R&S®ZVH
Cable and Antenna Analyzer
Specifications

Test & Measurement

Data Sheet | 07.00

ROHDE&SCHWARZ

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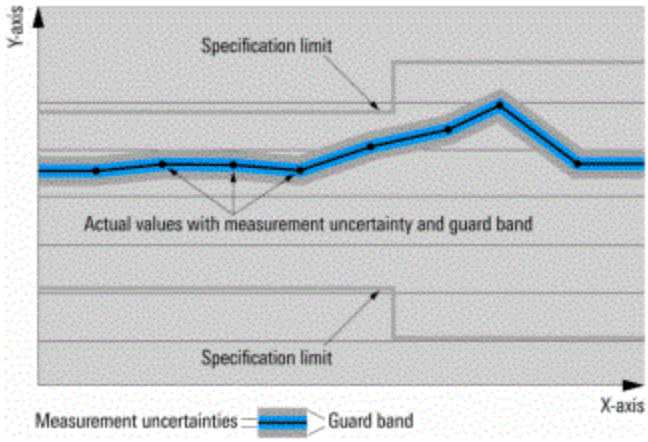
Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 15 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 <, ≤, >, ≥, ±, 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.

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 ($(f_{stop} - f_{start})$ / (data points – 1) + 1 Hz)

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

Measurements

Individual measurements		reflection (S_{11}, S_{22})
	with R&S® ZVH-K39 option	transmission (S_{21}, S_{12})
		1-port cable loss
		distance-to-fault
Measurement wizard		
Guides the user through a sequence of individual measurements. Uses the R&S®ZVHView PC software to configure the measurement sequence including hints displayed on the screen. R&S®ZVHView 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
Trigger		
Trigger source		free run, external rise, external fall
External trigger level		TTL level

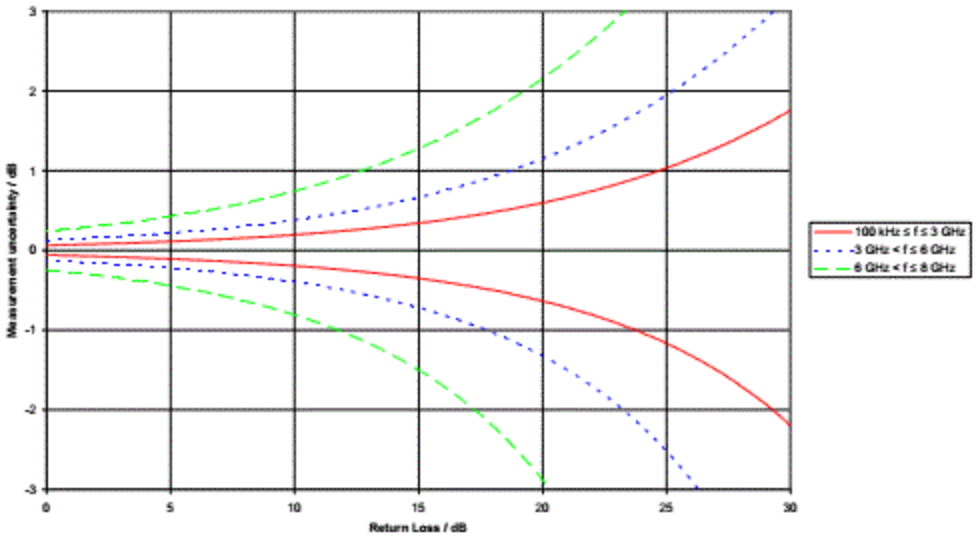
Reflection measurement S_{11}, S_{22}		
Result formats		magnitude, VSWR
Magnitude		
Range		1/2/5/10/20/50/100/120/150 dB, linear 100 %
Resolution		0.01 dB
VSWR		
Range	selectable	1 to 1.5, 2, 6, 11, 21 or 71
Corrected directivity	100 kHz ≤ f ≤ 3 GHz	> 43 dB (nom.)
	3 GHz < f ≤ 6 GHz	> 37 dB (nom.)
	6 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" on page 7

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" on page 7

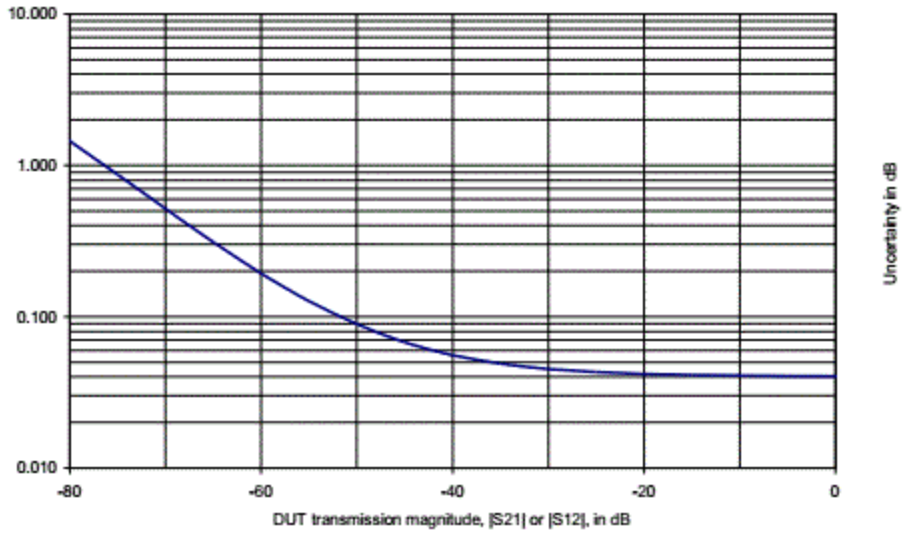
1-port cable loss measurement		
Result format		magnitude
Range	selectable	1/2/5/10/20/50/100/120/150 dB
Resolution		0.01 dB

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.)

Immunity to interference		
Maximum permissible spurious signal	measurement = reflection (S_{11})/1-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	< 3 s duration	33 dBm (= 2 W)
Max. pulse voltage		150 V
Max. 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	< 3 s duration	23 dBm (= 200 mW)
Max. pulse voltage		50 V
Max. 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)
Max. pulse voltage		50 V
Max. 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	max. rated input voltage	50 V
	max. 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	max. rated input voltage	50 V
	max. rated input current	600 mA
AUX		
Connector		7-contact female (type Binder 712)