



Version
06.00
August
2006

Vector Network Analyzer R&S®ZVB

Specifications

Specifications apply under the following conditions:

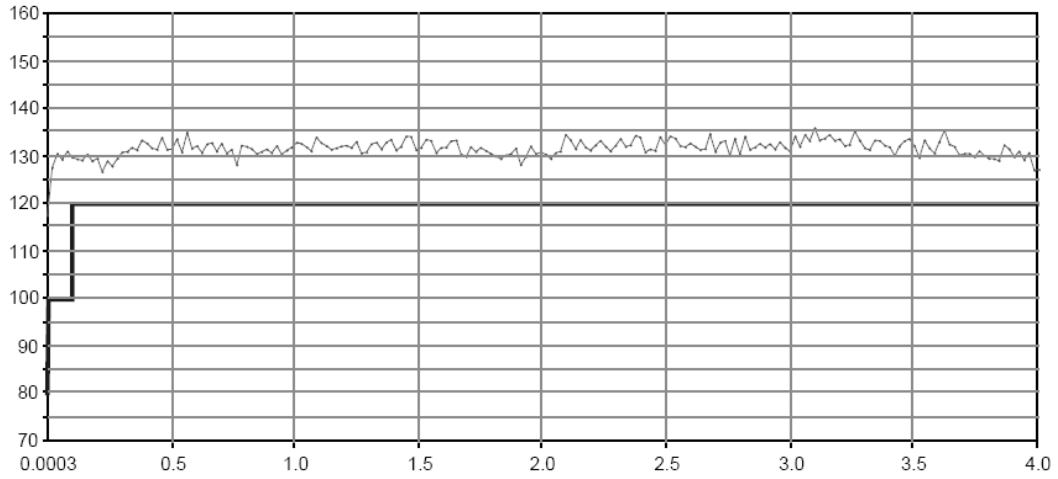
90 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and all internal adjustments performed. Data designated „overrange“ and data without tolerances: typical values only. Unless stated otherwise, specifications apply to test ports and a nominal source power of -10 dBm.

CONTENTS

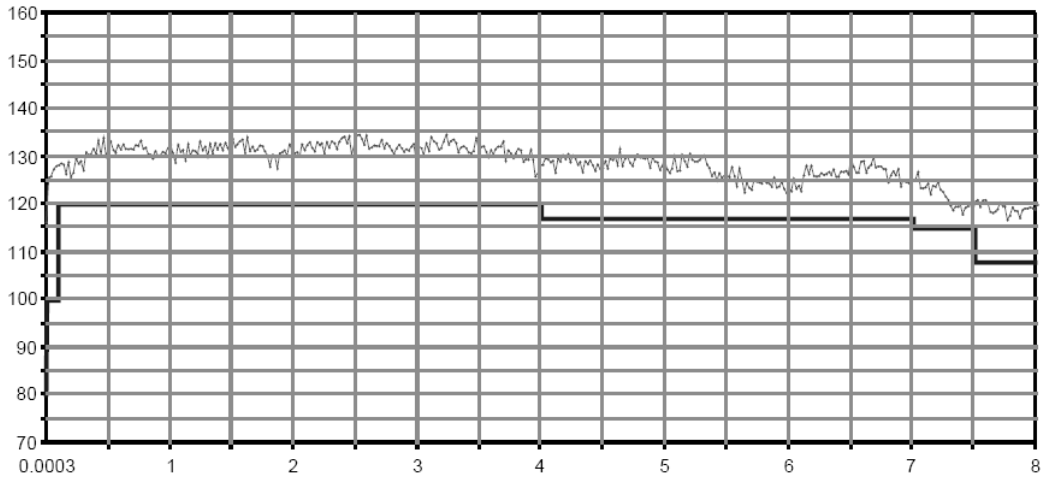
Measurement range	3
Measurement speed	5
Sweep times of R&S® ZVB	5
Measurement accuracy	6
Effective system data	9
Test port output	9
Test port input	12
Additional front panel connectors	12
Display	13
Rear panel connectors	13
Options	14
General data	14
Ordering information	15

Measurement range

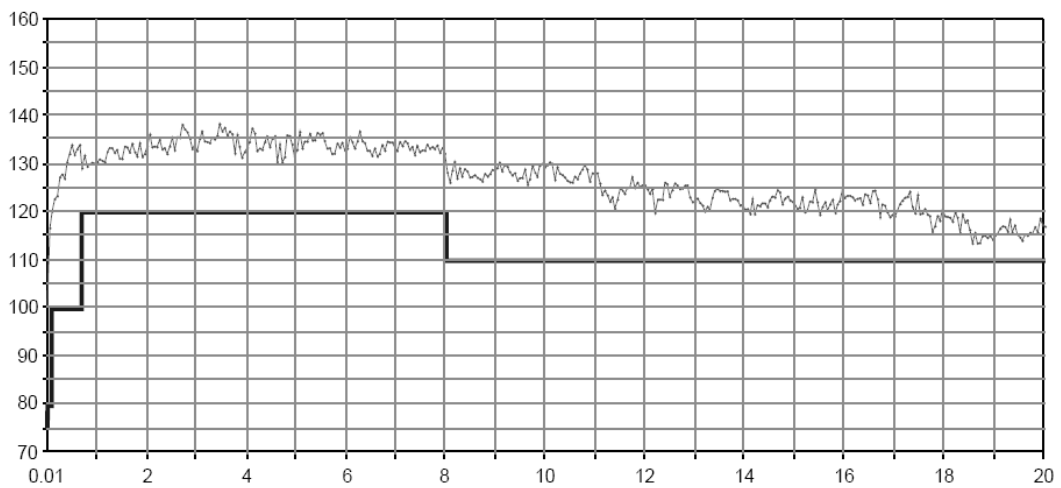
Impedance		50 Ω
Test port connector	R&S [®] ZVB4 and R&S [®] ZVB8	type N, female
	R&S [®] ZVB20	3.5 mm, male
Number of test ports		2, 3, or 4
Frequency range	R&S [®] ZVB4	300 kHz to 4 GHz
	R&S [®] ZVB8	300 kHz to 8 GHz
	R&S [®] ZVB20	10 MHz to 20 GHz
Static frequency accuracy	without optional oven quartz	8×10^{-6}
	with optional oven quartz	1×10^{-7}
Frequency resolution		1 Hz
Number of measurement points	per trace	2 to 20001
Measurement bandwidths	1/2/5 steps	1 Hz to 500 kHz
Dynamic range of R&S [®] ZVB4 two-port model and R&S [®] ZVB8 two-port model (without optional step attenuators)	from PORT 1 to PORT 2	
	300 kHz to 5 MHz	>80 dB, typ. 100 dB
	5 MHz to 100 MHz	>100 dB, typ. 120 dB
	100 MHz to 4 GHz	>120 dB, typ. 130 dB
	4 GHz to 7 GHz (R&S [®] ZVB8 only)	>117 dB, typ. 127 dB
	7 GHz to 7.5 GHz (R&S [®] ZVB8 only)	>115 dB, typ. 120 dB
Dynamic range of R&S [®] ZVB4 three-port and four-port models and R&S [®] ZVB8 three-port and four-port models (without optional step attenuators)	from PORT 1 to PORT 2 and from PORT 3 to PORT 4 (for four-port models only)	
	300 kHz to 5 MHz	>80 dB, typ. 100 dB
	5 MHz to 100 MHz	>100 dB, typ. 120 dB
	100 MHz to 500 MHz	>120 dB, typ. 130 dB
	500 MHz to 4 GHz	>123 dB, typ. 130 dB
	4 GHz to 7 GHz (R&S [®] ZVB8 only)	>120 dB, typ. 130 dB
	7 GHz to 7.5 GHz (R&S [®] ZVB8 only)	>115 dB, typ. 125 dB
7.5 GHz to 8 GHz (R&S [®] ZVB8 only)	>108 dB, typ. 125 dB	
Dynamic range of R&S [®] ZVB20	from PORT 1 to PORT 2 and from PORT 3 to PORT 4 (for four-port model only)	
	10 MHz to 100 MHz	>80 dB, typ. 110 dB
	100 MHz to 700 MHz	>100 dB, typ. 130 dB
	700 MHz to 8 GHz	>120 dB, typ. 133 dB
	8 GHz to 20 GHz	>110 dB, typ. 122 dB
The dynamic range is defined as the difference between the maximum source power and the rms value of the data trace of the transmission magnitude produced by noise and crosstalk with test ports short-circuited. The specification is valid without system error correction and at 10 Hz measurement bandwidth. The dynamic range can be increased by using a measurement bandwidth of 1 Hz.		



Dynamic range in dB versus frequency in GHz of R&S®ZVB4



Dynamic range in dB versus frequency in GHz range of R&S®ZVB8



Dynamic range in dB versus frequency in GHz range of R&S®ZVB20

Measurement speed

Measurement time	for 201 measurements points, with span 100 MHz, 500 kHz measurement bandwidth, ALC and display switched off	
	with center frequency 1.1 GHz	<6 ms
	with center frequency 5.1 GHz	<4.5 ms
Measurement time per point	CW mode, 500 kHz measurement bandwidth	<4.5 μ s
Data transfer time	for 201 measurements points	
	via IEC/IEEE bus	<2.9 ms
	via VX11 over 100 Mbit/s LAN	<1.3 ms
	via RSIB over 100 Mbit/s LAN	<0.7 ms
Time for measurement and data transfer	for 201 measurements points, with start frequency 1 GHz, stop frequency 1.1 GHz, 500 kHz measurement bandwidth, and display switched off (No additional time for data transfer is needed, as it is done simultaneously during the measurement.)	<6 ms
Switching time between channels	with not more than 2001 points	<1 ms
Switching time between two preloaded instrument settings	with not more than 2001 points	<10 ms

Sweep times of R&S® ZVB

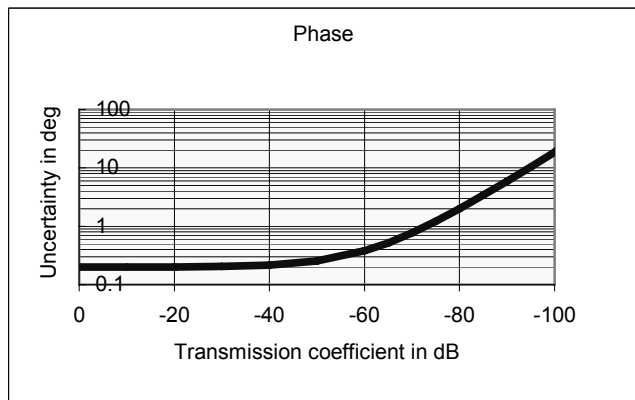
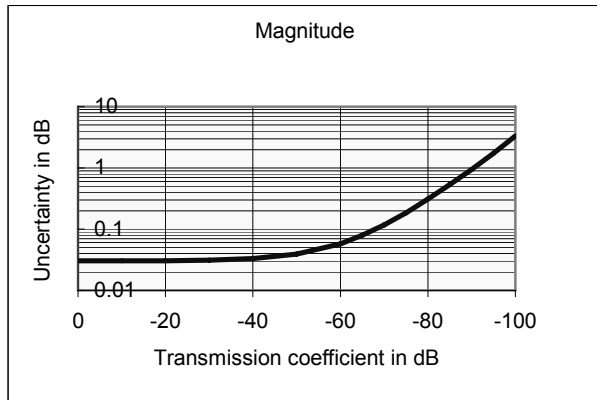
Number of measurement points	51	101	201	401	801	1601
Start frequency 5 GHz, stop frequency 5.2 GHz, ALC off, and measurement bandwidth of 100 kHz						
with full one port calibration or with correction switched off	2.4 ms	3.9 ms	6.3 ms	11 ms	20.4 ms	40.2 ms
with TOSM calibration	4.7 ms	8.6 ms	16.4 ms	32.4 ms	65 ms	170 ms
Start frequency 6 GHz, stop frequency 8 GHz, ALC off, and measurement bandwidth of 100 kHz						
with full one port calibration or with correction switched off	3.4 ms	6.2 ms	11 ms	17.3 ms	28.2 ms	49 ms
with TOSM calibration	5.3 ms	9.8 ms	18 ms	33 ms	63 ms	160 ms
Start frequency 10 MHz, stop frequency 4 GHz (R&S®ZVB4), 8 GHz (R&S®ZVB8), or 20 GHz (R&S®ZVB20), ALC off, and measurement bandwidth of 100 kHz						
with full one port calibration or with correction switched off	8.4 ms	12.6 ms	19.5 ms	30.5 ms	53.2 ms	88.2 ms
with TOSM calibration	10.3 ms	16.6 ms	28 ms	47 ms	81 ms	190 ms

Measurement accuracy

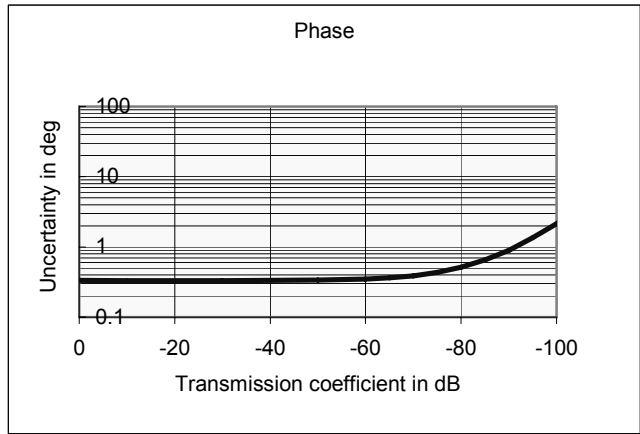
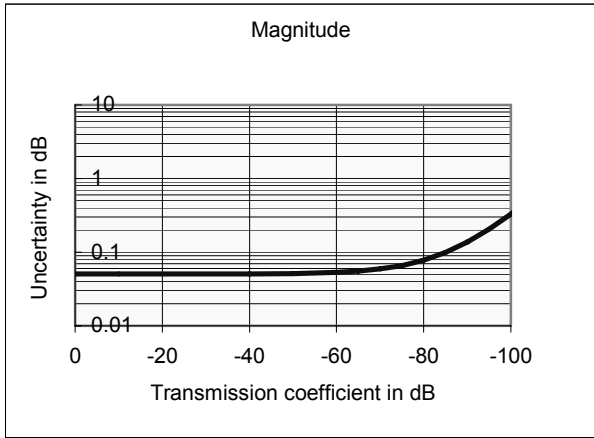
This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 K after calibration. Validity of the data is conditional on the use of a suitable calibration kit by which the effective system data specified below is achieved. Frequency points, measurement bandwidth, and sweep time have to be identical for measurement and calibration (no interpolation allowed).

Accuracy of transmission measurements		
R&S®ZVB4 and R&S®ZVB8		
300 kHz to 50 MHz	+15 dB to -30 dB	<0.2 dB or <2°
	-30 dB to -45 dB	<1 dB or <6°
Above 50 MHz	+15 dB to +5 dB	<0.2 dB or <2°
	+5 dB to -55 dB	<0.1 dB or <1°
	-55 dB to -70 dB	<0.2 dB or <2°
	-70 dB to -85 dB	<1 dB or <6°
R&S®ZVB20		
10 MHz to 50 MHz	+15 dB to -30 dB	<1 dB or <6°
50 MHz to 400 MHz	+15 dB to -30 dB	<0.2 dB or <2°
	-30 dB to -45 dB	<1 dB or <6°
400 MHz to 700 MHz	+15 dB to +5 dB	<0.2 dB or <2°
	+5 dB to -35 dB	<0.1 dB or <1°
	-35 dB to -50 dB	<0.2 dB or <2°
	-50 dB to -65 dB	<1 dB or <6°
700 MHz to 8 GHz	+15 dB to +5 dB	<0.2 dB or <2°
	+5 dB to -55 dB	<0.1 dB or <1°
	-55 dB to -70 dB	<0.2 dB or <2°
	-70 dB to -85 dB	<1 dB or <6°
8 GHz to 20 GHz	+15 dB to +5 dB	<0.2 dB or <2°
	+5 dB to -35 dB	<0.1 dB or <1°
	-35 dB to -50 dB	<0.2 dB or <2°
	-50 dB to -65 dB	<1 dB or <6°

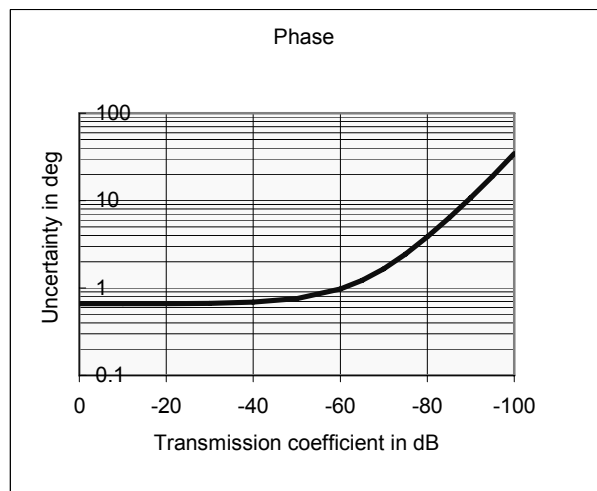
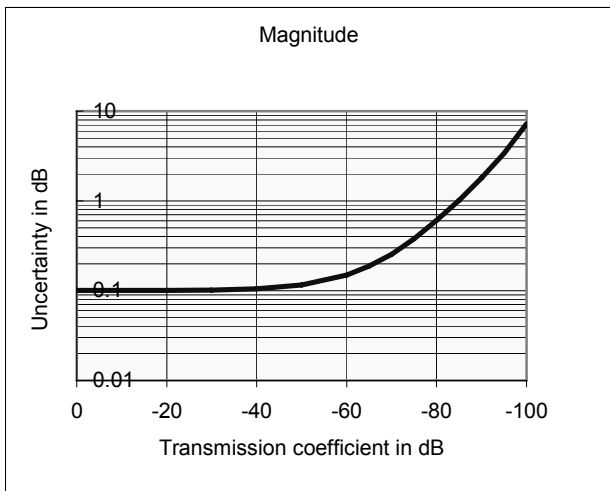
Specifications are based on a matched DUT, a measurement bandwidth of 10 Hz, and a nominal source power of -10 dBm.



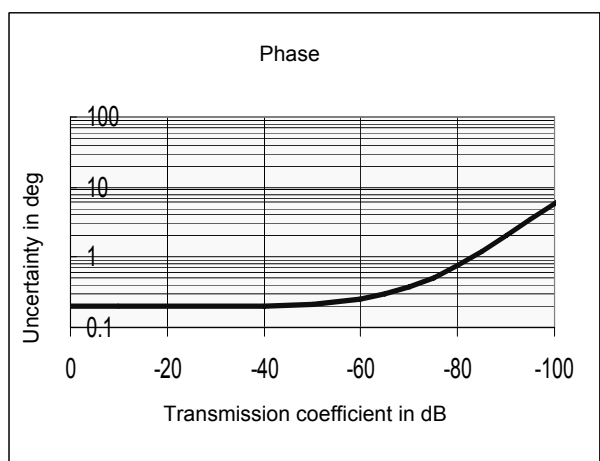
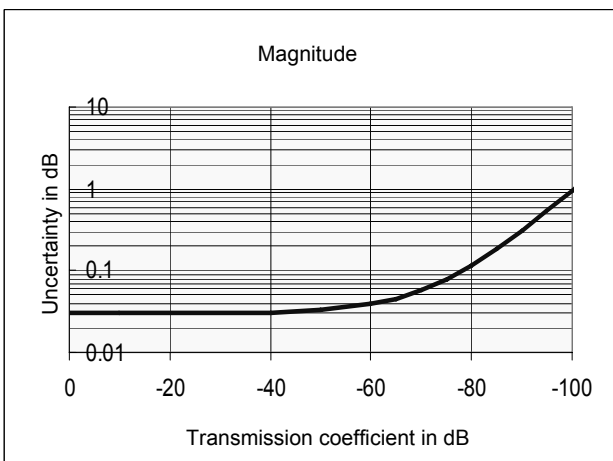
Typical accuracy of transmission magnitude and transmission phase measurements of R&S®ZVB4 and R&S®ZVB8 in the frequency range from 300 kHz to 4 GHz



Typical accuracy of transmission magnitude and transmission phase measurements of R&S[®]ZVB8 in the frequency range from 4 GHz to 8 GHz

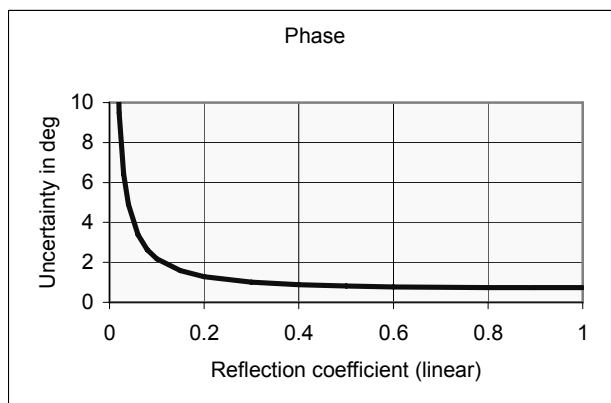
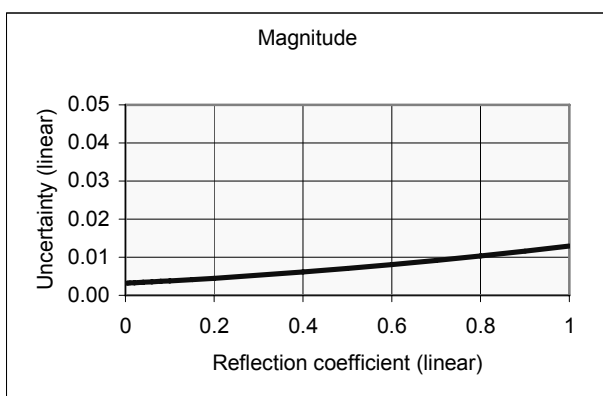


Typical accuracy of transmission magnitude and transmission phase measurements of R&S[®]ZVB20 in the frequency range from 10 MHz to 700 MHz



Typical accuracy of transmission magnitude and transmission phase measurements of R&S[®]ZVB20 in the frequency range from 700 MHz to 20 GHz

Accuracy of reflection measurements		
R&S®ZVB4 and R&S®ZVB8		
Above 300 kHz	+10 dB to +3 dB	<0.6 dB or <4°
	+3 dB to –15 dB	<0.4 dB or <3°
	–15 dB to –25 dB	<1 dB or <6°
	–25 dB to –35 dB	<3 dB or <20°
R&S®ZVB20		
10 MHz to 50 MHz	+3 dB to –15 dB	<1 dB or <6°
	–15 dB to –25 dB	<3 dB or <20°
50 MHz to 20 GHz	+10 dB to +3 dB	<0.6 dB or <4°
	+3 dB to –15 dB	<0.4 dB or <3°
	–15 dB to –25 dB	<1 dB or <6°
	–25 dB to –35 dB	<3 dB or <20°
Specifications are based on an isolating DUT, a measurement bandwidth of 10 Hz, and a nominal source power of –10 dBm.		



Typical accuracy of reflection magnitude and reflection phase measurements of R&S®ZVB4 in the frequency range from 300 kHz to 4 GHz, of R&S®ZVB8 in the frequency range from 300 kHz to 8 GHz, and of R&S®ZVB20 in the frequency range from 50 MHz to 20 GHz

Trace stability		
Trace noise of S11 (rms)	at 0 dBm source power and 0 dB reflection and 1 kHz measurement bandwidth	
	R&S®ZVB4 and R&S®ZVB8	
	Above 300 kHz	<0.004 dB, typ. 0.001 dB
	R&S®ZVB20	
	700 MHz to 8 GHz	<0.004 dB, typ. 0.001 dB
	8 GHz to 20 GHz	<0.015 dB, typ. 0.004 dB
Temperature dependence	at 0 dB transmission or reflection	<0.05 dB/K or <0.4°/K

Effective system data

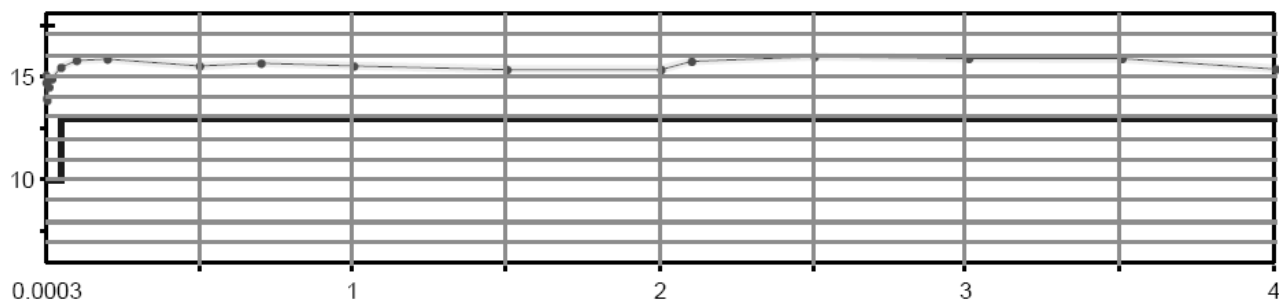
This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 K after calibration. The data is based on a measurement bandwidth of 10 Hz and system error calibration by means of a suitable calibration kit. Frequency points, measurement bandwidth, and sweep time have to be identical for measurement and calibration (no interpolation allowed).

R&S®ZVB4 and R&S®ZVB8		
Directivity	300 kHz to 4 GHz	>46 dB, typ. 50 dB
	4 GHz to 8 GHz (R&S®ZVB8 only)	>40 dB, typ. 50 dB
Source match	300 kHz to 4 GHz	>40 dB, typ. 46 dB
	4 GHz to 8 GHz (R&S®ZVB8 only)	>36 dB, typ. 40 dB
Reflection tracking	300 kHz to 4 GHz	<0.04 dB, typ. 0.01 dB
	4 GHz to 8 GHz (R&S®ZVB8 only)	<0.1 dB, typ. 0.01 dB
Load match	300 kHz to 4 GHz	>46 dB, typ. 50 dB
	4 GHz to 8 GHz (R&S®ZVB8 only)	>40 dB, typ. 46 dB
Transmission tracking	300 kHz to 4 GHz	<0.06 dB, typ. 0.01 dB
	4 GHz to 8 GHz (R&S®ZVB8 only)	<0.2 dB, typ. 0.05 dB
R&S®ZVB20		
Directivity	10 MHz to 700 MHz	>36 dB, typ. 40 dB
	700 MHz to 20 GHz	>40 dB, typ. 50 dB
Source match	10 MHz to 700 MHz	>30 dB, typ. 48 dB
	700 MHz to 20 GHz	>30 dB, typ. 48 dB
Reflection tracking	10 MHz to 700 MHz	<0.3 dB, typ. 0.05 dB
	700 MHz to 20 GHz	<0.3 dB, typ. 0.05 dB
Load match	10 MHz to 700 MHz	>36 dB, typ. 40 dB
	700 MHz to 20 GHz	>40 dB, typ. 50 dB
Transmission tracking	10 MHz to 700 MHz	<0.3 dB, typ. 0.1 dB
	700 MHz to 20 GHz	<0.3 dB, typ. 0.1 dB

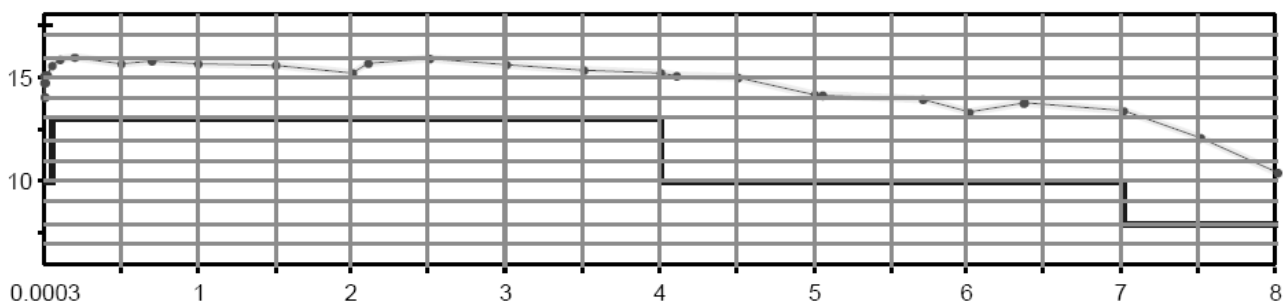
Test port output

Power range (without optional step attenuators)	R&S®ZVB4 and R&S®ZVB8	
	300 kHz to 50 MHz	–40 dBm to +10 dBm, typ. –45 dBm to +14 dBm
	50 MHz to 4 GHz	–40 dBm to +13 dBm, typ. –45 dBm to +15 dBm
	4 GHz to 7 GHz (R&S®ZVB8 only)	–40 dBm to +10 dBm, typ. –45 dBm to +13 dBm
	7 GHz to 8 GHz (R&S®ZVB8 only)	–40 dBm to +8 dBm, typ. –45 dBm to +12 dBm
	R&S®ZVB20	
	10 MHz to 13 GHz	–30 dBm to +10 dBm, typ. –40 dBm to +15 dBm
	13 GHz to 20 GHz	–30 dBm to +5 dBm, typ. –40 dBm to +10 dBm
Power accuracy (with ALC on and without power calibration)	R&S®ZVB4 and R&S®ZVB8	
	at –10 dBm	<2 dB
	in temperature range +18 °C to +28 °C above 50 MHz	<0.8 dB, typ. 0.3 dB
	R&S®ZVB20	
	at –10 dBm	<3 dB
	in temperature range +18 °C to +28 °C 50 MHz to 20 GHz	<0.8 dB, typ. 0.3 dB
Power linearity	referenced to –10 dBm	<2 dB
	in temperature range +18 °C to +28 °C above 50 MHz	<0.8 dB, typ. 0.2 dB
		0.01 dB
Power resolution		0.01 dB

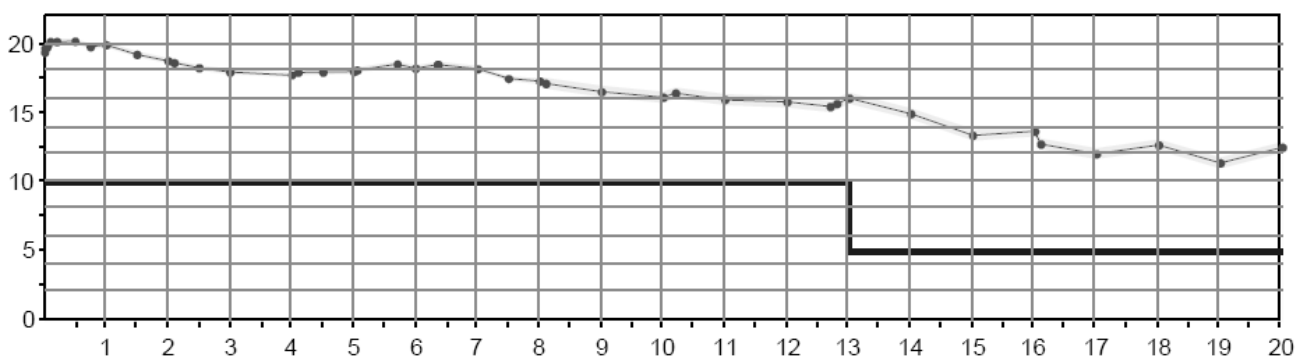
Harmonics (Output power is referenced to maximum specified output power)	R&S®ZVB4 and R&S®ZVB8	
	300 kHz to 50 MHz at -3 dB	typ. <-30 dBc
	50 MHz to 4 GHz at -5 dB	<-20 dBc, typ. <-30 dBc
	4 GHz to 7 GHz at -2 dB (R&S®ZVB8)	<-20 dBc, typ. <-30 dBc
	7 GHz to 8 GHz at 0 dB (R&S®ZVB8)	<-20 dBc, typ. <-30 dBc
	R&S®ZVB20	
	10 MHz to 50 MHz at -3 dB	typ. <-30 dBc
	50 MHz to 13 GHz at 0 dB	<-20 dBc, typ. <-30 dBc
	13 GHz to 20 GHz at 0 dB	<-20 dBc, typ. <-30 dBc



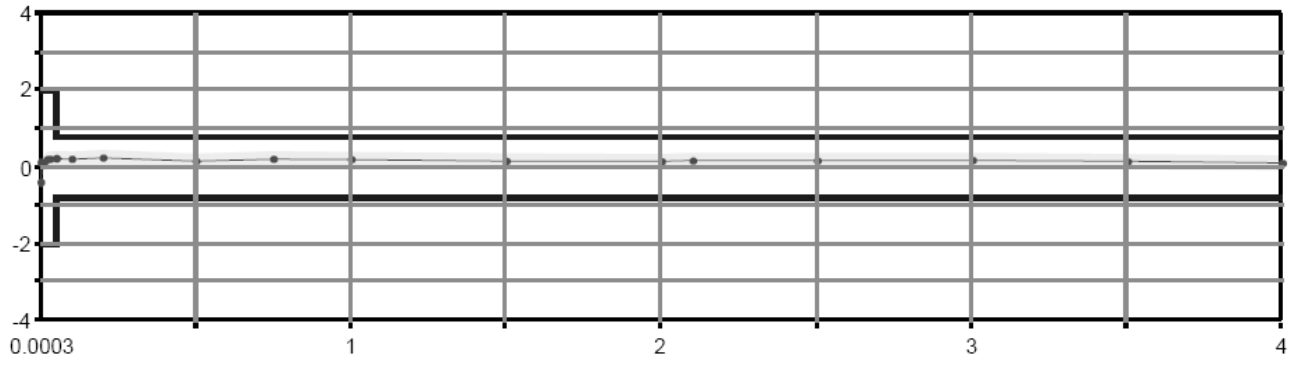
Maximum output power in dBm versus frequency in GHz of R&S®ZVB4



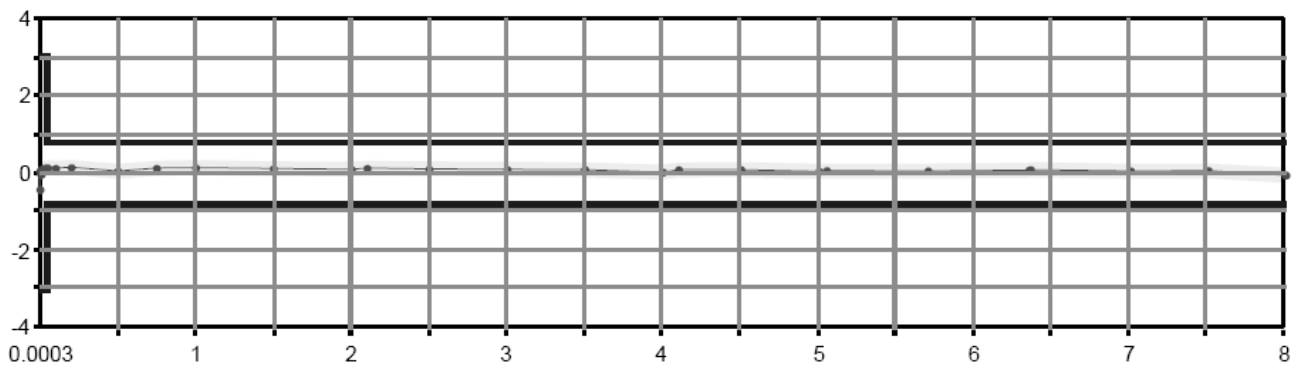
Maximum output power in dBm frequency in GHz of R&S®ZVB8



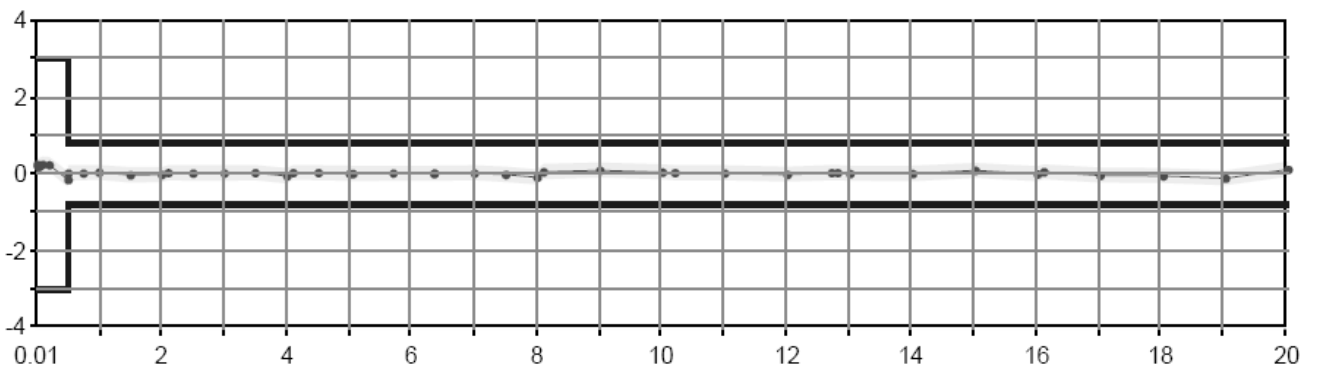
Maximum output power in dBm versus frequency in GHz of R&S®ZVB20



Output power accuracy in dB versus frequency in GHz of R&S[®]ZVB4



Output power accuracy in dB versus frequency in GHz of R&S[®]ZVB8



Output power accuracy in dB versus frequency in GHz of R&S[®]ZVB20

Test port input

Match	without system error correction	
	R&S® ZVB4	
	300 kHz to 8 GHz	>16 dB
	R&S® ZVB8	
	300 kHz to 7 GHz	>16 dB
	7 GHz to 8 GHz	>14 dB
	R&S® ZVB20	
	10 MHz to 50 MHz	>10 dB
	50 MHz to 2 GHz	>16 dB
	2 GHz to 20 GHz	>8 dB
Maximum nominal input level	R&S® ZVB4 and R&S® ZVB8	+13 dBm
	R&S® ZVB20	
	10 MHz to 8 GHz	+10 dBm
	8 GHz to 20 GHz	0 dBm
Power measurement accuracy	at -10 dBm without power calibration	
	in temperature range +18 °C to +28 °C	
	10 MHz to 8 GHz	1 dB
	8 GHz to 20 GHz (R&S® ZVB20 only)	2 dB
Receiver linearity	referenced to -10 dBm	
	in temperature range +18 °C to +28 °C	
	R&S® ZVB4 and R&S® ZVB8	
	for +20 dB to -60 dB	
	50 MHz to 4 GHz	0.1 dB
	4 GHz to 6 GHz (R&S® ZVB8 only)	0.1 dB
	6 GHz to 8 GHz (R&S® ZVB8 only)	0.2 dB
	R&S® ZVB20	
	for +20 dB to -30 dB	
	50 MHz to 700 MHz	0.1 dB
	for +20 dB to +10 dB	
	700 MHz to 8 GHz	0.3 dB
	for +15 dB to +10 dB	
	8 GHz to 20 GHz	0.3 dB
for +10 dB to -45 dB		
700 MHz to 20 GHz	0.1 dB	
Damage level		+27 dBm
Damage DC voltage		30 V
Noise level (without optional step attenuators)	at 10 Hz measurement bandwidth	
	R&S® ZVB4 and R&S® ZVB8	
	300 kHz to 100 MHz	<-70 dBm
	100 MHz to 4 GHz	<-110 dBm
	4 GHz to 8 GHz (R&S® ZVB8 only)	<-105 dBm
	R&S® ZVB20	
	100 MHz to 700 MHz	<-70 dBm
700 MHz to 8 GHz	<-105 dBm	
8 GHz to 20 GHz	<-100 dBm	
The noise level is defined as the rms value of the indicated noise floor.		

Additional front panel connectors

USB	(two) universal serial bus connectors for connecting USB devices (USB 1.1); two additional USB connectors at the rear panel
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Display

Screen	21 cm (8.4") diagonal color LCD
Resolution	800 × 600 × 262144 (high color)

Rear panel connectors

IEC BUS	remote control in line with IEEE488, IEC60625; 24 pins
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LAN 1	first local area network connector, 8 pins, RJ-45
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LAN 2	second local area network connector, 8 pins, RJ-45
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USB	(two) Universal Serial Bus connectors for connecting USB devices (USB 1.1); two additional USB connectors at the front panel
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10 MHz REF	alternatively input or output for external frequency reference signal	
Connector type		BNC, female
Input frequency		10 MHz
Maximum allowed deviation		1 kHz
Input power		0 dBm ± 3 dB
Input impedance		50 Ω
Output frequency		10 MHz
Output frequency accuracy		80 Hz
Output power		-3 dBm ± 8 dB at 50 Ω

DC MEAS 1 V	DC measurement input	
Connector type		4-pin Mini DIN, female
Voltage range		-1 V to +1 V
Measurement accuracy		2.5 % of reading + 2.5 mV
Input impedance		>10 kΩ
Damage voltage		30 V

DC MEAS 10 V	DC measurement input	
Connector type		4-pin Mini DIN, female
Voltage range		-10 V to +10 V
Measurement accuracy		2.5 % of reading + 25 mV
Input impedance		>10 kΩ
Damage voltage		30 V

PORT BIAS	DC bias input for PORT	
Connector type		BNC, female
Maximum nominal input voltage		30 V
Maximum nominal input current		200 mA
Damage voltage		30 V
Damage current		500 mA

MONITOR	IBM-PC-compatible VGA monitor connector, 15-pin D-Sub (for external monitor)
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USER CONTROL	several control and trigger signals, 25-pin D-Sub, 3.3 V TTL for controlling external generators, for limit checks, sweep signals, etc	
FOOT SWITCH 1 and FOOT SWITCH 2	pin 24 and pin 25 (inputs)	control inputs
DRIVE PORT 1 to DRIVE PORT 4	pin 16 to pin 19 (outputs)	indicate driving port
CHANNEL BIT 0 to CHANNEL BIT 3	pin 8 to pin 11 (outputs)	channel-specific user-configurable bits
PASS 1 and PASS 2	pin 13 and pin 14 (outputs)	pass/fail results of limit checks
BUSY	pin 4 (output)	measurements running
READY FOR TRIGGER	pin 6 (output)	ready for trigger
EXT GEN TRIGGER	pin 21 (output)	control signal for external generator
EXT GEN BLANK	pin 22 (input)	handshake signal from external generator
EXTERNAL TRIGGER	pin 2 (input)	trigger input for analyzer

EXT TRIGGER	trigger input for analyzer	
Connector type		BNC, female
TTL signal (edge triggered)		3 V
Polarity (selectable)		positive or negative
Minimum pulse width		1 μ s
Input impedance		>10 k Ω

Options

Generator Step Attenuators	extend the lower limit of the output power range of R&S® ZVB8 by 70 dB	
Frequency range		300 kHz to 8 GHz
Power range		upper limit is reduced by 6 dB, lower limit is extended by 70 dB
Power accuracy	at -10 dBm without power calibration	identical to specifications without optional step attenuators
Power linearity	above -30 dBm	identical to specifications without optional step attenuators
	-30 dBm to -70 dBm	<2 dB
	-70 dBm to -100 dBm	<3 dB
Dynamic range		is reduced by 6 dB

General data

Temperature loading	operating temperature range	+5 °C to +40 °C
	storage temperature range	-40 °C to +70 °C in line with IEC 60068-2-1 and IEC 60068-2-2
Damp heat		+40 °C at 95 % rel. humidity, in line with IEC 60068-2-30
Mechanical resistance	vibration, sinusoidal	5 Hz to 150 Hz, in line with IEC 60068-2-6
	vibration, random	10 Hz to 300 Hz, in line with IEC 60068-2-64
	shock	40 g shock spectrum, in line with IEC 60068-2-27, MIL-STD 810
Calibration interval		1 year
EMC	RF emission	in line with CISPR 11/EN 55011 Group 1 Class B (for a shielded test set-up)
EMC	other emissions and immunity	in line with IEC/EN 61326, emission class B (residential environment), immunity industrial environment (excluding operating frequency)
Safety		in line with IEC 61010-1, EN61010-1, and UL 3111-1

Power supply		100 V to 240 V (AC) with tolerance $\pm 10\%$, 50 Hz to 60 Hz with tolerance $\pm 5\%$, safety class I to VDE 411
Power consumption		450 W, typ. 350 W (standby: typ. 10 W)
Conformity mark		VDE, GS, CSA, CSA-NRTL/C, CE
Dimensions (W × H × D)	R&S®ZVB4 and R&S®ZVB8	465.1 mm × 241.8 mm × 417.0 mm
	R&S®ZVB20 with two or three ports	465.1 mm × 241.8 mm × 417.0 mm
	R&S®ZVB20 with four ports	465.1 mm × 286.2 mm × 417.0 mm
Weight	R&S®ZVB4 and R&S®ZVB8	20 kg
	R&S®ZVB20 with two or three ports	20 kg
	R&S®ZVB20 with four ports	25 kg

Ordering information

Designation	Type	Order No.
Vector Network Analyzer, 4 GHz, 2 ports	R&S®ZVB4	1145.1010.04
Vector Network Analyzer, 4 GHz, 3 ports	R&S®ZVB4	1145.1010.05
Vector Network Analyzer, 4 GHz, 4 ports	R&S®ZVB4	1145.1010.06
Vector Network Analyzer, 8 GHz, 2 ports	R&S®ZVB8	1145.1010.08
Vector Network Analyzer, 8 GHz, 3 ports	R&S®ZVB8	1145.1010.09
Vector Network Analyzer, 8 GHz, 4 ports	R&S®ZVB8	1145.1010.10
Vector Network Analyzer, 20 GHz, 2 ports	R&S®ZVB20	1145.1010.20
Vector Network Analyzer, 20 GHz, 4 ports	R&S®ZVB20	1145.1010.22
Options		
Generator Step Attenuator Port 1 for R&S®ZVB8 (max. two step attenuators insertable)	R&S®ZVB8-B21	1302.5480.02
Generator Step Attenuator Port 2 for R&S®ZVB8 (max. two step attenuators insertable)	R&S®ZVB8-B22	1302.5073.02
Generator Step Attenuator Port 3 for R&S®ZVB8 with three ports or four ports (max. two step attenuators insertable)	R&S®ZVB8-B23	1302.5496.02
Oven Quartz (OCXO)	R&S®ZVAB-B4	1164.1757.02
Time Domain	R&S®ZVAB-K2	1164.1657.02
Mixer and Harmonic Measurements	R&S®ZVB-K3	1164.1592.02



For product brochure, see PD 0758.1529.12
and www.rohde-schwarz.com
(search term: ZVB)



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