gbyte [8]	R&S®HA-Z232	1309.6223.00
Headphones	R&S®FSH-Z36	1145.5838.02
GSM/UMTS/CDMA antenna magnetic mount, for 850/900/1800/1900/2100 band	R&S®TS95A16	1118.6943.16
Spare USB cable	R&S®HA-Z211	1309.6169.00
Spare Ethernet cable	R&S®HA-Z210	1309.6152.00
Spare power supply, including mains plug for EU, GB, US	R&S®HA-Z201	1309.6100.00
Power cord + adapter for R&S®HA-Z201 power supply (changes the power supply to laptop style)		
Power cord EU	R&S®HA-Z209	1309.7465.02
Power cord GB	R&S®HA-Z209	1309.7465.03
Power cord US/JP	R&S®HA-Z209	1309.7465.04
Power cord AUS	R&S®HA-Z209	1309.7465.05
GPS receiver	R&S®HA-Z240	1309.6700.03
Portable system for EMVU measurements		
Hard case	R&S®TS-EMF	1158.9295.05
Isotropic antenna, 30 MHz to 3 GHz, for R&S®TS-EMF	R&S®TSEMF-B1	1074.5719.02
Isotropic antenna, 700 MHz to 6 GHz, for R&S®TS-EMF	R&S®TSEMF-B2	1074.5702.02
Isotropic antenna, 9 kHz to 200 MHz, for R&S®TS-EMF	R&S®TSEMF-B3	1074.5690.02
Calibration unit, 2 MHz to 4 GHz, for R&S®FSH models .23/.24/.28/.30	R&S®ZN-Z103	1321.1828.02
Calibration unit, 1 MHz to 6 GHz, for R&S®FSH models .23/.24/.28/.30	R&S®ZN-Z103	1321.1828.12
Spare CD-ROM including R&S®InstrumentView software and operating manual for R&S®ZVH4/ZVH8	R&S®ZVH-Z45	1309.6946.00
Spare printed quick start guide, for R&S®ZVH4/ZVH8, English	R&S®ZVH-Z46	1309.6900.12
Spare printed quick start guide, for R&S®ZVH4/ZVH8, German	R&S®ZVH-Z47	1309.6900.11

Power sensors supported by the R&S®ZVH-K9 [9]

Designation	Type	Order No.
Directional power sensors		
30 mW to 300 W, 25 MHz to 1 GHz	R&S®FSH-Z14	1120.6001.02
30 mW to 300 W, 200 MHz to 4 GHz	R&S®FSH-Z44	1165.2305.02
Universal power sensors	R&S®NRP-Z221	1417.0309.02
1 nW to 100 mW, 10 MHz to 8 GHz, two-path	R&S®NRP-Z211	1417.0409.02
1 nW to 100 mW, 10 MHz to 18 GHz, two-path	R&S®NRP-Z221	1417.0309.02
Wideband power sensors [10, 11]		
1 nW to 100 mW, 50 MHz to 18 GHz	R&S®NRP-Z81	1137.9009.02
1 nW to 100 mW, 50 MHz to 40 GHz (2.92 mm)	R&S®NRP-Z85	1411.7501.02
1 nW to 100 mW, 50 MHz to 40 GHz (2.40 mm)	R&S®NRP-Z86	1417.0109.40
1 nW to 100 mW, 50 MHz to 44 GHz (2.40 mm)	R&S®NRP-Z86	1417.0109.44
Three-path diode power sensors		
100 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP8S	1419.0006.02
100 pW to 200 mW, 10 MHz to 18 GHz	R&S®NRP18S	1419.0029.02
100 pW to 200 mW, 10 MHz to 33 GHz	R&S®NRP33S	1419.0064.02
100 pW to 200 mW, 50 MHz to 40 GHz	R&S®NRP40S	1419.0041.02
100 pW to 200 mW, 50 MHz to 50 GHz	R&S®NRP50S	1419.0087.02
Average power sensors		
100 pW to 200 mW, 8 kHz to 6 GHz	R&S®NRP6A	1424.6796.02
100 pW to 200 mW, 8 kHz to 18 GHz	R&S®NRP18A	1424.6815.02

[7] The battery charger is dedicated for charging an additional battery outside the instrument. The internal battery is charged by the instrument itself.
[8] Firmware update is installed from SD memory card.
[9] For average power measurements only.
[10] Peak power measurements supported by the R&S®ZVH-K29 option.
[11] Product discontinued.

Pulse power sensors [10, 12]		
1 nW to 100 mW, 50 MHz to 18 GHz	R&S®NRP18P	1444.1190.02
1 nW to 100 mW, 50 MHz to 40 GHz (2.92 mm)	R&S®NRP40P	1444.1290.02
1 nW to 100 mW, 50 MHz to 18 GHz (2.40 mm)	R&S®NRP50P	1444.1390.02
R&S®NRP-Zxx power sensors require the following adapter cable for operation on the R&S®ZVH		
USB adapter cable (passive), length: 2 m (78.7 in), to connect R&S®NRP-Zxx S/SN power sensors to the R&S®ZVH cable and antenna analyzer	R&S®NRP-Z4	1146.8001.02
R&S®FSH-Zxx power sensors require the following adapter cable for connection to a PC		
USB adapter cable	R&S®FSH-Z144	1145.5909.02
R&S®NRP power sensors require the following adapter cable for operation on the R&S®ZVH		
USB interface cable, length: 1.5 m (59 in), to connect R&S®NRP power sensors to the R&S®ZVH cable and antenna analyzer	R&S®NRP-ZKU	1419.0658.03

Warranty and service

Warranty		
Base unit		3 years
All other items [13]		1 year
Service options		
	Service plans	**On demand**
Calibration	up to five years [14]	pay per calibration
Warranty and repair	up to five years [14]	standard price repair
Contact your Rohde & Schwarz sales office for further details.		

[12] Starting from firmware version V2.10

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

[14] For extended periods, contact your Rohde & Schwarz sales office.

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Data without tolerance limits is not binding | Subject to change