

R&S® ZNBT

Vector Network Analyzer

Specifications



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Definitions

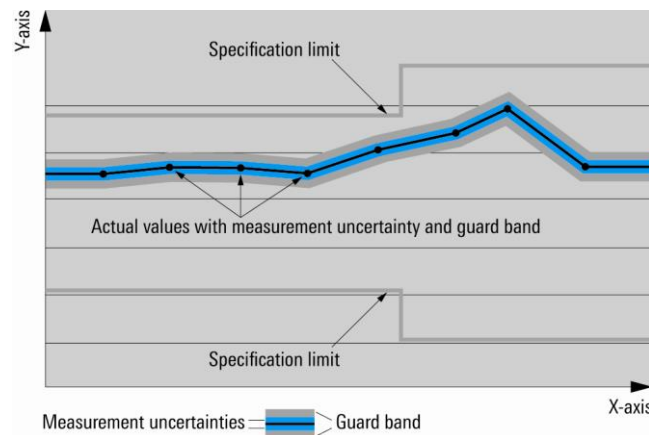
General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 60 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable
- Unless stated otherwise, specifications apply to test ports and a nominal source power of -10 dBm

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \leq , $>$, \geq , \pm , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



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.

Measurement range

Impedance		50 Ω
Test port connector	R&S®ZNBT8	N female
	R&S®ZNBT20	3.5 mm, male, ruggedized
Number of test ports (the R&S®ZNBT8 supports simultaneous data acquisition at all test ports)	R&S®ZNBT8 base unit	4
	R&S®ZNBT20 base unit	8
	with R&S®ZNBT8-B108 option (additional ports 5 to 8)	8
	with R&S®ZNBT8-B112 or R&S®ZNBT20-B112 option (additional ports 9 to 12)	12
	with R&S®ZNBT8-B116 or R&S®ZNBT20-B116 option (additional ports 13 to 16)	16
	with R&S®ZNBT8-B120 option (additional ports 17 to 20)	20
	with R&S®ZNBT8-B124 option (additional ports 21 to 24)	24
Frequency range	R&S®ZNBT8	9 kHz to 8.5 GHz
	R&S®ZNBT20	100 kHz to 20 GHz

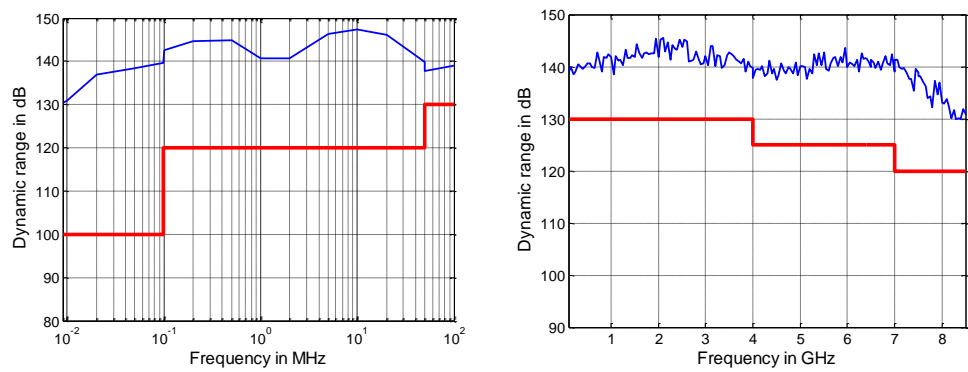
Static frequency accuracy		(time since last adjustment \times aging rate) + temperature drift + calibration accuracy
Aging per year	standard	$\pm 1 \times 10^{-6}$
	with R&S®ZNBT8-B4 precision frequency reference option	$\pm 1 \times 10^{-7}$
Temperature drift (+5 °C to +40 °C)	standard	$\pm 1 \times 10^{-6}$
	with R&S®ZNBT8-B4 precision frequency reference option	$\pm 1 \times 10^{-8}$
Achievable initial calibration accuracy	standard	$\pm 5 \times 10^{-7}$
	with R&S®ZNB-B4 precision frequency reference option	$\pm 5 \times 10^{-8}$

Frequency resolution		1 Hz
Number of measurement points ¹	per trace	2 to 100001
Measurement bandwidth	1/1.5/2/3/5/7 steps	
	without optional increased bandwidth	1 Hz to 1 MHz
	with optional increased bandwidth	1 Hz to 10 MHz

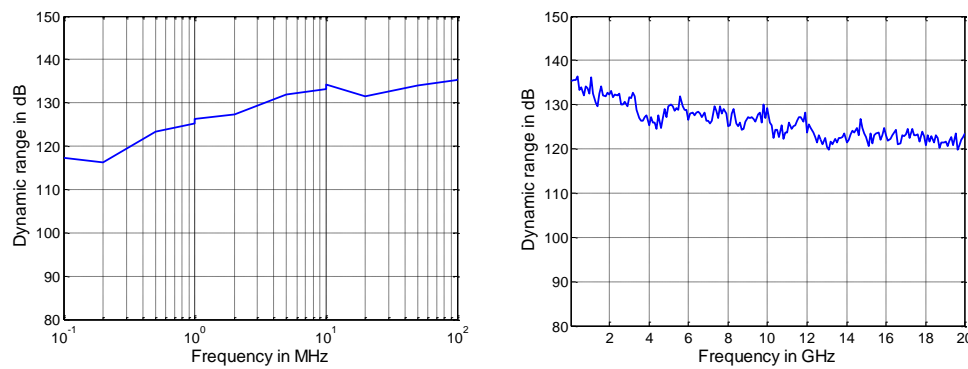
		Specification	Typical
Dynamic range ² of the R&S®ZNBT8 at all ports (without optional step attenuators)	9 kHz to 100 kHz	≥ 100 dB	122 dB
	100 kHz to 50 MHz	≥ 120 dB	138 dB
	50 MHz to 4 GHz	≥ 130 dB	140 dB
	4 GHz to 7 GHz	≥ 125 dB	138 dB
	7 GHz to 8.5 GHz	≥ 120 dB	130 dB
Dynamic range ² of the R&S®ZNBT20 at all ports	100 kHz to 1 MHz		115 dB
	1 MHz to 10 MHz		125 dB
	10 MHz to 100 MHz		130 dB
	100 MHz to 2 GHz		130 dB
	2 GHz to 10 GHz		125 dB
	10 GHz to 20 GHz		120 dB

¹ The maximum number of sweep points may vary depending on the number of ports involved in the measurement.

² Dynamic range is defined as the difference between the actual maximum source power and the RMS value of the data trace of the transmission magnitude, which is produced by noise and crosstalk with the test ports short-circuited. The specification applies at 10 Hz measurement bandwidth, without system error correction. The dynamic range can be increased by using a measurement bandwidth of 1 Hz. Crosstalk does not limit the dynamic range.



Dynamic range in dB versus frequency for the R&S®ZNB8.

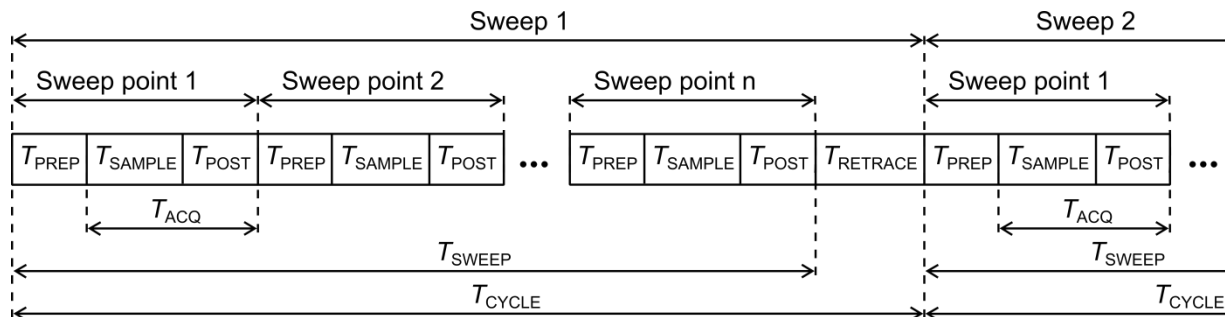


Dynamic range in dB versus frequency for the R&S®ZNB20.

Measurement speed

Measured with firmware version 2.70 (R&S®ZNB8) / 2.75 (R&S®ZNB20) and Windows 7/64 bit.

Measurement time	for 201 measurements points, with 200 MHz span, 1 MHz measurement bandwidth					
		T_{SWEEP}		T_{CYCLE}		
	R&S®ZNB8					
	with 900 MHz center frequency	< 2.5 ms		< 5 ms		
	with 5.1 GHz center frequency	< 2.0 ms		< 5 ms		
	R&S®ZNB20					
	with 900 MHz center frequency	< 3 ms		< 5 ms		
	with 5.1 GHz center frequency	< 3.5 ms		< 5.5 ms		
Acquisition time per point (T_{ACQ})	1 MHz measurement bandwidth, CW mode		7.5 μs			
Sampling time per point (T_{SAMPLE}) IF filter: normal	at 1 MHz measurement bandwidth		860 ns			
	at 10 MHz measurement bandwidth		312 ns			
Time for measurement and data transfer (typical)	for 201 measurements points, with 800 MHz start frequency, 1 GHz stop frequency, 1 MHz measurement bandwidth ³	VXI11	RSIB	IEC/IEEE	USB 3.0	
		over 1 Gbit/s LAN				
	R&S®ZNB8	4.6 ms	4.2 ms	5.1 ms	—	
	R&S®ZNB20	4.9 ms	4.5 ms	5.3 ms	4.5 ms	
Data transfer time	for 201 measurements points (magnitude)		0.9 ms	0.5 ms	1.3 ms	0.5 ms
Switching time between channels or preloaded instrument settings	with a maximum of 2001 points		< 8 ms			



- T_{PREP} Preparation time required to set up the internal hardware components
- T_{SAMPLE} Sampling time (approximately equal to the settling time of the digital filters)
- T_{POST} Time required for hardware postprocessing
- T_{ACQ} Acquisition time ($T_{\text{SAMPLE}} + T_{\text{POST}}$)
- T_{SWEEP} Time required for one sweep
- T_{RETRACE} Time between two sweeps
- T_{CYCLE} Sweep cycle time ($T_{\text{SWEEP}} + T_{\text{RETRACE}}$)

Measurement data acquisition process.

³ In continuous mode, no additional time for data transfer is needed, as this occurs simultaneously during the measurement.

Typical sweep times in ms versus number of measurement points ⁴ of the R&S®ZNB8

Number of measurement points	51		201		401		1601		5001	
Sweep mode (stepped, swept)	swept	step	swept	step	swept	step	swept	step	swept	step
800 MHz start frequency, 1 GHz stop frequency, AGC AUTO, 500 kHz measurement bandwidth										
With correction switched off	1.2	1.7	1.9	4	2.9	4.9	7.9	11.7	22.5	33.9
With 4-port TOSM calibration	3.2	5.1	6.4	13.9	10.6	18.9	31.9	48.1	91.1	141
With 24-port TOSM calibration	20.4	33.1	58.6	104	107	153	413	505	1310	1577
800 MHz start frequency, 1 GHz stop frequency, AGC LOW DIST, 1 kHz measurement bandwidth										
With correction switched off	46.8	46.8	181	181	360	360	1383	1383	4310	4310
With 4-port TOSM calibration	185	185	722	722	1435	1438	5520	5530	17240	17250
With 24-port TOSM calibration	1106	1108	4330	4330	8630	8630	33191	33191	103810	103810
1 MHz start frequency, 4.5 GHz stop frequency, AGC AUTO, 500 kHz measurement bandwidth										
With correction switched off	2.9	2.9	5.3	5.3	4.8	8	10.3	24.2	25.3	65.6
With 4-port TOSM calibration	10	13.2	19.6	22.9	17.7	34.8	40.1	99.3	100	265
With 24-port TOSM calibration	61.9	63.7	136	136	139	227	405	771	1300	2300
1 MHz start frequency, 4.5 GHz stop frequency, AGC LOW DIST, 1 kHz measurement bandwidth										
With correction switched off	49.9	49.9	183	183	360	360	1420	1420	4430	4430
With 4-port TOSM calibration	197	197	728	729	1435	1438	5670	5680	17680	17680
With 24-port TOSM calibration	1178	1182	4360	4380	8610	8630	34101	34111	106432	106442
1 MHz start frequency, 8.5 GHz stop frequency, AGC AUTO, 500 kHz measurement bandwidth										
With correction switched off	3.2	3.2	5.6	5.6	8.5	8.5	11.3	24.1	26	66.1
With 4-port TOSM calibration	11.1	16.2	20.9	28	32.5	40.2	44.6	103	103	272
With 24-port TOSM calibration	68.5	70.5	142	145	223	232	404	753	1255	2340
1 MHz start frequency, 8.5 GHz stop frequency, AGC LOW DIST, 1 kHz measurement bandwidth										
With correction switched off	51.4	51.4	184	184	361	361	1420	1420	4420	4420
With 4-port TOSM calibration	202	203	734	736	1440	1443	5680	5680	17650	17660
With 24-port TOSM calibration	1213	1215	4410	4416	8640	8660	34081	34111	106270	106292

Typical sweep times in ms versus number of measurement points ⁴ of the R&S®ZNB20

9 GHz start frequency, 10 GHz stop frequency, AGC AUTO, 500 kHz measurement bandwidth										
With correction switched off	2.1	2.1	2.5	3.7	3.4	5.7	8	14.3	20.2	32
With 4-port TOSM calibration	7	7.1	8.8	13.8	12.2	21.8	31.7	57.3	81.1	162
With 16-port TOSM calibration	28.4	29	39.9	58.8	59.4	99.3	184	307	565	965
9 GHz start frequency, 10 GHz stop frequency, AGC LOW DIST, 1 kHz measurement bandwidth										
With correction switched off	46.4	46.4	178	178	352	352	1400	1402	4320	4320
With 4-port TOSM calibration	183	184	708	708	1405	1408	5600	5600	17270	17270
With 16-port TOSM calibration	731	732	2825	2830	5620	5620	22400	22400	69210	69210
1 MHz start frequency, 20 GHz stop frequency, AGC AUTO, 500 kHz measurement bandwidth										
With correction switched off	9.1	9.1	12.5	12.5	15.2	15.2	28.1	28.1	33.9	63.1
With 4-port TOSM calibration	35	35	48.5	48.5	59.1	59.3	111	111	135	252
With 16-port TOSM calibration	145	145	204	206	256	258	534	542	714	1418
1 MHz start frequency, 20 GHz stop frequency, AGC LOW DIST, 1 kHz measurement bandwidth										
With correction switched off	56.6	56.7	191	192	367	368	1415	1415	4380	4380
With 4-port TOSM calibration	224	225	761	764	1465	1470	5660	5660	17540	17540
With 16-port TOSM calibration	900	903	3050	3070	5870	5880	22680	22700	70360	70400

⁴ Sweep time is to be understood as cycle time; static frequency accuracy of the instrument applies; measured with controller LPW11, firmware version 2.75, Windows 7.

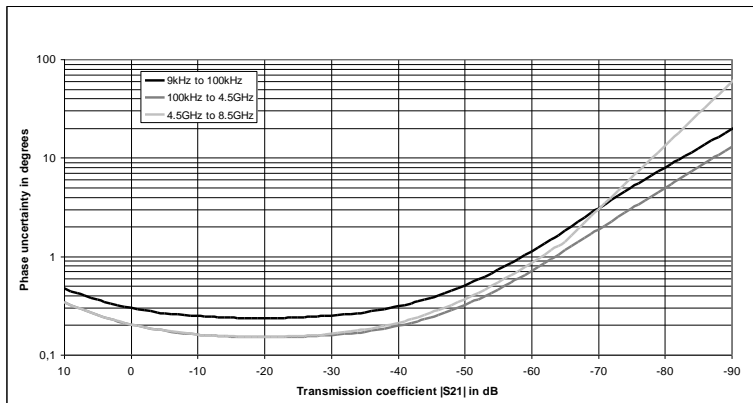
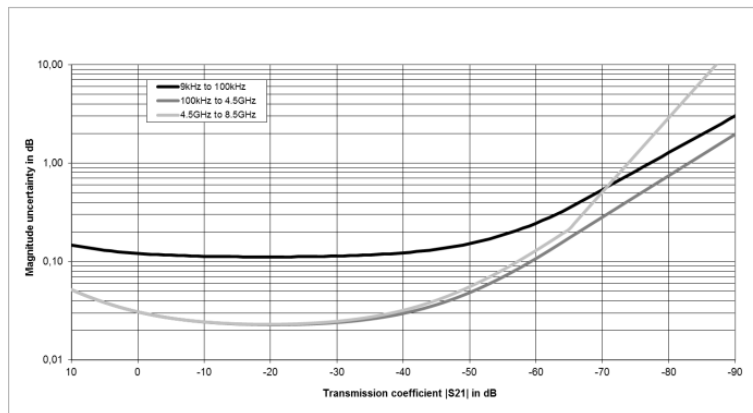
Measurement accuracy of the R&S®ZNB T8

This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 K since calibration. The data is valid if a R&S®ZV-Z270 calibration kit is used. This calibration kit is used to achieve the effective system data specified below. Frequency points, measurement bandwidth and sweep time have to be identical for measurement and calibration (no interpolation).

Accuracy of transmission measurements

9 kHz to 100 kHz	+5 dB to –50 dB	< 0.2 dB or < 0.5°
	–50 dB to –60 dB	< 0.3 dB or < 2°
100 kHz to 8.5 GHz	+5 dB to –40 dB	< 0.04 dB or < 0.3°
	–40 dB to –50 dB	< 0.06 dB or < 0.4°
	–50 dB to –60 dB	< 0.2 dB or < 1°

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

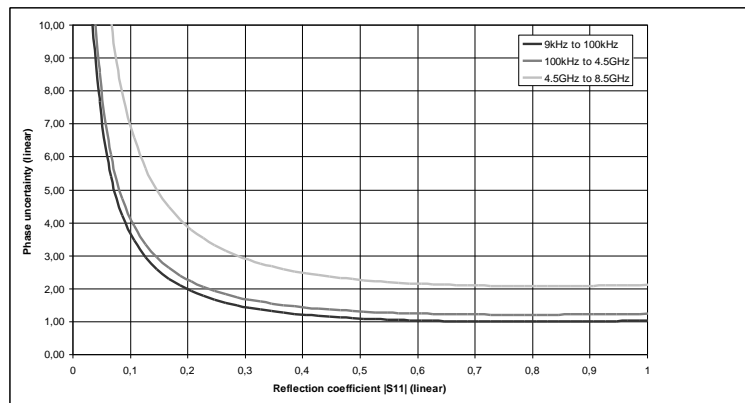
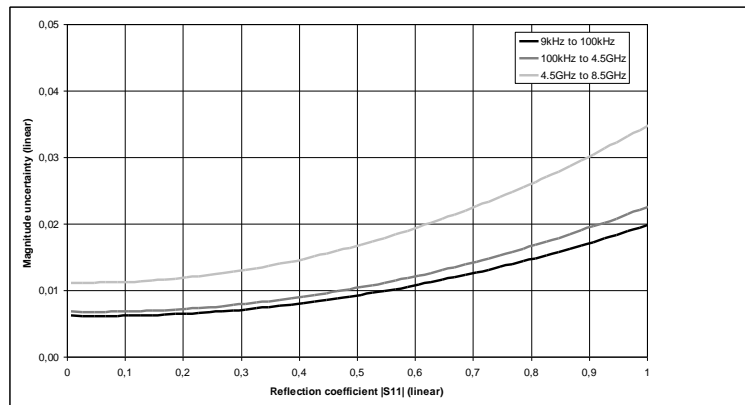


Typical accuracy of transmission magnitude and transmission phase measurements for the R&S®ZNB T8 in the frequency range from 9 kHz to 8.5 GHz. Analysis conditions: $S_{11} = S_{22} = 0$, cal. power –10 dBm, meas. power –10 dBm.

Accuracy of reflection measurements

	Logarithmic			Linear	
		Magnitude	Phase		Magnitude
9 kHz to 100 kHz	0 dB	≤ 0.18 dB	$\leq 1^\circ$	0 dB to -3 dB	0.020
	-3 dB	≤ 0.16 dB	$\leq 1^\circ$	< -3 dB to -6 dB	0.013
	-6 dB	≤ 0.16 dB	$\leq 1.1^\circ$	< -6 dB to -15 dB	0.009
	-15 dB	≤ 0.3 dB	$\leq 2.2^\circ$	< -15 dB to -25 dB	0.006
	-25 dB	≤ 0.9 dB	$\leq 6^\circ$	< -25 dB to -35 dB	0.006
	-35 dB	≤ 2.5 dB	$\leq 20^\circ$		
100 kHz to 4.5 GHz	0 dB	≤ 0.2 dB	$\leq 1.2^\circ$	0 dB to -3 dB	0.023
	-3 dB	≤ 0.18 dB	$\leq 1.2^\circ$	< -3 dB to -6 dB	0.015
	-6 dB	≤ 0.2 dB	$\leq 1.3^\circ$	< -6 dB to -15 dB	0.010
	-15 dB	≤ 0.4 dB	$\leq 2.5^\circ$	< -15 dB to -25 dB	0.007
	-25 dB	≤ 1 dB	$\leq 7^\circ$	< -25 dB to -35 dB	0.007
	-35 dB	≤ 3 dB	$\leq 25^\circ$		
4.5 GHz to 8.5 GHz	0 dB	≤ 0.3 dB	$\leq 2^\circ$	0 dB to -3 dB	0.035
	-3 dB	≤ 0.3 dB	$\leq 2^\circ$	< -3 dB to -6 dB	0.023
	-6 dB	≤ 0.3 dB	$\leq 2.3^\circ$	< -6 dB to -15 dB	0.017
	-15 dB	≤ 0.6 dB	$\leq 4.2^\circ$	< -15 dB to -25 dB	0.012
	-25 dB	≤ 1.7 dB	$\leq 15^\circ$	< -25 dB to -35 dB	0.011
	-35 dB	≤ 4.5 dB	$\leq 45^\circ$		

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



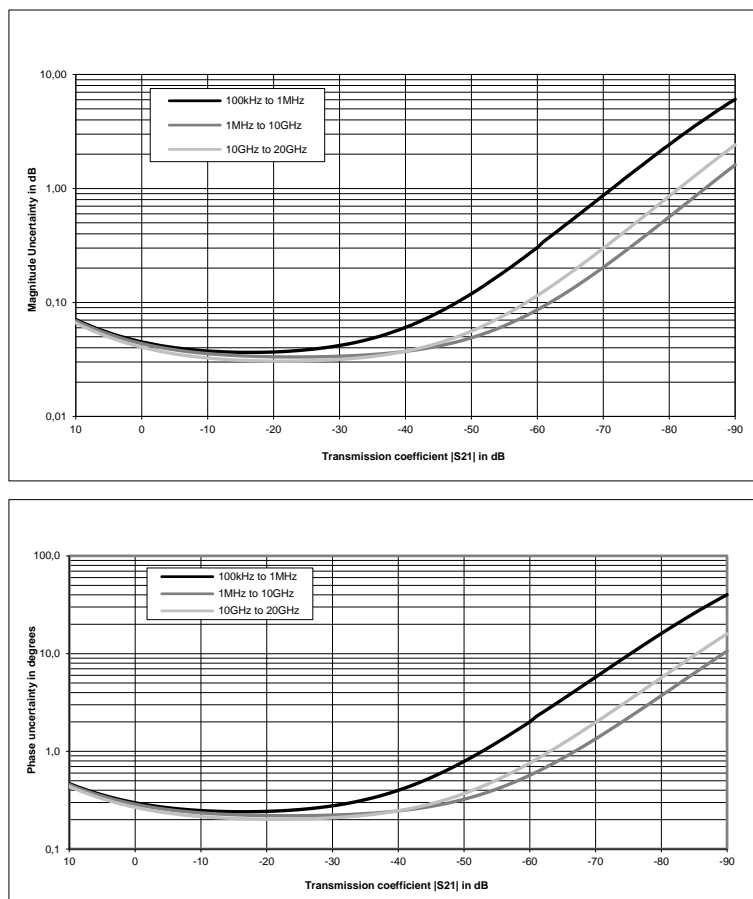
Typical accuracy of reflection magnitude and reflection phase measurements for the R&S®ZNB8 in the frequency range from 9 kHz to 8.5 GHz.
Analysis conditions: $S_{12} = S_{21} = 0$, cal. power -10 dBm, meas. power -10 dBm.

Measurement accuracy of the R&S®ZNB20

This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 K since calibration. The data is valid if a R&S®ZV-Z235 calibration kit is used. This calibration kit is used to achieve the effective system data specified below. Frequency points, measurement bandwidth and sweep time have to be identical for measurement and calibration (no interpolation).

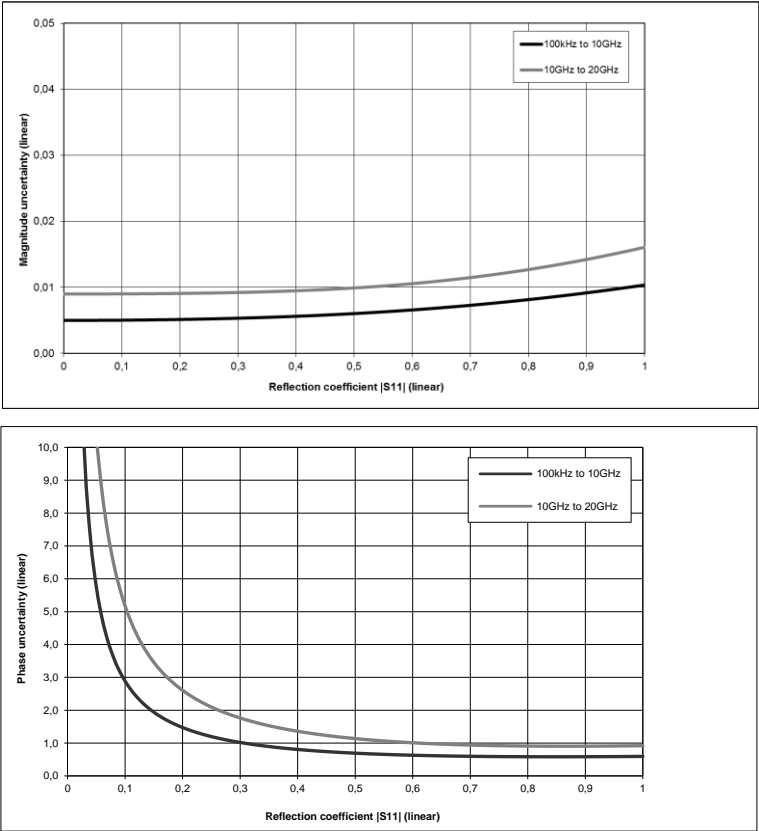
Accuracy of transmission measurements		Magnitude	Phase
100 kHz to 1 MHz	+5 dB to –35 dB	≤ 0.06 dB	$\leq 0.4^\circ$
	–35 dB to –50 dB	≤ 0.20 dB	$\leq 0.8^\circ$
	–50 dB to –60 dB	≤ 0.30 dB	$\leq 2.0^\circ$
1 MHz to 10 GHz	+5 dB to –35 dB	≤ 0.06 dB	$\leq 0.4^\circ$
	–35 dB to –50 dB	≤ 0.04 dB	$\leq 0.4^\circ$
	–50 dB to –60 dB	≤ 0.10 dB	$\leq 0.6^\circ$
10 GHz to 20 GHz	+5 dB to –35 dB	≤ 0.05 dB	$\leq 0.4^\circ$
	–35 dB to –50 dB	≤ 0.06 dB	$\leq 0.4^\circ$
	–50 dB to –60 dB	≤ 0.20 dB	$\leq 0.8^\circ$

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 for the R&S®ZNB20 in the frequency range from 100 kHz to 20 GHz. Analysis conditions: $S_{11} = S_{22} = 0$, cal. power –10 dBm, meas. power –10 dBm.

Accuracy of reflection measurements					
	Logarithmic			Linear	
		Magnitude	Phase		Magnitude
100 kHz to 10 GHz	0 dB	≤ 0.10 dB	≤ 0.6°	0 dB to −3 dB	0.011
	−3 dB	≤ 0.10 dB	≤ 0.6°	< −3 dB to −6 dB	0.007
	−6 dB	≤ 0.11 dB	≤ 0.7°	< −6 dB to −15 dB	0.006
	−15 dB	≤ 0.30 dB	≤ 1.7°	< −15 dB to −25 dB	0.006
	−25 dB	≤ 0.80 dB	≤ 5.5°	< −25 dB to −35 dB	0.006
10 GHz to 20 GHz	−35 dB	≤ 2.20 dB	≤ 17°		
	0 dB	≤ 0.14 dB	≤ 0.9°	0 dB to −3 dB	0.016
	−3 dB	≤ 0.15 dB	≤ 1.0°	< −3 dB to −6 dB	0.012
	−6 dB	≤ 0.18 dB	≤ 1.2°	< −6 dB to −15 dB	0.010
	−15 dB	≤ 0.45 dB	≤ 3.0°	< −15 dB to −25 dB	0.009
	−25 dB	≤ 1.30 dB	≤ 10°	< −25 dB to −35 dB	0.009
	−35 dB	≤ 3.60 dB	≤ 31°		
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
for the R&S®ZNBT20 in the frequency range from 100 kHz to 20 GHz.
Analysis conditions: $S_{12} = S_{21} = 0$, cal. power −10 dBm, meas. power −10 dBm.

Effective system data

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

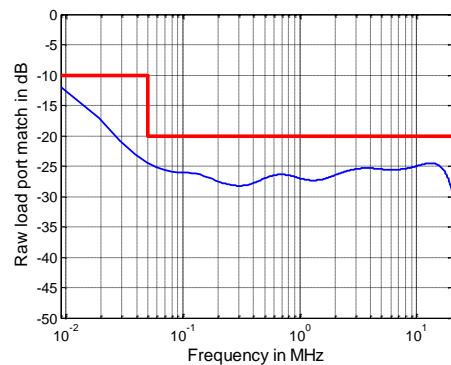
R&S®ZNBT8 calibrated using R&S®ZV-Z270	9 kHz to 100 kHz	100 kHz to 4.5 GHz	4.5 GHz to 8.5 GHz
Directivity	≥ 46 dB	≥ 45 dB	≥ 40 dB
Source match	≥ 41 dB	≥ 40 dB	≥ 36 dB
Load match	≥ 44 dB	≥ 45 dB	≥ 40 dB
Reflection tracking	≤ 0.02 dB	≤ 0.02 dB	≤ 0.05 dB
Transmission tracking	≤ 0.028 dB	≤ 0.018 dB	≤ 0.09 dB

R&S®ZNBT20 calibrated using R&S®ZV-Z235	100 kHz to 10 GHz	10 GHz to 20 GHz
Directivity	≥ 46 dB	≥ 41 dB
Source match	≥ 43 dB	≥ 38 dB
Load match	≥ 44 dB	≥ 40 dB
Reflection tracking	≤ 0.05 dB	≤ 0.05 dB
Transmission tracking	≤ 0.025 dB	≤ 0.035 dB

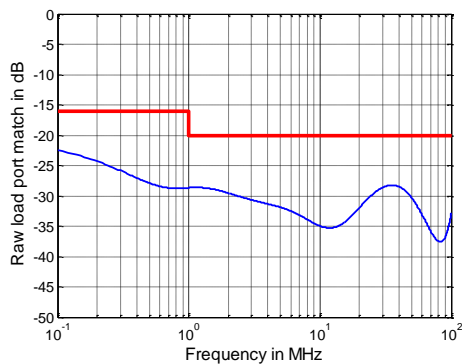
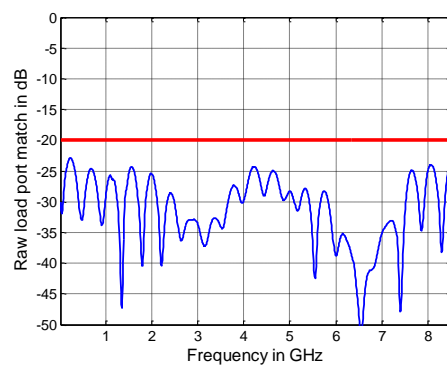
Factory-calibrated system data

This data is valid between +18 °C and +28 °C. The data is based on a source power of –10 dBm and a measurement bandwidth of 1 kHz.

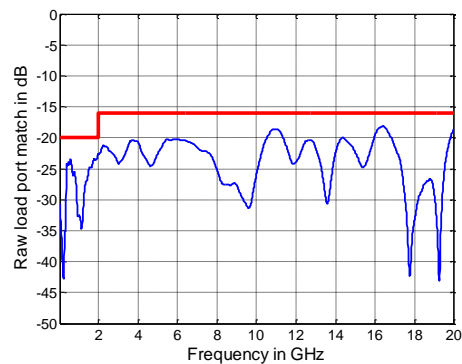
		Specification	Typical
Directivity	9 kHz to 50 kHz	≥ 20 dB	35 dB
	50 kHz to 10 GHz	≥ 30 dB	50 dB
	10 GHz to 20 GHz	≥ 25 dB	35 dB
Source match	9 kHz to 50 kHz	≥ 20 dB	35 dB
	50 kHz to 10 GHz	≥ 30 dB	50 dB
	10 GHz to 20 GHz	≥ 25 dB	35 dB
Reflection tracking	9 kHz to 20 GHz	≤ 0.5 dB	0.1 dB
Transmission tracking	9 kHz to 20 GHz	≤ 0.5 dB	0.1 dB
Load match of the R&S®ZNB T8	50 kHz to 8.5 GHz	≥ 20 dB	25 dB
Load match of the R&S®ZNB T20	100 kHz to 20 MHz	≥ 16 dB	20 dB
	20 MHz to 2 GHz	≥ 20 dB	23 dB
	2 GHz to 20 GHz	≥ 16 dB	19 dB



Raw load port match versus frequency for the R&S®ZNB T8.



Raw load port match versus frequency for the R&S®ZNB T20.



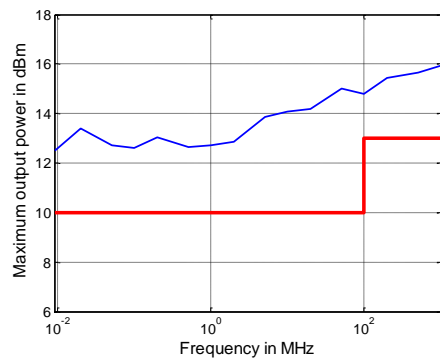
Trace stability				
Trace noise magnitude (RMS) of the R&S®ZNB8	at 0 dBm source power, 0 dB reflection	IF bandwidth	Specification	Typical
	9 kHz to 20 kHz	1 kHz	≤ 0.008 dB	0.004 dB
	20 kHz to 100 kHz	1 kHz	≤ 0.004 dB	0.001 dB
	100 kHz to 100 MHz	10 kHz	≤ 0.004 dB	0.001 dB
	100 MHz to 8.5 GHz	10 kHz	≤ 0.004 dB	0.002 dB
Trace noise magnitude (RMS) of the R&S®ZNB20	at 0 dBm source power, 0 dB reflection			
	100 kHz to 300 kHz	10 kHz	≤ 0.008 dB	0.002 dB
	300 kHz to 20 GHz	10 kHz	≤ 0.004 dB	0.001 dB
Trace noise phase (RMS) of the R&S®ZNB8	at 0 dBm source power, 0 dB reflection			
	9 kHz to 20 kHz	1 kHz	≤ 0.070°	0.040°
	20 kHz to 100 kHz	1 kHz	≤ 0.035°	0.010°
	100 kHz to 100 MHz	10 kHz	≤ 0.035°	0.005°
	100 MHz to 8.5 GHz	10 kHz	≤ 0.035°	0.020°
Trace noise phase (RMS) of the R&S®ZNB20	at 0 dBm source power, 0 dB reflection			
	100 kHz to 300 kHz	10 kHz	≤ 0.070°	0.02°
	300 kHz to 20 GHz	10 kHz	≤ 0.035°	0.01°
Temperature dependence	at 0 dB transmission or reflection			
	9 kHz to 4.5 GHz	magnitude		0.01 dB/K
		phase		0.15 °/K
	4.5 GHz to 20 GHz	magnitude		0.04 dB/K
		phase		0.80 °/K

Test port output

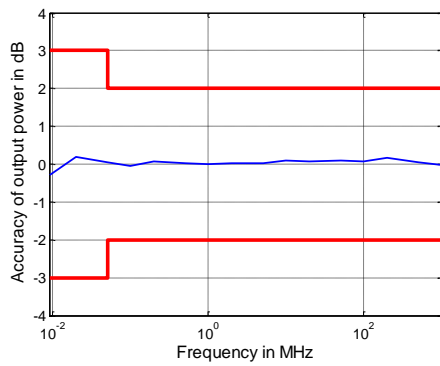
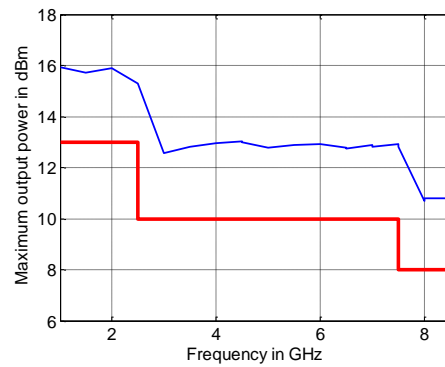
This data is valid from +18 °C to +28 °C.

		Specification	Typical
Power range of the R&S®ZNBT8	without R&S®ZNBT8-B21/-B22/-B23/-B24/-B25/-B26 extended power range option		
	9 kHz to 100 MHz	–55 dBm to +10 dBm	up to +12 dBm
	100 MHz to 2.5 GHz	–55 dBm to +13 dBm	up to +15 dBm
	2.5 GHz to 7.5 GHz	–55 dBm to +10 dBm	up to +13 dBm
	7.5 GHz to 8.5 GHz	–55 dBm to +8 dBm	up to +12 dBm
	with R&S®ZNBT8-B21/-B22/-B23/-B24/-B25/-B26 extended power range option		
	9 kHz to 100 MHz	–85 dBm to +10 dBm	up to +12 dBm
	100 MHz to 2.5 GHz	–85 dBm to +13 dBm	up to +15 dBm
	2.5 GHz to 7.5 GHz	–85 dBm to +10 dBm	up to +13 dBm
	7.5 GHz to 8.5 GHz	–85 dBm to +8 dBm	up to +12 dBm
Power range of the R&S®ZNBT20	without R&S®ZNBT20-B21/-B22/-B23/-B24 extended power range option		
	100 kHz to 1 MHz	–30 dBm to +6 dBm	up to +8 dBm
	1 MHz to 10 MHz	–30 dBm to +8 dBm	up to +10 dBm
	10 MHz to 1 GHz	–30 dBm to +10 dBm	up to +12 dBm
	1 GHz to 10 GHz	–30 dBm to +8 dBm	up to +10 dBm
	10 GHz to 20 GHz	–30 dBm to +5 dBm	up to +7 dBm
	with R&S®ZNBT20-B21/-B22/-B23/-B24 extended power range option		
	100 kHz to 1 MHz	–60 dBm to +6 dBm	up to +8 dBm
	1 MHz to 10 MHz	–60 dBm to +8 dBm	up to +10 dBm
	10 MHz to 1 GHz	–60 dBm to +10 dBm	up to +12 dBm
	1 GHz to 10 GHz	–60 dBm to +8 dBm	up to +10 dBm
	10 GHz to 20 GHz	–60 dBm to +5 dBm	up to +7 dBm
Power accuracy of the R&S®ZNBT8	source power –10 dBm		
	9 kHz to 50 kHz	≤ 3 dB	
	50 kHz to 8.5 GHz	≤ 2 dB	
Power accuracy of the R&S®ZNBT20	source power –10 dBm		
	100 kHz to 10 GHz	≤ 2 dB	
	10 GHz to 20 GHz	≤ 3 dB	
Power linearity of the R&S®ZNBT8	referenced to –10 dBm		
	source power ≥ –55 dBm	≤ 1 dB	
	source power < –55 dBm	≤ 2 dB	
Power linearity of the R&S®ZNBT20	referenced to –10 dBm		
	source power ≥ –30 dBm	≤ 1 dB	
	source power < –30 dBm	≤ 2 dB	
Power resolution		0.01 dB	

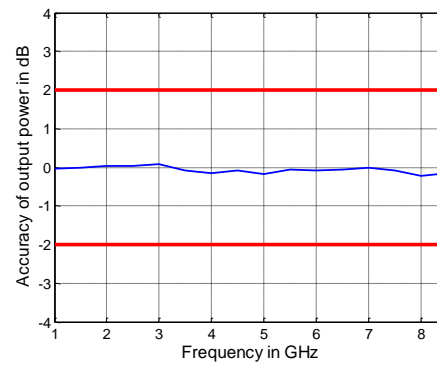
		Specification	Typical
Harmonics of the R&S®ZNBT8	at 0 dBm		
	20 kHz to 100 MHz	≤ –20 dBc	–30 dBc
	100 MHz to 8.5 GHz	≤ –25 dBc	–35 dBc
Harmonics of the R&S®ZNBT20	at 0 dBm		
	100 kHz to 10 MHz	≤ –15 dBc	–20 dBc
	10 MHz to 100 MHz	≤ –20 dBc	–30 dBc
	100 MHz to 8 GHz	≤ –25 dBc	–35 dBc
	8 GHz to 15 GHz	≤ –18 dBc	–25 dBc
	at –5 dBm		
	15 GHz to 18 GHz	≤ –18 dBc	–25 dBc
	18 GHz to 20 GHz	≤ –12 dBc	–15 dBc

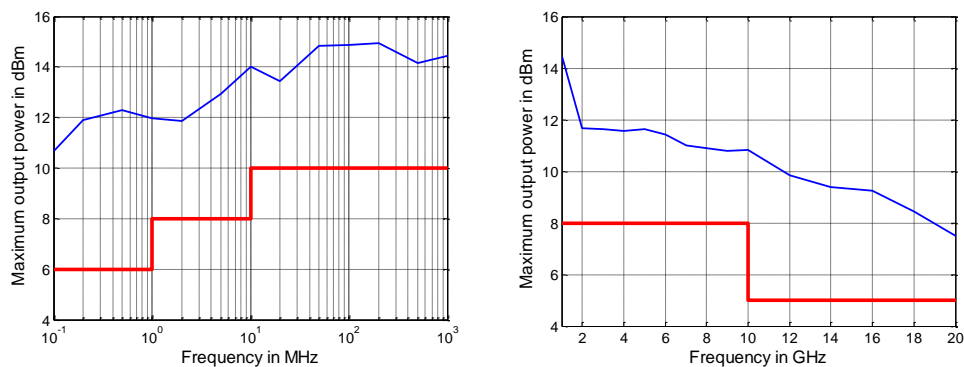


Maximum output power in dBm versus frequency for the R&S®ZNB T8.

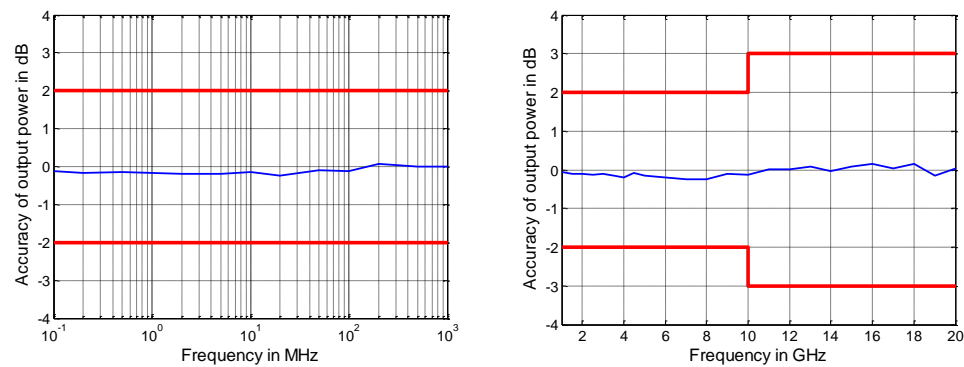


Output power accuracy in dB versus frequency for the R&S®ZNB T8.





Maximum output power in dBm versus frequency for the R&S® ZNBT20.



Output power accuracy in dB versus frequency for the R&S® ZNBT20.

Test port input

Match	without system error correction	
	R&S®ZNBT8	
	9 kHz to 50 kHz	> 10 dB
	50 kHz to 8.5 GHz	> 20 dB
	R&S®ZNBT20	
	100 kHz to 1 MHz	> 16 dB
	1 MHz to 2 GHz	> 20 dB
Maximum nominal input level	2 GHz to 20 GHz	> 16 dB
		+13 dBm
Power measurement accuracy at –10 dBm without power calibration	R&S®ZNBT8	
	9 kHz to 100 kHz	< 2 dB
	100 kHz to 8.5 GHz	< 1 dB
	R&S®ZNBT20	
	100 kHz to 20 GHz	< 1 dB
Receiver linearity referenced to –10 dBm	R&S®ZNBT8	
	for +20 dB to +10 dB	
	9 kHz to 7.5 GHz	< 0.2 dB
	for +18 dB to +10 dB	
	7.5 GHz to 8.5 GHz	< 0.2 dB
	for +10 dB to –40 dB	
	9 kHz to 8.5 GHz	< 0.1 dB
	R&S®ZNBT20	
	for +16 dB to +10 dB	
	100 kHz to 1 MHz	< 0.3 dB
	for +18 dB to +10 dB	
	1 MHz to 10 MHz	< 0.3 dB
	for +20 dB to +10 dB	
	10 MHz to 1 GHz	< 0.3 dB
	for +18 dB to +10 dB	
	1 GHz to 10 GHz	< 0.3 dB
	for +15 dB to +10 dB	
	10 GHz to 20 GHz	< 0.3 dB
	for +10 dB to –40 dB	
	100 kHz to 20 GHz	< 0.1 dB
Damage level		+27 dBm
Damage DC voltage		30 V
Noise level ⁵ at 1 kHz measurement bandwidth, normalized to 1 Hz	R&S®ZNBT8	
	9 kHz to 50 kHz	< –115 dBm (1 Hz)
	50 kHz to 50 MHz	< –120 dBm (1 Hz)
	50 MHz to 4 GHz	< –130 dBm (1 Hz)
	4 GHz to 6.5 GHz	< –125 dBm (1 Hz)
	6.5 GHz to 8.5 GHz	< –120 dBm (1 Hz)
	R&S®ZNBT20	
	100 kHz to 300 kHz	< –105 dBm (1 Hz)
	300 kHz to 1 MHz	< –110 dBm (1 Hz)
	1 MHz to 10 MHz	< –115 dBm (1 Hz)
	10 MHz to 2 GHz	< –120 dBm (1 Hz)
	2 GHz to 20 GHz	< –115 dBm (1 Hz)

Additional front panel connectors

USB	(two) universal serial bus host connectors for connecting USB devices (USB 2.0); two additional USB connectors on rear panel
-----	---

Display

Screen	3.91 cm (1.54") diagonal amber OLED display
Resolution	128 × 64

⁵ The noise level is defined as the RMS value of the specified noise floor. Below 700 kHz, the R&S®ZNBT20 may exhibit spurious signals that exceed the specified noise level.

Rear panel connectors

LAN	local area network connector, 8-pin, RJ-45
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USB Host	(two) universal serial bus host connectors for connecting USB devices (USB 3.0); two additional USB connectors on front panel
USB Device	universal serial bus client connector for remote control of VNA (USB 3.0)

REF IN	input for external frequency reference signal	
Connector type		BNC, female
Input frequency range		1 MHz to 20 MHz in steps of 1 MHz
Maximum permissible deviation		1 kHz
Input power		-10 dBm to +15 dBm
Input impedance		50 Ω

REF OUT	output for external frequency reference signal	
Connector type		BNC, female
Output frequency		10 MHz
Output power		+9 dBm \pm 4 dB at 50 Ω

MONITOR (DVI-D)	DVI-D connector (for external monitor, single link)
MONITOR (Display Port)	Display Port connector (for external monitor, version 1.1a)

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.	
CHANNEL BIT 0 to CHANNEL BIT 3	pin 8 to pin 11 (outputs)	channel-specific, user-configurable bits
CHANNEL BIT 4 to CHANNEL BIT 7	pin 16 to pin 19 (outputs)	channel-specific, user-configurable bits
DRIVE PORT 1 to DRIVE PORT 4	pin 16 to pin 19 (outputs)	indicates drive ports (can alternatively be used for channel bits 4 to 7)
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)	first trigger input for analyzer, 5 V tolerant
EXTERNAL TRIGGER 2	pin 25 (input)	second trigger input for analyzer, 5 V tolerant

EXT TRIG IN	trigger input for analyzer	
Connector type		BNC, female
TTL signal (edge-triggered or level-triggered)		3 V, 5 V tolerant
Polarity (selectable)		positive or negative
Minimum pulse width		1 μ s
Input impedance		> 10 k Ω

EXT TRIG OUT	trigger output of analyzer	
Connector type		BNC, female
Logic high		typ. 3.3 V

Options

R&S®ZNBT-B4

Precision reference frequency		
Static frequency accuracy		(time since last adjustment × aging rate) + temperature drift + calibration accuracy
Aging per year	with R&S®ZNBT-B4 precision frequency reference option	$\pm 1 \times 10^{-7}$
Temperature drift (+5 °C to +40 °C)	with R&S®ZNBT-B4 precision frequency reference option	$\pm 1 \times 10^{-8}$
Achievable initial calibration accuracy	with R&S®ZNBT-B4 precision frequency reference option	$\pm 5 \times 10^{-8}$

R&S®ZNBT-B10

GPIO interface	remote control interface in line with IEEE 488, IEC 60625; 24-pin
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R&S®ZNBT-B12

Device control	
DIRECT CTRL interface	direct control bus output

R&S®ZNBT8-B21/-B22/-B23/-B24/-B25/-B26, R&S®ZNBT20-B21/-B22/-B23/-B24

		Specification	Typical
Extended power range			
Frequency range	R&S®ZNBT8-B21/-B22/-B23/-B24/-B25/-B26	9 kHz to 8.5 GHz	
	R&S®ZNBT20-B21/-B22/-B23/-B24	100 kHz to 20 GHz	
Power range for the R&S®ZNBT8	9 kHz to 100 MHz	–85 dBm to +10 dBm	up to +12 dBm
	100 MHz to 2.5 GHz	–85 dBm to +13 dBm	up to +15 dBm
	2.5 GHz to 7.5 GHz	–85 dBm to +10 dBm	up to +13 dBm
	7.5 GHz to 8.5 GHz	–85 dBm to +8 dBm	up to +12 dBm
Power range for the R&S®ZNBT20	100 kHz to 1 MHz	–60 dBm to +6 dBm	up to +8 dBm
	1 MHz to 10 MHz	–60 dBm to +8 dBm	up to +10 dBm
	10 MHz to 1 GHz	–60 dBm to +10 dBm	up to +12 dBm
	1 GHz to 10 GHz	–60 dBm to +8 dBm	up to +10 dBm
	10 GHz to 20 GHz	–60 dBm to +5 dBm	up to +7 dBm

R&S®ZNBT-B81

This data is valid from +18 °C to +28 °C and at a maximum measurement bandwidth of 10 kHz.

DC inputs		
Number of ports		4
Connector type		BNC, female
Voltage range		± 20 V, ± 3 V, ± 0.3 V
Measurement accuracy	± 20 V	1 % of reading + 0.01 V
	± 3 V	1 % of reading + 0.001 V
	± 0.3 V	1 % of reading \pm 0.001 V
Input impedance		≥ 1 M Ω
Damage voltage		30 V

R&S®ZNBT8-B108 to R&S®ZNBT8-B124 and R&S®ZNBT20-B112 to R&S®ZNBT20-B116

For additional ports, the specifications of paragraphs Measurement range, Measurement speed, Measurement accuracy, Effective system data, Factory-calibrated system data, Test port output and Test port input are valid in an analogous way.

R&S®ZNBT-Z14

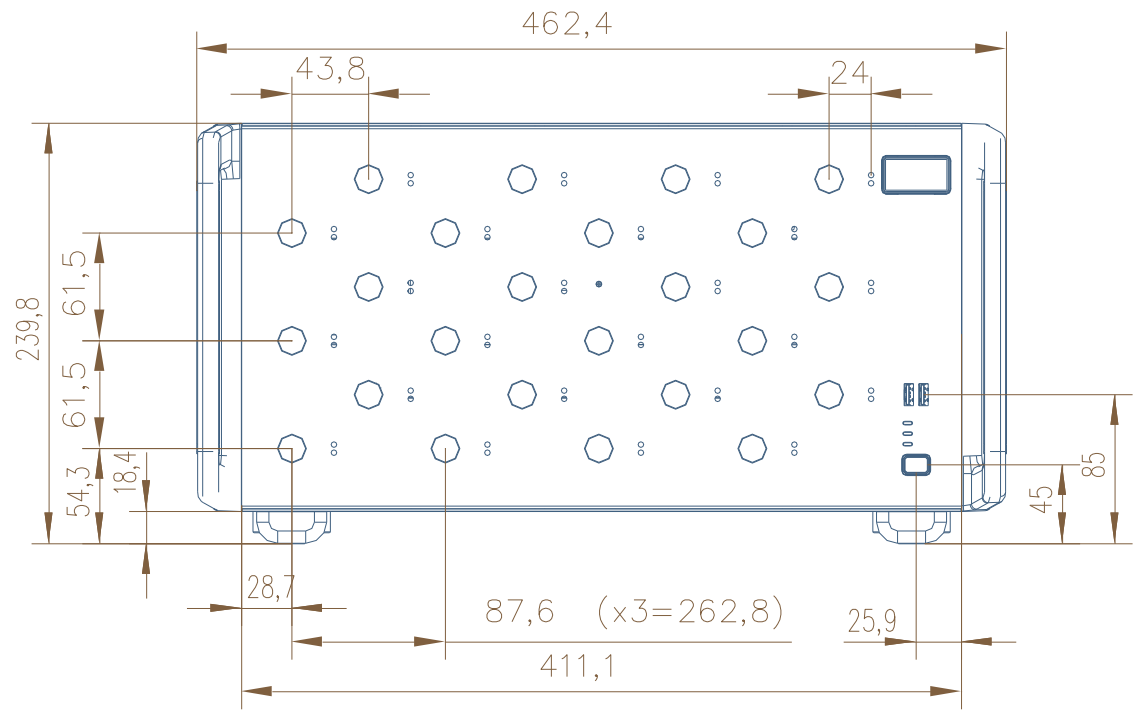
Handler I/O (external)	several control and trigger signals, 36-pin Centronics connector, 3.3 V TTL, for controlling external devices, limit checks, sweep signals, etc.	
Keysight handler interface compatibility	type 3	
Input signals	pin 2, pin 18	3.3 V TTL, 5 V tolerant
Output signals	pin 3 to pin 17, pin 19 to pin 21, pin 30 to pin 34, pin 36	3.3 V TTL, 5 V tolerant
Input/output signals	pin 22 to pin 29	3.3 V TTL, 5 V tolerant
+5 V output	pin 35	+5 V, max. 100 mA
Response time of write strobe signal	pin 32	1 µs
Pulse width of write strobe signal	pin 32	1 µs
Pulse width of external trigger signal	pin 18	> 1 µs
Pulse width of sweep end signal	pin 34	> 10 µs

General data

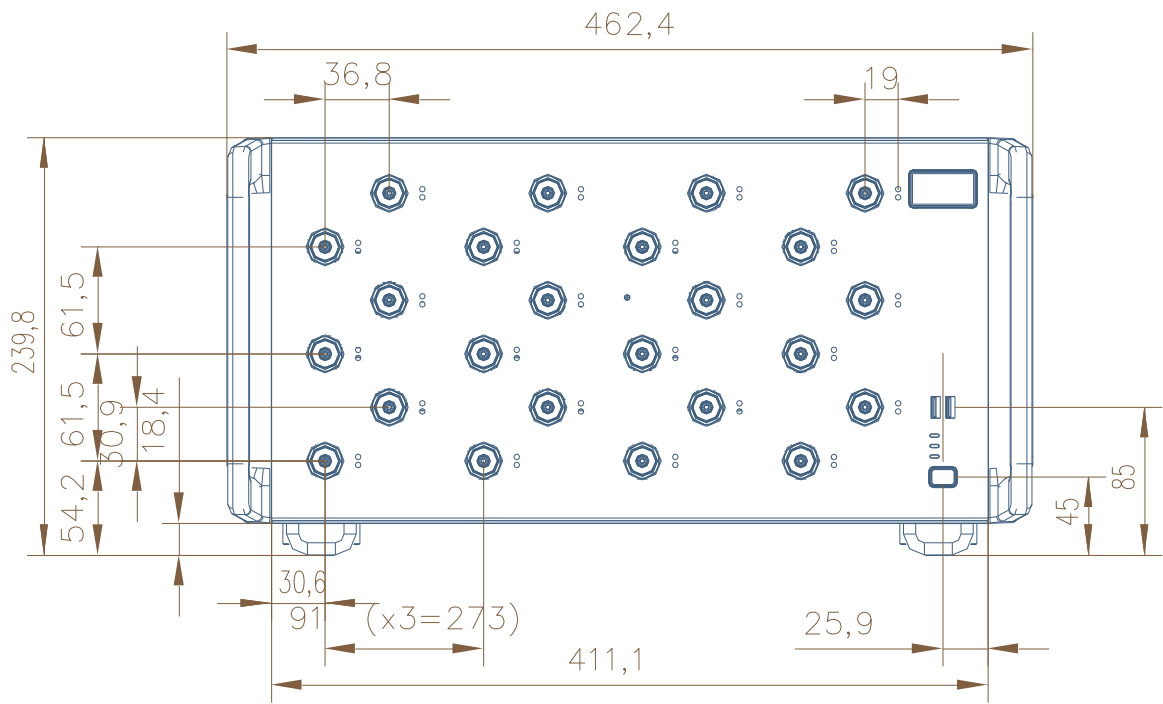
Temperature loading		in line with IEC 60068-2-1 and IEC 60068-2-2
	operating temperature range	+5 °C to +40 °C
	storage temperature range	–20 °C to +60 °C
Damp heat		+40 °C at 85 % rel. humidity, in line with IEC 60068-2-30
Altitude	operating environment	max. 2000 m
	storage environment	max. 4500 m
Mechanical resistance	vibration, sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude constant, 55 Hz to 150 Hz, 0.5 g constant, in line with IEC 60068-2-6
	vibration, random	10 Hz to 300 Hz, acceleration 1.2 g (RMS) in line with IEC 60068-2-64
	shock	40 g shock spectrum, in line with MIL-STD-810E, method 516.4, procedure I
Calibration interval		1 year
EMC	RF emission	in line with CISPR 11/EN 55011 group 1 class A (for a shielded test setup); instrument complies with the emission requirements stipulated by EN 55011 and EN 61326-1 class A; this means that the instrument is suitable for use in industrial environments
	immunity	in line with EMC Directive 2004/108/EC including: EN 61326-1 (immunity test requirement for industrial environment, EN 61326 table 2), EN 61326-2-1, EN 61000-3-2, EN 61000-3-3
Safety		in line with IEC 61010-1, EN 61010-1 and UL 61010-1
Power supply		100 V to 240 V at 50 Hz to 60 Hz and 400 Hz, max. 10 A to 4.2 A, respectively
Power consumption	R&S®ZNBT8	
	with 4 ports	max. 1000 W, typ. 199 W
	with 8 ports	max. 1000 W, typ. 267 W
	with 12 ports	max. 1000 W, typ. 357 W
	with 16 ports	max. 1000 W, typ. 432 W
	with 20 ports	max. 1000 W, typ. 517 W
	with 24 ports	max. 1000 W, typ. 586 W
	R&S®ZNBT20	
	with 8 ports	max. 1000 W, typ. 256 W
	with 12 ports	max. 1000 W, typ. 343 W
	with 16 ports	max. 1000 W, typ. 450 W
Test mark		VDE, GS, cCSA _{US} , CE conformity mark

Dimensions	W × H × D	463 mm × 240 mm × 612 mm (18.2 in × 9.4 in × 24.1 in)
Weight	R&S®ZNBT8	
	with 4 ports	typ. 22 kg (48.5 lb)
	with 8 ports	typ. 24 kg (52.9 lb)
	with 12 ports	typ. 29 kg (63.9 lb)
	with 16 ports	typ. 31 kg (68.3 lb)
	with 20 ports	typ. 36 kg (79.4 lb)
	with 24 ports	typ. 38 kg (83.8 lb)
	R&S®ZNBT20	
	with 8 ports	typ. 27 kg (59.5 lb)
	with 12 ports	typ. 34 kg (75 lb)
	with 16 ports	typ. 36 kg (79.4 lb)
Shipping weight	R&S®ZNBT8	
	with 4 ports	typ. 28 kg (61.7 lb)
	with 8 ports	typ. 30 kg (66.1 lb)
	with 12 ports	typ. 35 kg (77.2 lb)
	with 16 ports	typ. 37 kg (81.6 lb)
	with 20 ports	typ. 42 kg (92.6 lb)
	with 24 ports	typ. 44 kg (97.0 lb)
	R&S®ZNBT20	
	with 8 ports	typ. 33 kg (72.8 lb)
	with 12 ports	typ. 40 kg (88.2 lb)
	with 16 ports	typ. 42 kg (92.6 lb)

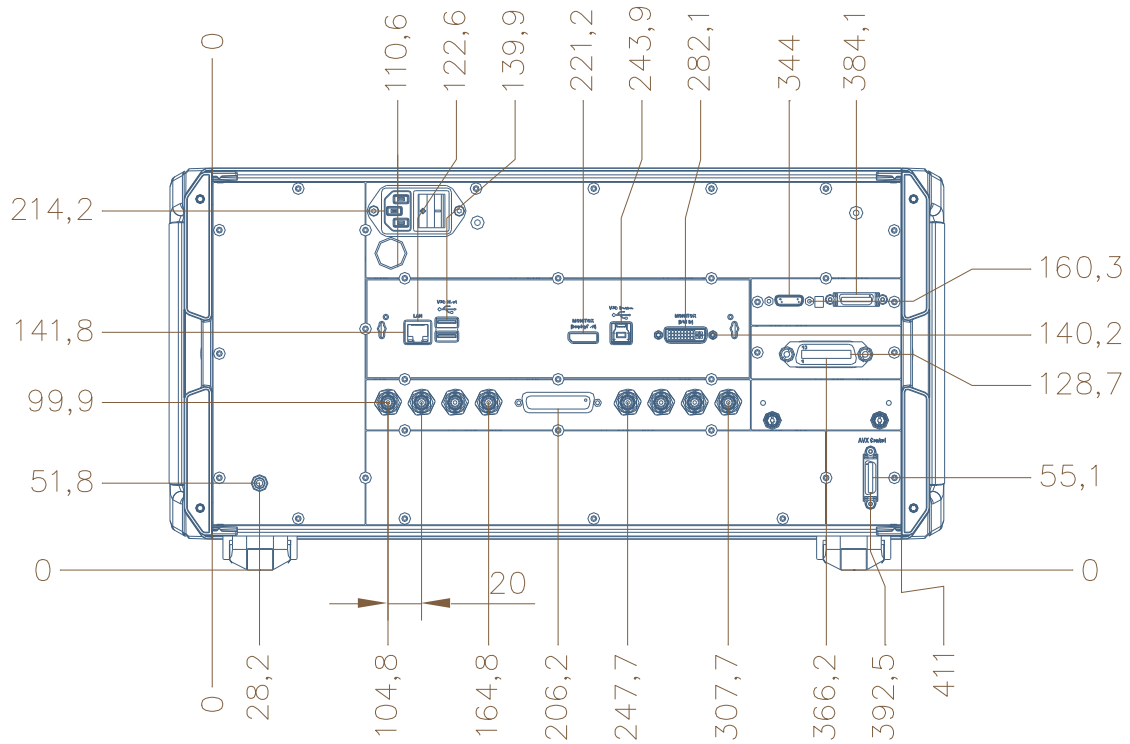
Dimensions (in mm)



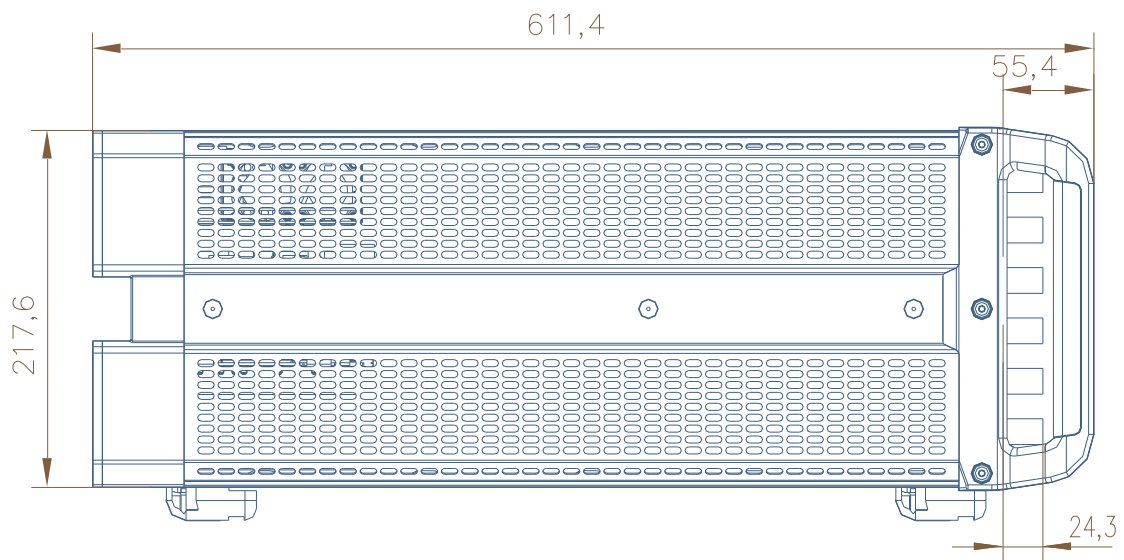
Front view of the R&S®ZNB8.



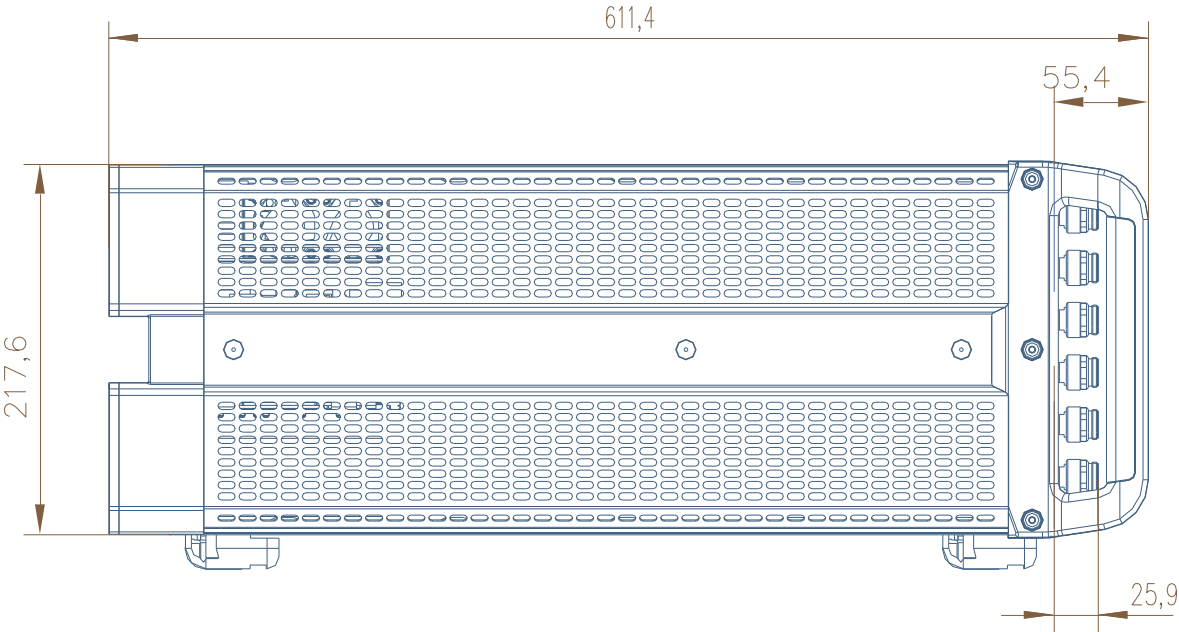
Front view of the R&S®ZNB20.



Rear view of the R&S®ZNBT8 and the R&S®ZNBT20.



Side view of the R&S®ZNBT8.



Side view of the R&S®ZNB20.

Ordering information

Designation	Type	Order No.
Base unit		
Vector Network Analyzer, 4 ports, 8.5 GHz, N ⁶	R&S®ZNBT8	1318.7006.24
Vector Network Analyzer, 8 ports, 20 GHz, 3.5 mm ⁶	R&S®ZNBT20	1332.9002.24
Options		
Additional Ports		
Additional Ports 5 to 8, for R&S®ZNBT8	R&S®ZNBT8-B108	1319.4200.02
Additional Ports 9 to 12, for R&S®ZNBT8	R&S®ZNBT8-B112	1319.4217.02
Additional Ports 13 to 16, for R&S®ZNBT8	R&S®ZNBT8-B116	1319.4223.02
Additional Ports 17 to 20, for R&S®ZNBT8	R&S®ZNBT8-B120	1319.4230.02
Additional Ports 21 to 24, for R&S®ZNBT8	R&S®ZNBT8-B124	1319.4246.02
Additional Ports 9 to 12, for R&S®ZNBT20	R&S®ZNBT20-B112	1332.9454.02
Additional Ports 13 to 16, for R&S®ZNBT20	R&S®ZNBT20-B116	1332.9460.02
Extended Power Range		
Extended Power Range for Ports 1 to 4, for R&S®ZNBT8	R&S®ZNBT8-B21	1319.4252.02
Extended Power Range for Ports 5 to 8, for R&S®ZNBT8	R&S®ZNBT8-B22	1319.4269.02
Extended Power Range for Ports 9 to 12, for R&S®ZNBT8	R&S®ZNBT8-B23	1319.4275.02
Extended Power Range for Ports 13 to 16, for R&S®ZNBT8	R&S®ZNBT8-B24	1319.4281.02
Extended Power Range for Ports 17 to 20, for R&S®ZNBT8	R&S®ZNBT8-B25	1319.4298.02
Extended Power Range for Ports 20 to 24, for R&S®ZNBT8	R&S®ZNBT8-B26	1319.4300.02
Extended Power Range for Ports 1 to 4, for R&S®ZNBT20	R&S®ZNBT20-B21	1332.9348.02
Extended Power Range for Ports 5 to 8, for R&S®ZNBT20	R&S®ZNBT20-B22	1332.9354.02
Extended Power Range for Ports 9 to 12, for R&S®ZNBT20	R&S®ZNBT20-B23	1332.9360.02
Extended Power Range for Ports 13 to 16, for R&S®ZNBT20	R&S®ZNBT20-B24	1332.9377.02
Receiver Step Attenuators		
Receiver Step Attenuators for Ports 1 to 4, for R&S®ZNBT8	R&S®ZNBT8-B361	1319.4317.02
Receiver Step Attenuators for Ports 5 to 8, for R&S®ZNBT8	R&S®ZNBT8-B362	1319.4323.02
Receiver Step Attenuators for Ports 9 to 12, for R&S®ZNBT8	R&S®ZNBT8-B363	1319.4330.02
Receiver Step Attenuators for Ports 13 to 16, for R&S®ZNBT8	R&S®ZNBT8-B364	1319.4346.02
Receiver Step Attenuators for Ports 17 to 20, for R&S®ZNBT8	R&S®ZNBT8-B365	1319.4352.02
Receiver Step Attenuators for Ports 21 to 24, for R&S®ZNBT8	R&S®ZNBT8-B366	1319.4369.02
Precision Reference Frequency	R&S®ZNBT-B4	1332.9477.02
GPIO Interface	R&S®ZNBT-B10	1332.9483.02
Device Control	R&S®ZNBT-B12	1332.9490.02
Additional Removable Hard Disk, 64 bit, for LPW10	R&S®ZNBT-B19	1332.9283.10
Additional Removable Hard Disk, 64 bit, for LPW11	R&S®ZNBT-B19	1332.9283.11
DC Inputs	R&S®ZNBT-B81	1332.9502.02
Time Domain Analysis	R&S®ZNBT-K2	1318.8425.02
Frequency Conversion ⁷	R&S®ZNBT-K4	1318.8431.02
Intermodulation Measurements ⁸	R&S®ZNBT-K14	1318.8448.02
10 MHz Receiver Bandwidth	R&S®ZNBT-K17	1318.8454.02
1 mHz Frequency Resolution	R&S®ZNBT-K19	1319.4000.02
Handler I/O (external) for R&S®ZNBT	R&S®ZNBT-Z14	1326.6640.05
Rackmount Kit	R&S®ZZA-KN5	1175.3040.00
Direct Control Cable	R&S®ZN-B121	1323.9290.00

⁶ External monitor, mouse and keyboard or external touchscreen required for manual operation.

⁷ Requires R&S®ZVAB-B44 to control external generators via IEC/IEEE bus. Second internal source is included with R&S®ZNBT8-B112.

⁸ Requires R&S®ZNBT-K4.

Warranty		
Base unit		3 years
All other items		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	

Extended warranty with a term of one and two years (WE1 and WE2)

Repairs carried out during the contract term are free of charge ⁹. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs ⁹ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For product brochure, see PD 3606.9727.12 and www.rohde-schwarz.com

⁹ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

Service that adds value

- ▮ Worldwide
- ▮ Local and personalized
- ▮ Customized and flexible
- ▮ Uncompromising quality
- ▮ Long-term dependability

About Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

Sustainable product design

- ▮ Environmental compatibility and eco-footprint
- ▮ Energy efficiency and low emissions
- ▮ Longevity and optimized total cost of ownership

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

Rohde & Schwarz GmbH & Co. KG

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PD 3606.9727.22 | Version 03.02 | July 2016 (ch)

R&S®ZNB Vector Network Analyzer

Data without tolerance limits is not binding | Subject to change

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