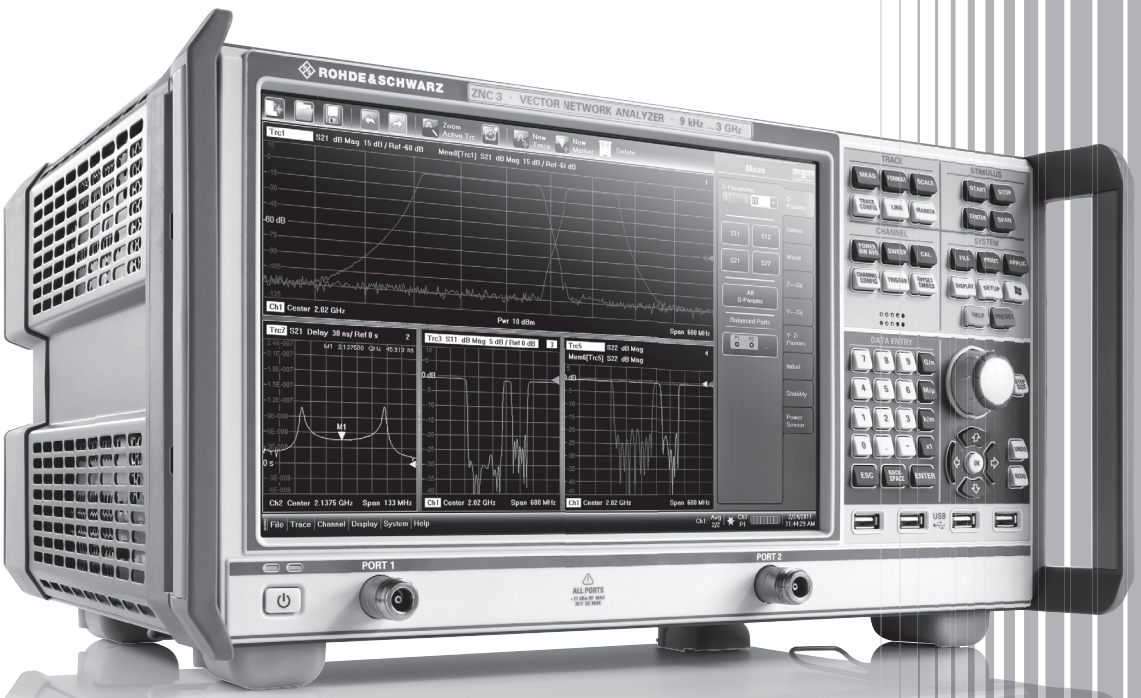
R&S®ZNC Vector Network Analyzer

Specifications

Test & Measurement

Data Sheet | 03.00



ROHDE&SCHWARZ

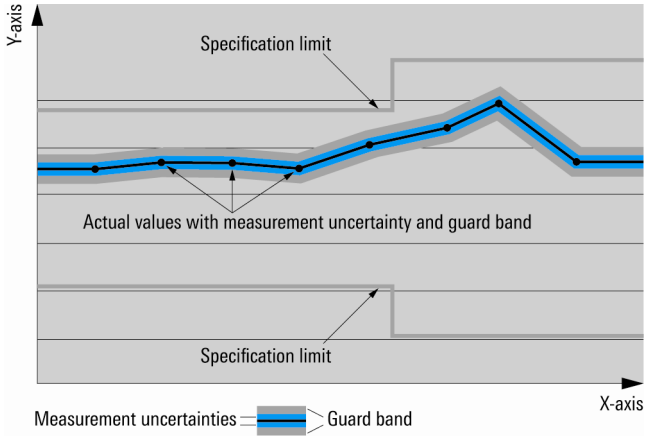
CONTENTS

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 <, ≤, >, ≥, ±, 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.

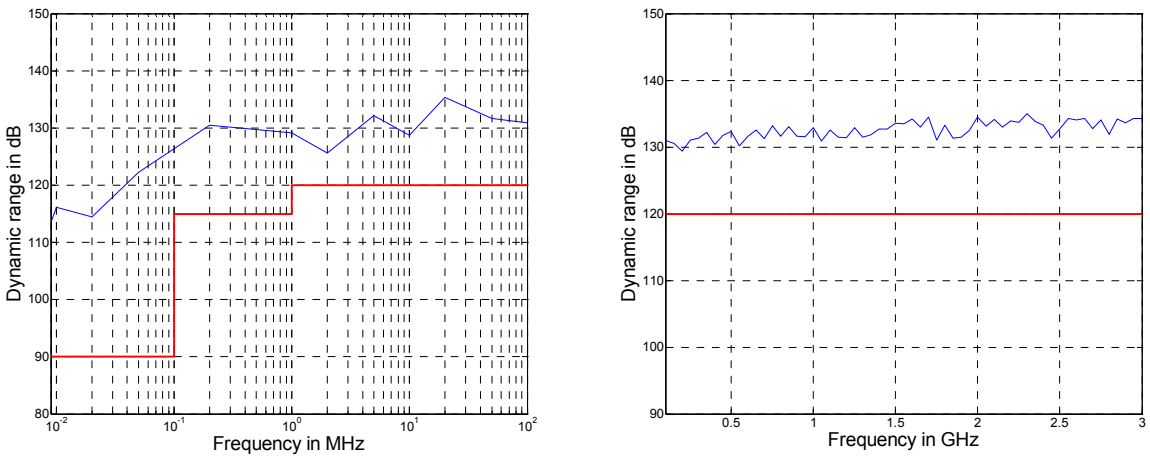
Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

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.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Measurement range

Impedance		50 Ω
Test port connector		N female
Number of test ports		2
Frequency range		9 kHz to 3 GHz
Static frequency accuracy		8 ppm
Frequency resolution		1 Hz
Number of measurement points	per trace	2 to 5001
Measurement bandwidth	1/1.5/2/3/5/7 steps	1 Hz to 300 kHz
Dynamic range [1]	9 kHz to 100 kHz	> 90 dB, typ. 110 dB
	100 kHz to 1 MHz	> 115 dB, typ. 120 dB
	1 MHz to 3 GHz	> 120 dB, typ. 130 dB



Dynamic range in dB versus frequency for the R&S®ZNC3.

[1] The 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.

Measurement speed

Measurement time	for 201 measurements points, with 200 MHz span, 300 kHz measurement bandwidth with 900 MHz center frequency	< 8 ms
Measurement time per point	300 kHz measurement bandwidth, CW mode	< 4 us
Time for measurement and data transfer	for 201 measurements points, with 800 MHz start frequency, 1 GHz stop frequency, 300 kHz measurement bandwidth (No additional time for data transfer is needed, as this occurs simultaneously during the measurement.)	typ. 8 ms
Switching time between channels	with no more than 2001 points	< 5 ms
Switching time between two preloaded instrument settings	with no more than 2001 points	< 5 ms

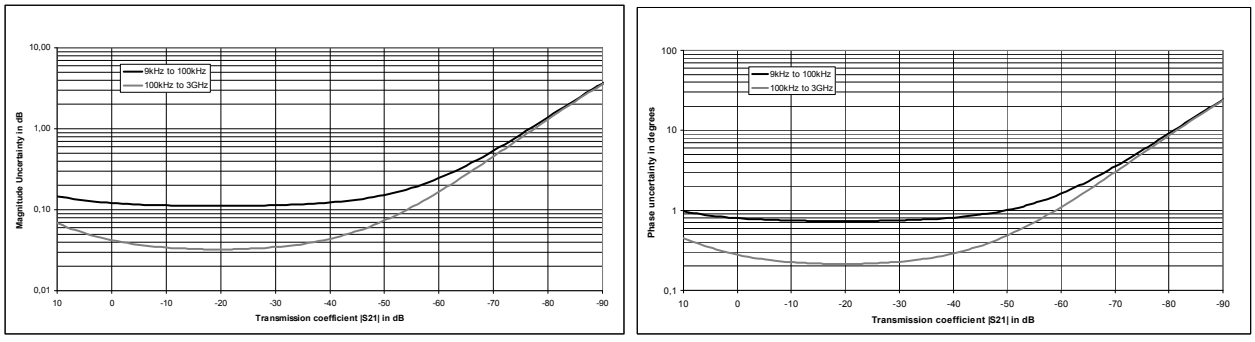
Typical sweep times versus number of measurement points [2]					
Number of measurement points	**51**	**201**	**401**	**1601**	**5001**
800 MHz start frequency, 1 GHz stop frequency, AGC LOW DIST, 1 kHz measurement bandwidth					
With correction switched OFF	46 ms	176 ms	345 ms	1355 ms	4220 ms
With 2-port TOSM calibration	90 ms	350 ms	685 ms	2700 ms	8450 ms
800 MHz start frequency, 1 GHz stop frequency, AGC AUTO, 100 kHz measurement bandwidth					
With correction switched OFF	2.9 ms	7 ms	9 ms	23 ms	60 ms
With 2-port TOSM calibration	4.8 ms	13 ms	18 ms	46 ms	120 ms
800 MHz start frequency, 1 GHz stop frequency, AGC AUTO, 300 kHz measurement bandwidth					
With correction switched OFF	2.8 ms	6 ms	8 ms	14 ms	34 ms
With 2-port TOSM calibration	4.2 ms	11 ms	14 ms	27 ms	68 ms
100 kHz start frequency, 3 GHz stop frequency, AGC LOW DIST, 1 kHz measurement bandwidth					
With correction switched OFF	47 ms	177 ms	350 ms	1380 ms	4260 ms
With 2-port TOSM calibration	93 ms	352 ms	695 ms	2750 ms	8530 ms
100 kHz start frequency, 3 GHz stop frequency, AGC AUTO, 100 kHz measurement bandwidth					
With correction switched OFF	4.0 ms	9 ms	14 ms	42 ms	105 ms
With 2-port TOSM calibration	7.0 ms	16 ms	25 ms	79 ms	210 ms
100 kHz start frequency, 3 GHz stop frequency, AGC AUTO, 300 kHz measurement bandwidth					
With correction switched OFF	3.7 ms	8 ms	12 ms	32 ms	76 ms
With 2-port TOSM calibration	6.5 ms	14 ms	21 ms	62 ms	150 ms

[2] Sweep time is to be understood as cycle time; static frequency accuracy of the instrument applies; measured with firmware version 1.20, Windows 7.

Measurement accuracy

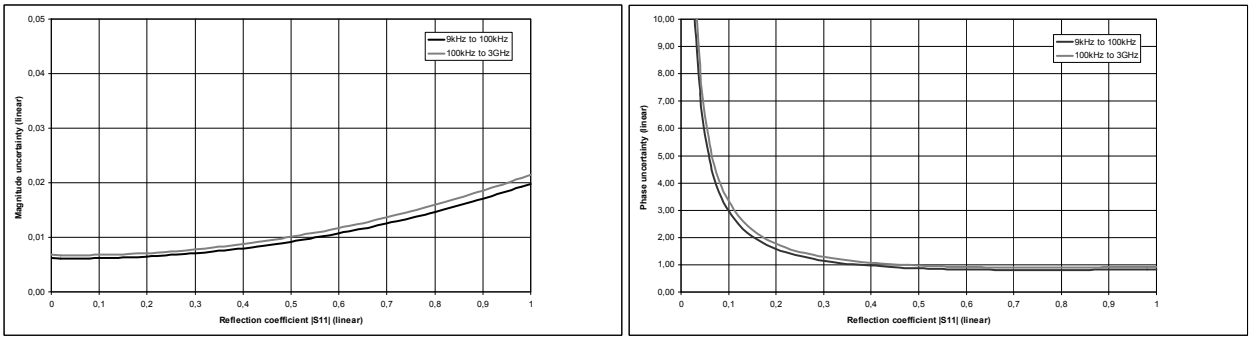
This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 °C after calibration. Validity of the data is conditional on the use of an R&S®ZV-Z270 calibration kit. This calibration kit is used to achieve the effective system data specified below. Frequency points,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

Accuracy of transmission measurements		
Above 9 kHz	+5 dB to –35 dB	< 0.05 dB or < 0.5°
	–35 dB to –50 dB	< 0.1 dB or < 1°
	–50 dB to –60 dB	< 0.2 dB or < 2°
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®ZNC3 in the frequency range from 9 kHz to 3 GHz. Analysis conditions $S_{11} = S_{22} = 0$, cal. power –10 dBm, meas. power –10 dBm.

Accuracy of reflection measurements		
9 kHz to 50 MHz	0 dB to –15 dB	< 0.3 dB or < 2°
	–15 dB to –25 dB	< 0.8 dB or < 6°
	–25 dB to –35 dB	< 3.0 dB or < 17°
50 MHz to 3 GHz	0 dB to –15 dB	< 0.2 dB or < 2°
	–15 dB to –25 dB	< 0.6 dB or < 4°
	–25 dB to –35 dB	< 2.0 dB or < 12°
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®ZNC3 in the frequency range from 9 kHz to 3 GHz. Analysis conditions $S_{12} = S_{21} = 0$, cal. power –10 dBm, meas. power –10 dBm.

Trace stability			
Trace noise magnitude (RMS)	at 0 dBm source power, 0 dB reflection	IF bandwidth	
	9 kHz to 20 kHz	1 kHz	< 0.008 dB RMS, typ. 0.004 dB
	20 kHz to 100 kHz	1 kHz	< 0.004 dB RMS, typ. 0.001 dB
	100 kHz to 100 MHz	10 kHz	< 0.002 dB RMS, typ. 0.001 dB
	100 MHz to 3 GHz	10 kHz	< 0.004 dB RMS, typ. 0.002 dB
Trace noise phase (RMS)	at 0 dBm source power, 0 dB reflection	IF bandwidth	
	9 kHz to 20 kHz	1 kHz	< 0.07° RMS, typ. 0.04° RMS
	20 kHz to 100 kHz	1 kHz	< 0.035° RMS, typ. 0.01° RMS
	100 kHz to 100 MHz	10 kHz	< 0.015° RMS, typ. 0.005° RMS
	100 MHz to 3 GHz	10 kHz	< 0.035° RMS, typ. 0.02° RMS
Temperature dependence	at 0 dB transmission or reflection		
	9 kHz to 3 GHz	magnitude	typ. 0.01 dB/°C
		phase	typ. 0.15°/°C

Effective system data

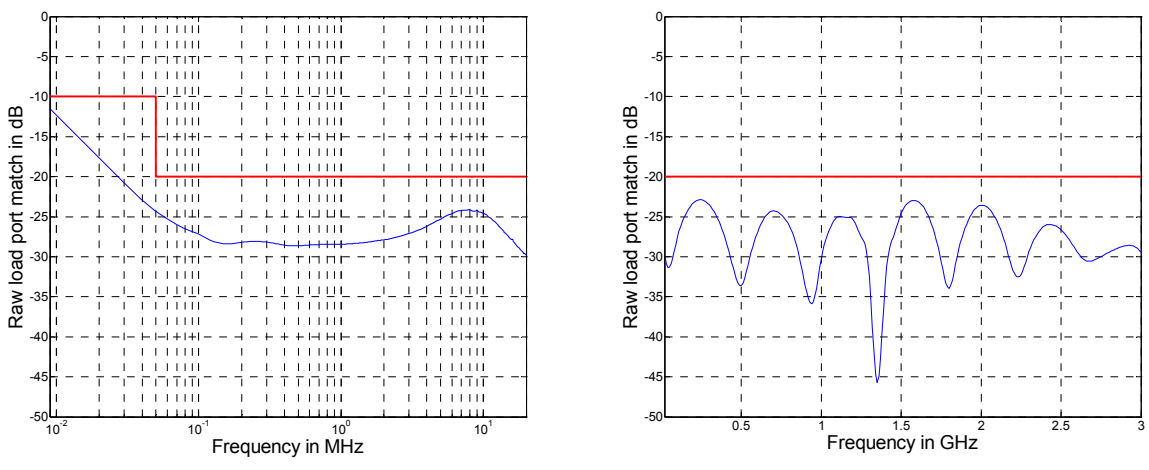
This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 °C after calibration. The data is based on a measurement bandwidth of 10 Hz and system error calibration with an R&S®ZV-Z270 calibration kit. Frequency points, measurement bandwidth and sweep time have to be identical for measurement and calibration (no interpolation allowed).

	9 kHz to 100 kHz	**100 kHz to 3 GHz**
Directivity	46	45
Source match	41	40
Load match	44	45
Reflection tracking	0.02	0.02
Transmission tracking	0.028	0.018

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.

Directivity	9 kHz to 50 kHz	> 20 dB, typ. 35 dB
	50 kHz to 3 GHz	> 30 dB, typ. 50 dB
Source match	9 kHz to 50 kHz	> 20 dB, typ. 35 dB
	50 kHz to 3 GHz	> 30 dB, typ. 50 dB
Reflection tracking	9 kHz to 3 GHz	< 0.5 dB, typ. 0.1 dB
Load match	9 kHz to 50 kHz	> 10 dB, typ. 15 dB
	50 kHz to 3 GHz	> 20 dB, typ. 25 dB
Transmission tracking	9 kHz to 3 GHz	< 0.5 dB, typ. 0.1 dB

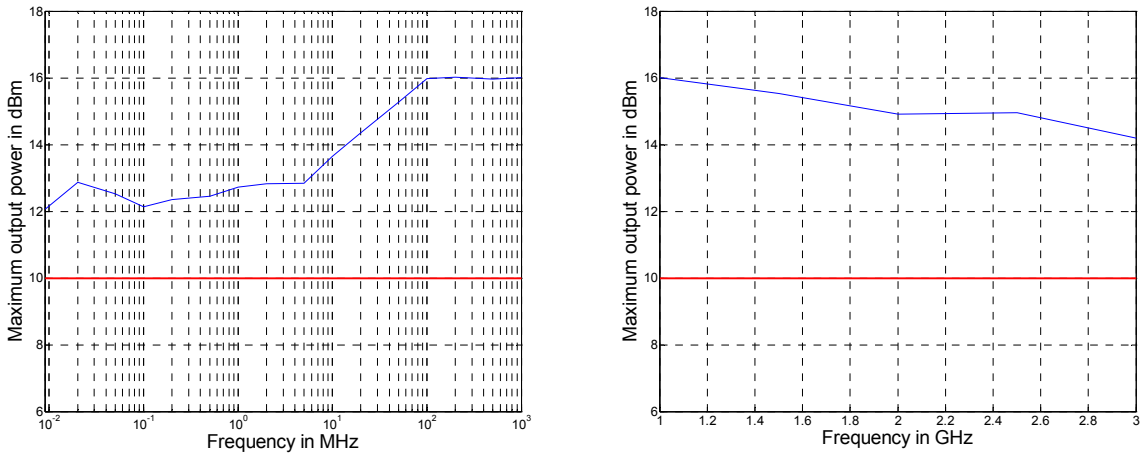


Raw load port match versus frequency for the R&S®ZNC3.

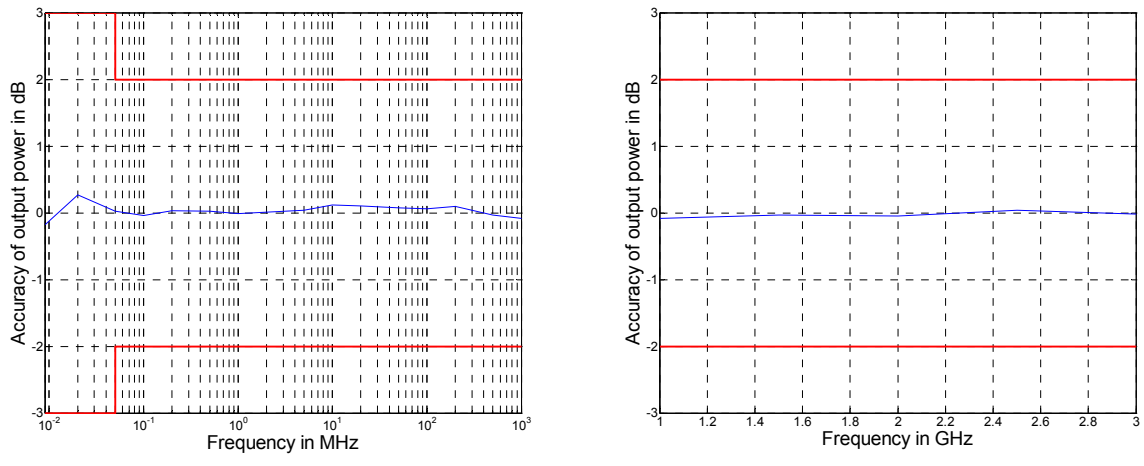
Test port output

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

Power range	without R&S®ZNC3-B22 extended power range option	
	9 kHz to 100 MHz	–10 dBm to +10 dBm, typ. +12 dBm
	100 MHz to 3 GHz	–10 dBm to +10 dBm, typ. +13 dBm
Power range	with R&S®ZNC3-B22 extended power range option	
	9 kHz to 100 MHz	–50 dBm to +10 dBm, typ. +12 dBm
	100 MHz to 3 GHz	–50 dBm to +10 dBm, typ. +13 dBm
Power accuracy	source power –10 dBm	
	9 kHz to 50 kHz	< 3 dB
	50 kHz to 3 GHz	< 2 dB, typ. 0.5 dB
Power linearity	referenced to –10 dBm	
	source power ≥ –35 dBm	< 1 dB
	source power < –35 dBm	< 2 dB
Power resolution		0.01 dB
Harmonics	at 0 dBm	
	20 kHz to 100 MHz	typ. < –30 dBc
	100 MHz to 3 GHz	< –25 dBc, typ. < –30 dBc



Maximum output power in dBm versus frequency for the R&S®ZNC3.



Output power accuracy in dB versus frequency for the R&S®ZNC3.

Test port input

Match	without system error correction	
	9 kHz to 50 kHz	> 10 dB
	50 kHz to 3 GHz	> 20 dB
Maximum nominal input level		+13 dBm
Power measurement accuracy	at –10 dBm without power calibration	
	9 kHz to 100 kHz	< 2 dB
	100 kHz to 3 GHz	< 1 dB
Receiver linearity	referenced to –10 dBm	
	for +20 dB to +10 dB	
	9 kHz to 3 GHz	< 0.2 dB
	for +10 dB to –40 dB	
	9 kHz to 3 GHz	< 0.2 dB
Damage level		+27 dBm
Damage DC voltage		30 V
Noise level	at 1 kHz measurement bandwidth, normalized to 1 Hz	
	9 kHz to 100 kHz	< –105 dBm (1 Hz)
	100 kHz to 3 GHz	< –120 dBm (1 Hz)
The noise level is defined as the RMS value of the specified noise floor.		

Additional front panel connectors

USB	(four) universal serial bus connectors for connecting USB devices (USB 2.0)

Display

Screen	30.7 cm (12.1") diagonal WXGA color LCD with touchscreen
Resolution	1280 × 800 × 262144 (high color, 125 dpi)
Pixel failure rate	$< 1 \times 10^{-5}$

Rear panel connectors

GPIB	optional remote control in line with IEEE 488, IEC60625; 24-pin

LAN	local area network connector, 8-pin, RJ-45

10 MHz REF	either input or output 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
Output frequency		10 MHz
Output frequency accuracy		80 Hz
Output power		+9 dBm ± 4 dB at 50 Ω

MONITOR	DVI connector (for external monitor)

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)	indicated drive ports (alternatively user-selectable to 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 TRIGGER	trigger input for analyzer	
Connector type		BNC, female
TTL signal (edge- or level-triggered)		3 V, 5 V tolerant
Polarity (selectable)		positive or negative
Minimum pulse width		1 µs
Input impedance		> 10 kΩ

Options

R&S®ZN-B14

Handler I/O	several control and trigger signals, 36-pin Centronics connector, 3.3 V TTL for controlling external devices, limit checks, sweep signals, etc.	
Agilent 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

R&S®ZNC3-B22

Extended power range		
Frequency range	R&S®ZNC3-B22	9 kHz to 3 GHz
Power range	9 kHz to 100 MHz	–50 dBm to +10 dBm, typ. +12 dBm
	100 MHz to 3 GHz	–50 dBm to +10 dBm, typ. +13 dBm

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 no. 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); the 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
EMC, immunity		in line with EMC Directive 2004/108/EC including: IEC/EN 61326-1 (immunity test requirement for industrial environment, EN 61326 table 2), IEC/EN 61326-2-1, IEC/EN 61000-3-2, IEC/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, max 1.8 A to 0.8 A respectively
Power consumption		max. 160 W, typ. 110 W
Test mark		VDE, GS, $_{C}$CSA$_{US}$, CE conformity mark
Dimensions	W × H × D	461.1 mm × 239.9 mm × 351.0 mm (18.2 in × 9.6 in × 13.9 in)
Weight		13.5 kg (29.7 lbs)
Shipping weight		18.5 kg (40.8 lbs)

Ordering information

Designation	Type	Order No.
Base unit		
Vector Network Analyzer, 3 GHz, 2 ports	R&S®ZNC3	1311.6004K12
Options		
Extended Power Range	R&S®ZNC3-B22	1316.1752.02
GPIB Interface	R&S®ZNC-B10	1316.1617.02
Handler I/O	R&S®ZN-B14	1316.2459.02
Time Domain Analysis	R&S®ZNC-K2	1316.1630.02
1 mHz Frequency Resolution	R&S®ZNC-K19	1317.8596.02
19" Rackmount Kit	R&S®ZZA-KN5	1175.3040.00

Service options		
Extended Warranty, one year	R&S®WE1ZNC	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2ZNC	
Extended Warranty, three years	R&S®WE3ZNC	
Extended Warranty, four years	R&S®WE4ZNC	
Extended Warranty with Calibration Coverage, one year	R&S®CW1ZNC	
Extended Warranty with Calibration Coverage, two years	R&S®CW2ZNC	
Extended Warranty with Calibration Coverage, three years	R&S®CW3ZNC	
Extended Warranty with Calibration Coverage, four years	R&S®CW4ZNC	

Extended warranty with a term of one to four years (WE1 to WE4)
Repairs carried out during the contract term are free of charge [3]. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

Extended warranty with calibration (CW1 to CW4)
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 [3] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For product brochure, see PD 5214.5610.12 and www.rohde-schwarz.com

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

Service you can rely on

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

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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