

R&S® ZNB3000

VECTOR NETWORK ANALYZER

Specifications

dataTec

Mess- und Prüftechnik. Die Experten.

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Specifications
Version 03.00

ROHDE & SCHWARZ

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Definitions

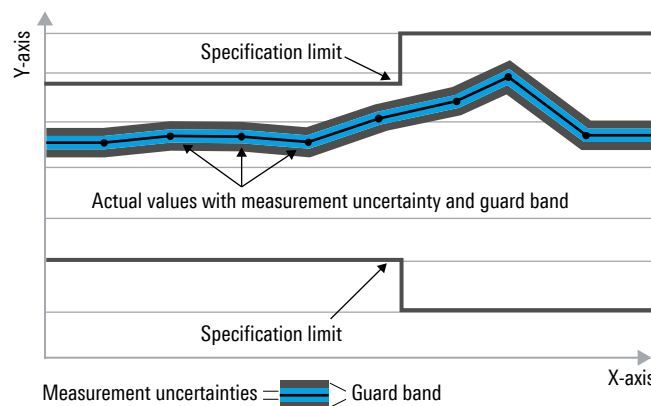
General

Product data applies under the following conditions:

- Three hours of storage at ambient temperature followed by 30 minutes of warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \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. All specification data is valid between +18 °C and +28 °C.



Non-traceable specifications with limits (n. trc.)

Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value, e.g. dimensions or resolution of a setting parameter. Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with $<$, $>$ or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter, e.g. nominal impedance. In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

Measurement range

| | | |
|------------------------------|--|--------------------------|
| Impedance | | 50 Ω |
| Test port connector | R&S®ZNB3004 | type N, female |
| | R&S®ZNB3020 | 3.5 mm, male, ruggedized |
| Number of test ports | R&S®ZNB3004 | 2 or 4 |
| | R&S®ZNB3020 | 2 or 4 |
| Frequency range ¹ | R&S®ZNB3004 | 9 kHz to 4.5 GHz |
| | R&S®ZNB3004 with R&S®ZNB3-B082/ R&S®ZNB3-B084 | 9 kHz to 9.0 GHz |
| | R&S®ZNB3020 | 9 kHz to 20.0 GHz |
| | R&S®ZNB3020 with R&S®ZNB3-B262/ R&S®ZNB3-B264 | 9 kHz to 26.5 GHz |
| | | |

| | | |
|---|---|------------------------|
| Static frequency accuracy | The static frequency accuracy is determined with the formula <i>(time since last adjustment in years × aging per year) + temperature drift + achievable initial calibration accuracy</i> using the values specified below. Depending on whether or not the R&S®ZNB-B4 precision frequency reference option is installed, the standard or the improved value have to be taken into account. | |
| Aging per year | standard | $\pm 1 \times 10^{-6}$ |
| | with R&S®ZNB-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®ZNB-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 | per trace | 1 to 100 001 |
| Measurement bandwidth | 1/1.5/2/3/5/7 steps | |
| | base unit | 1 Hz to 1 MHz |
| | with R&S®ZNB3-K17 option for increased IF bandwidth | 1 Hz to 10 MHz |

¹ Specified and typical data given in this specifications document apply to the R&S®ZNB3004 and the R&S®ZNB3020; note their respective frequency ranges with and without the corresponding frequency upgrade option.

Dynamic range

The receiver noise floor referred to in the following is defined as the root mean square (RMS) value of the data trace of the transmission magnitude, which is produced by noise and crosstalk with the test ports short-circuited. The specifications apply at 10 Hz measurement bandwidth, without user correction applied. The dynamic range can be increased by using a measurement bandwidth of 1 Hz. Crosstalk does not limit the dynamic range. Dynamic range performance is specified between port 1 and port 2 as well as between port 3 and port 4 (4-port model). Otherwise, dynamic range performance is typical.

| | Specification | Typical |
|-----------------------------------|--|----------|
| System dynamic range ² | R&S®ZNB3004, with or without R&S®ZNB3-B082/B084 (without additional options, for extended dynamic range refer to Options) | |
| | 9 kHz to 100 kHz | ≥ 110 dB |
| | 100 kHz to 50 MHz | ≥ 125 dB |
| | 50 MHz to 7GHz | ≥ 130 dB |
| | 7 GHz to 8.5 GHz | ≥ 120 dB |
| | 8.5 GHz to 9.0 GHz | ≥ 115 dB |
| | R&S®ZNB3020, respectively with or without R&S®ZNB3-B262/B264 ³ | |
| | 9 kHz to 300 kHz | ≥ 115 dB |
| | 300 kHz to 1 MHz | ≥ 135 dB |
| | 1 MHz to 10 MHz ⁴ | ≥ 140 dB |
| | 10 MHz to 100 MHz | ≥ 145 dB |
| | 100 MHz to 24 GHz | ≥ 140 dB |
| | 24 GHz to 26.5 GHz | ≥ 135 dB |

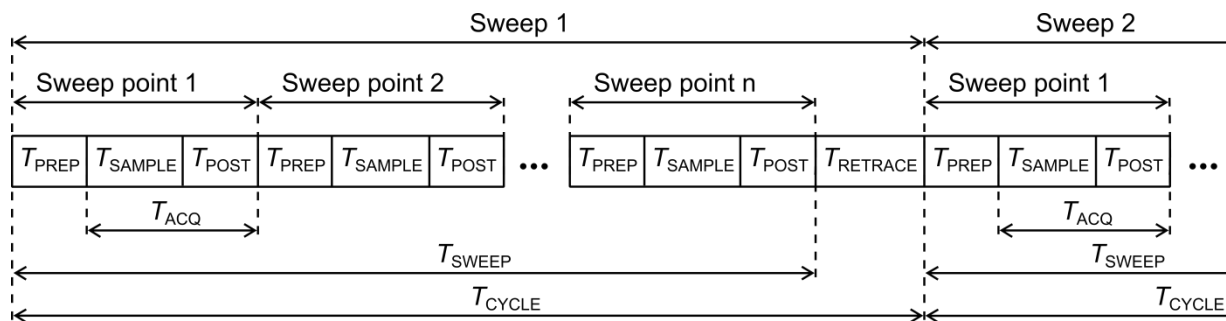
² Difference between maximum output power and receiver noise floor.

³ Without enhanced dynamic range mode the nominal system dynamic range above 100 kHz is reduced by 15 dB to 20 dB. Below 100 kHz, the impact could be higher.

⁴ It may typically be degraded at 2 MHz.

Measurement speed

Measured with firmware version 4.10 and Windows 11.



| | |
|----------------------|---|
| 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} | Aquisition 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 sequence

Nominal sweep cycle times in ms versus number of measurement points ⁵ of the R&S®ZNB3004, with or without R&S®ZNB3-B082/B084, sweep mode: stepped

| Number of measurement points | 51 | 201 | 401 | 1601 | 5001 |
|---|-----|-----|------|------|------|
| 800 MHz start frequency, 1 GHz stop frequency, Memory AGC on, 500 kHz measurement bandwidth | | | | | |
| With correction switched off | 0.8 | 1.3 | 2.1 | 5.7 | 15.1 |
| With 2-port TOSM calibration | 1.4 | 2.6 | 4.4 | 11.5 | 29.7 |
| With 4-port TOSM calibration | 2.6 | 5.8 | 8.2 | 22.8 | 60.9 |
| 1 MHz start frequency, 4.5 GHz stop frequency, Memory AGC on, 500 kHz measurement bandwidth | | | | | |
| With correction switched off | 1.2 | 1.9 | 2.9 | 6.9 | 17.1 |
| With 2-port TOSM calibration | 2.2 | 3.7 | 4.9 | 12.3 | 32.4 |
| With 4-port TOSM calibration | 4.2 | 7.2 | 10.4 | 25.9 | 65.8 |
| 1 MHz start frequency, 9.0 GHz stop frequency, Memory AGC on, 500 kHz measurement bandwidth | | | | | |
| With correction switched off | 1.7 | 2.6 | 3.6 | 7.7 | 17.4 |
| With 2-port TOSM calibration | 3.2 | 4.7 | 6.5 | 13.9 | 33.7 |
| With 4-port TOSM calibration | 6.2 | 9.6 | 12.8 | 28.7 | 69.3 |

Nominal sweep cycle times in ms versus number of measurement points ⁵ of the R&S®ZNB3020, with or without R&S®ZNB3-B262/B264, sweep mode: stepped

| Number of measurement points | 51 | 201 | 401 | 1601 | 5001 |
|---|------|------|------|------|------|
| 9 GHz start frequency, 10 GHz stop frequency, 500 kHz measurement bandwidth | | | | | |
| With correction switched off | 1.1 | 1.9 | 3.1 | 9.4 | 18.3 |
| With 2-port TOSM calibration | 1.7 | 3.5 | 6.2 | 13.5 | 30.0 |
| With 4-port TOSM calibration | 4.3 | 9.9 | 14.7 | 25.9 | 62.3 |
| 1 MHz start frequency, 20 GHz stop frequency, 500 kHz measurement bandwidth | | | | | |
| With correction switched off | 3.6 | 4.3 | 5.2 | 10.4 | 21.7 |
| With 2-port TOSM calibration | 7.0 | 8.5 | 10.7 | 18.4 | 39.1 |
| With 4-port TOSM calibration | 14.2 | 17.6 | 22.4 | 39.7 | 79.3 |
| 1 MHz start frequency, 26.5 GHz stop frequency, 500 kHz measurement bandwidth | | | | | |
| With correction switched off | 3.9 | 4.8 | 5.9 | 11.8 | 21.7 |
| With 2-port TOSM calibration | 7.7 | 9.6 | 11.0 | 21.2 | 40.1 |
| With 4-port TOSM calibration | 15.6 | 20.0 | 23.7 | 43.7 | 80.1 |

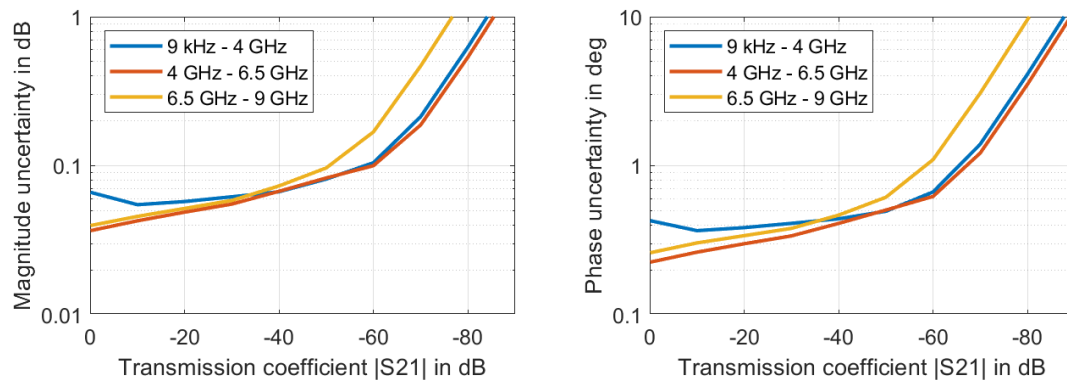
⁵ Sweep time is to be understood as cycle time; static frequency accuracy of the instrument applies; measured with firmware version 4.10, Windows 11.

R&S®ZNB3004 measurement accuracy

This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 °C since calibration. Validity of the data is conditional if an 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 allowed).

| Uncertainty of transmission measurements | | Magnitude | Phase |
|--|------------------|-----------|-------|
| 9 kHz to 100 kHz | +0 dB to –20 dB | 0.05 dB | 0.5° |
| | –20 dB to –40 dB | 0.07 dB | 0.6° |
| | –40 dB to –50 dB | 0.09 dB | 0.7° |
| | –50 dB to –60 dB | 0.21 dB | 1.4° |
| > 100 kHz to 4 GHz | +0 dB to –20 dB | 0.05 dB | 0.5° |
| | –20 dB to –40 dB | 0.07 dB | 0.6° |
| | –40 dB to –50 dB | 0.09 dB | 0.7° |
| | –50 dB to –60 dB | 0.20 dB | 1.4° |
| > 4 GHz to 6.5 GHz | +0 dB to –20 dB | 0.05 dB | 0.5° |
| | –20 dB to –40 dB | 0.07 dB | 0.6° |
| | –40 dB to –50 dB | 0.11 dB | 0.8° |
| | –50 dB to –60 dB | 0.25 dB | 1.7° |
| > 6.5 GHz to 9.0 GHz | +0 dB to –20 dB | 0.05 dB | 0.6° |
| | –20 dB to –40 dB | 0.09 dB | 0.8° |
| | –40 dB to –50 dB | 0.20 dB | 1.4° |
| | –50 dB to –60 dB | 0.60 dB | 4.1° |

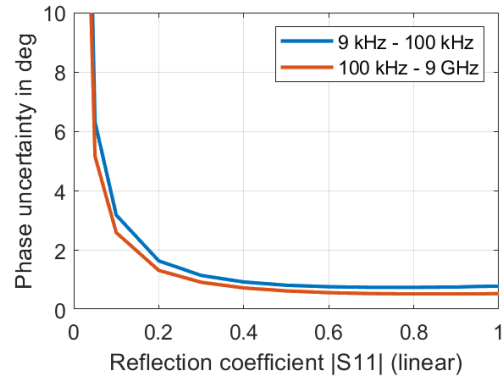
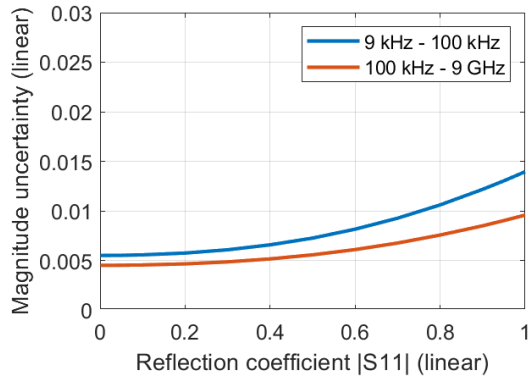
Specifications are based on a matched DUT, a measurement bandwidth of 10 Hz and a nominal source power of –10 dBm.



Typical uncertainty of transmission magnitude and transmission phase measurements for the R&S®ZNB3004 with or without frequency upgrade option, in the frequency range from 9 kHz to 9.0 GHz; analysis conditions: $S_{11} = S_{22} = 0$, cal. power: –10 dBm, meas. power: –10 dBm

| Uncertainty of reflection measurements | Logarithmic | | | Linear | |
|--|------------------|-----------|-------|------------------|-----------|
| | Reflection level | Magnitude | Phase | Reflection range | Magnitude |
| 9 kHz to 100 kHz | 0 dB | 0.1 dB | 1.0° | 0 dB to -15 dB | 0.017 |
| | -15 dB | 0.4 dB | 2.6° | -15 dB to -25 dB | 0.008 |
| | -25 dB | 1.1 dB | 7.1° | -25 dB to -35 dB | 0.007 |
| > 100 kHz to 9.0 GHz | 0 dB | 0.1 dB | 0.7° | 0 dB to -15 dB | 0.013 |
| | -15 dB | 0.3 dB | 1.9° | -15 dB to -25 dB | 0.006 |
| | -25 dB | 0.9 dB | 6.1° | -25 dB | 0.006 |

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



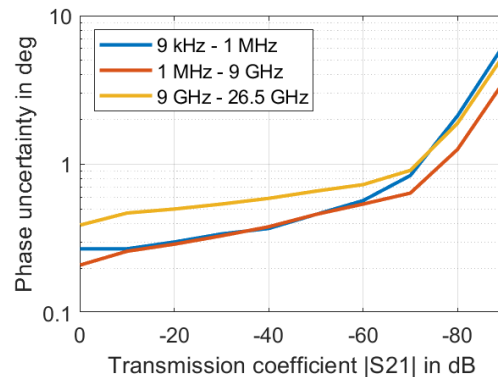
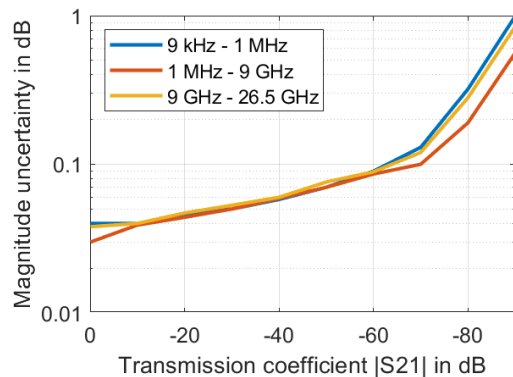
Typical uncertainty of reflection magnitude and reflection phase measurements for the R&S®ZNB3004 with or without frequency upgrade option, in the frequency range from 9 kHz to 9.0 GHz; analysis conditions: $S_{12} = S_{21} = 0$, cal. power: -10 dBm, meas. power: -10 dBm

R&S®ZNB3020 measurement accuracy

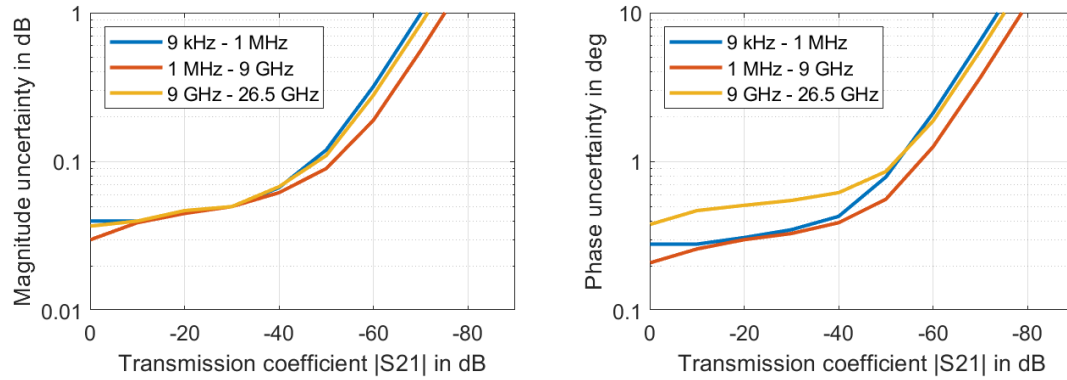
This data is valid between +18 °C and +28 °C, provided the temperature has not varied by more than 1 °C since calibration. Validity of the data is conditional if an R&S®ZN-Z235 (with 3.5 mm test port adapter connector) or R&S®ZN-Z229 calibration kit is used. This calibration kit is used to achieve the effective system data specified below. Frequency points, measurement bandwidth and sweep time have to be identical for measurement and calibration (no interpolation allowed).

| Uncertainty of transmission measurements | | Magnitude | Phase |
|--|------------------|-----------|-------|
| 9 kHz to 300 kHz | 0 dB to -20 dB | 0.05 dB | 0.3° |
| | -20 dB to -40 dB | 0.06 dB | 0.4° |
| | -40 dB to -50 dB | 0.08 dB | 0.5° |
| | -50 dB to -60 dB | 0.13 dB | 0.9° |
| > 300 kHz to 1 MHz | 0 dB to -20 dB | 0.04 dB | 0.3° |
| | -20 dB to -40 dB | 0.06 dB | 0.4° |
| | -40 dB to -50 dB | 0.08 dB | 0.5° |
| | -50 dB to -60 dB | 0.13 dB | 0.9° |
| > 1 MHz to 4 GHz | 0 dB to -20 dB | 0.04 dB | 0.3° |
| | -20 dB to -40 dB | 0.06 dB | 0.4° |
| | -40 dB to -50 dB | 0.08 dB | 0.5° |
| | -50 dB to -60 dB | 0.10 dB | 0.7° |
| > 4 GHz to 9 GHz | 0 dB to -20 dB | 0.05 dB | 0.4° |
| | -20 dB to -40 dB | 0.06 dB | 0.5° |
| | -40 dB to -50 dB | 0.08 dB | 0.5° |
| | -50 dB to -60 dB | 0.10 dB | 0.7° |
| > 9 GHz to 26.5 GHz | 0 dB to -20 dB | 0.06 dB | 0.7° |
| | -20 dB to -40 dB | 0.07 dB | 0.7° |
| | -40 dB to -50 dB | 0.09 dB | 0.8° |
| | -50 dB to -60 dB | 0.12 dB | 1.0° |

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



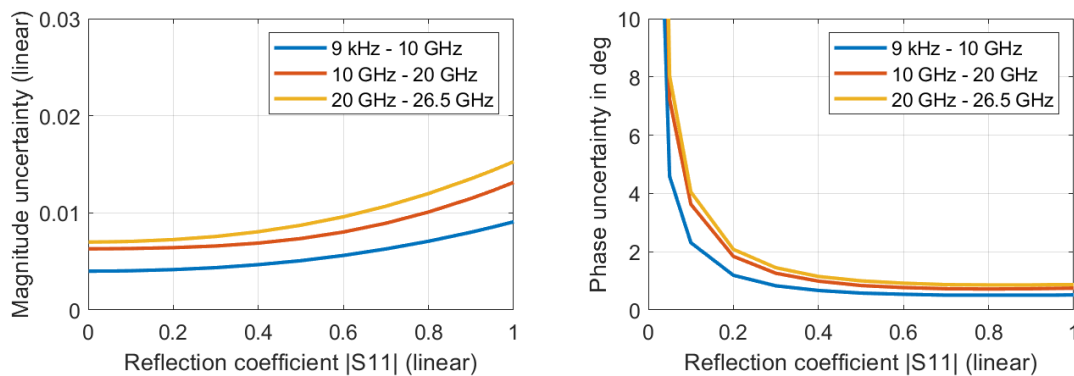
Typical uncertainty of transmission magnitude and transmission phase measurements for the R&S®ZNB3020 with or without frequency upgrade option, in the frequency range from 9 kHz to 26.5 GHz; analysis conditions: $S_{11} = S_{22} = 0$, cal. power: -10 dBm, meas. power: -10 dBm, EDR on



Typical uncertainty of transmission magnitude and transmission phase measurements for the R&S®ZNB3020 with or without frequency upgrade option, in the frequency range from 9 kHz to 26.5 GHz; analysis conditions: $S_{11} = S_{22} = 0$, cal. power: -10 dBm, meas. power: -10 dBm, EDR off

| Uncertainty of reflection measurements With R&S®ZN-Z235 | Logarithmic | | | Linear | |
|--|------------------|-----------|-------|----------------------|-----------|
| | Reflection level | Magnitude | Phase | Reflection range | Magnitude |
| 9 kHz to 10 GHz | 0 dB | 0.10 dB | 0.6° | 0 dB to -15 dB | 0.011 |
| | -15 dB | 0.29 dB | 1.9° | -15 dB to -25 dB | 0.006 |
| | -25 dB | 0.93 dB | 6.1° | -25 dB to -35 dB | 0.006 |
| > 10 GHz to 20 GHz | 0 dB | 0.12 dB | 0.8° | 0 dB to -15 dB | 0.014 |
| | -15 dB | 0.34 dB | 2.3° | -15 dB to -25 dB | 0.007 |
| | -25 dB | 1.09 dB | 7.1° | -25 dB to -35 dB | 0.007 |
| > 20 GHz to 26.5 GHz | 0 dB | 0.14 dB | 0.9° | 0 dB to -15 dB | 0.016 |
| | -15 dB | 0.44 dB | 2.9° | -15 dB to -25 dB | 0.009 |
| | -25 dB | 1.40 dB | 9.2° | -25 dB to -35 dB | 0.009 |

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



Typical uncertainty of reflection magnitude and reflection phase measurements for the R&S®ZNB3020 with or without frequency upgrade option, in the frequency range from 9 kHz to 26.5 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®ZNB3004, calibrated using R&S®ZV-Z270 | 9 kHz to 100 kHz | 100 kHz to 9.0 GHz |
|--|-------------------------|---------------------------|
| Directivity | ≥ 44 dB | ≥ 46 dB |
| Source match | ≥ 39 dB | ≥ 43 dB |
| Load match | ≥ 40 dB | ≥ 45 dB |
| Reflection tracking | ≤ 0.075 dB | ≤ 0.06 dB |
| Transmission tracking | ≤ 0.05 dB | ≤ 0.03 dB |

| R&S®ZNB3020, calibrated using R&S®ZN-Z235 | 9 kHz to 10 GHz | 10 GHz to 20 GHz | 20 GHz to 26.5 GHz |
|--|------------------------|-------------------------|---------------------------|
| Directivity | ≥ 46 dB | ≥ 44 dB | ≥ 42 dB |
| Source match | ≥ 43 dB | ≥ 40 dB | ≥ 40 dB |
| Load match | ≥ 45 dB | ≥ 43 dB | ≥ 41 dB |
| Reflection tracking | ≤ 0.04 dB | ≤ 0.05 dB | ≤ 0.06 dB |
| Transmission tracking | ≤ 0.03 dB | ≤ 0.03 dB | ≤ 0.03 dB |

Factory-calibrated system data

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

| | | Specification | Typical |
|-----------------------|---|---------------|---------|
| Directivity | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 9 kHz to 50 kHz | ≥ 20 dB | 35 dB |
| | 50 kHz to 9.0 GHz | ≥ 30 dB | 50 dB |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 50 kHz | ≥ 20 dB | |
| | 50 kHz to 10 GHz | ≥ 30 dB | |
| | 10 GHz to 20.0 GHz | ≥ 25 dB | |
| | 20.0 GHz to 26.5 GHz | ≥ 20 dB | |
| Source match | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 9 kHz to 50 kHz | ≥ 20 dB | 35 dB |
| | 50 kHz to 9.0 GHz | ≥ 30 dB | 50 dB |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 50 kHz | ≥ 20 dB | |
| | 50 kHz to 10 GHz | ≥ 30 dB | |
| | 10 GHz to 20.0 GHz | ≥ 25 dB | |
| | 20.0 GHz to 26.5 GHz | ≥ 20 dB | |
| Reflection tracking | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 9 kHz to 9.0 GHz | ≤ 0.5 dB | 0.05 dB |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 26.5 GHz | ≤ 0.5 dB | |
| Transmission tracking | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 9 kHz to 9.0 GHz | ≤ 0.5 dB | 0.05 dB |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 26.5 GHz | ≤ 0.5 dB | |
| Load match | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 9 kHz to 50 kHz | ≥ 10 dB | 15 dB |
| | 50 kHz to 8.5 GHz | ≥ 20 dB | 25 dB |
| | 8.5 GHz to 9.0 GHz | ≥ 15 dB | 20 dB |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 50 kHz | ≥ 5 dB | 9 dB |
| | 50 kHz to 1 MHz | ≥ 15 dB | 20 dB |
| | 1 MHz to 100 MHz | ≥ 25 dB | 35 dB |
| | 100 MHz to 10 GHz | ≥ 12 dB | 18 dB |
| | 10 GHz to 26.5 GHz | ≥ 10 dB | 16 dB |

| Trace stability | IF bandwidth | | Specification | Typical |
|-----------------------------|--|--------|---------------|-----------|
| Trace noise magnitude (RMS) | R&S®ZNB3004, with or without frequency upgrade option ⁶ | | | |
| | 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 9.0 GHz | 10 kHz | ≤ 0.004 dB | 0.002 dB |
| | R&S®ZNB3020, with or without frequency upgrade option ⁷ | | | |
| | 9 kHz to 1 MHz | 1 kHz | ≤ 0.0015 dB | 0.0005 dB |
| | 1 MHz to 16 GHz | 10 kHz | ≤ 0.0015 dB | 0.0005 dB |
| | 16 GHz to 26.5 GHz | 10 kHz | ≤ 0.0024 dB | 0.0008 dB |
| Trace noise phase (RMS) | R&S®ZNB3004, with or without frequency upgrade option ⁶ | | | |
| | 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 9.0 GHz | 10 kHz | ≤ 0.035° | 0.020° |
| | R&S®ZNB3020, with or without frequency upgrade option ⁷ | | | |
| | 9 kHz to 100 kHz | 1 kHz | ≤ 0.04° | 0.03° |
| | 100 kHz to 1 MHz | 1 kHz | ≤ 0.015° | 0.002° |
| | 1 MHz to 100 MHz ⁸ | 10 kHz | ≤ 0.015° | 0.001° |
| | 100 MHz to 6 GHz | 10 kHz | ≤ 0.015° | 0.001° |
| | 6 GHz to 8 GHz | 10 kHz | ≤ 0.015° | 0.002° |
| | 8 GHz to 16 GHz | 10 kHz | ≤ 0.015° | 0.003° |
| | 16 GHz to 24 GHz | 10 kHz | ≤ 0.015° | 0.004° |
| | 24 GHz to 26.5 GHz | 10 kHz | ≤ 0.015° | 0.005° |

| Measured temperature stability R&S®ZNB3004 ⁹ | 9 kHz to 100 kHz | 100 kHz to 9 GHz |
|---|------------------|------------------|
| Transmission magnitude, at –10 dBm source power | 0.015 dB/K | |
| Transmission phase ¹⁰ , at –10 dBm source power | 0.035°/GHz/K | |
| Vector network analyzer (VNA) uncertainty model, applicable for R&S®ZNB3-K50 and R&S®ZNB3-K50P real-time measurement uncertainty analysis options | | |
| Tracking magnitude | 0.014 dB/K | 0.010 dB/K |
| Symmetry magnitude | 0.006 dB/K | 0.004 dB/K |
| Directivity/match | –65 dB | –60 dB |
| Tracking phase | 0.15°/K | 0.20°/K |
| Symmetry phase | 0.025°/GHz/K | 0.020°/GHz/K |

| Measured temperature stability R&S®ZNB3020 ⁹ | 9 kHz to 100 kHz | 100 kHz to 8 GHz | 8 GHz to 10 GHz | 10 GHz to 26.5 GHz |
|---|------------------|------------------|-----------------|--------------------|
| Transmission magnitude, at –10 dBm source power | 0.014 dB/K | | | 0.018 dB/K |
| Transmission phase ¹⁰ , at –10 dBm source power | 0.025°/GHz/K | | | |
| Vector network analyzer (VNA) uncertainty model, applicable for R&S®ZNB3-K50 and R&S®ZNB3-K50P real-time measurement uncertainty analysis options | | | | |
| Tracking magnitude | 0.004 dB/K | 0.008 dB/K | 0.01 dB/K | 0.014 dB/K |
| Symmetry magnitude | 0.005 dB/K | | 0.018 dB/K | 0.008 dB/K |
| Directivity/match | –65 dB | | –63 dB | –60 dB |
| Tracking phase | 0.15°/K | 0.02°/GHz/K | | |
| Symmetry phase | 0.15°/K | 0.02°/GHz/K | | |

⁶ At 0 dBm source power, 0 dB reflection.

⁷ At maximum specified source power, 0 dB reflection.

⁸ It may typically be degraded at 2 MHz.

⁹ The stability is obtained by measuring the through connection repeatedly while varying the temperature in the range +18 °C to +28 °C and observing the deviations between the measurements. A temperature drift per Kelvin is deduced.

¹⁰ The phase drift increases linearly with frequency. It is described only by the slope, therefore, the factor between phase drift and frequency is stated.

Test port output

| Parameter | Frequency range | Specification | Typical |
|---|---|--------------------|---------------|
| Power range | without optional extended power range | | |
| | R&S®ZNB3004, with or without frequency upgrade 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 |
| | 8.5 GHz to 9.0 GHz | –55 dBm to +5 dBm | up to +8 dBm |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 100 kHz | –30 dBm to +4 dBm | up to +6 dBm |
| | 100 kHz to 1 MHz | –30 dBm to +8 dBm | up to +12 dBm |
| | 1 MHz to 10 MHz | –30 dBm to +10 dBm | up to +15 dBm |
| | 10 MHz to 1 GHz | –30 dBm to +11 dBm | up to +16 dBm |
| | 1 GHz to 6 GHz | –30 dBm to +13 dBm | up to +16 dBm |
| | 6 GHz to 10 GHz | –30 dBm to +13 dBm | up to +15 dBm |
| | 10 GHz to 15 GHz | –30 dBm to +11 dBm | up to +14 dBm |
| | 15 GHz to 20 GHz | –30 dBm to +10 dBm | up to +12 dBm |
| | 20 GHz to 26.5 GHz | –30 dBm to +8 dBm | up to +11 dBm |
| Minimum power level | using optional extended power range (see Options) | | |
| | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 9 kHz to 9.0 GHz | –85 dBm | |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 26.5 GHz | –60 dBm | |
| Power accuracy, source power: –10 dBm | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 9 kHz to 50 kHz | ≤ 3 dB | 0.5 dB |
| | 50 kHz to 9.0 GHz | ≤ 2 dB | 0.3 dB |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 9 kHz to 20 GHz | ≤ 2 dB | |
| | 20 GHz to 26.5 GHz | ≤ 2.5 dB | |
| Power linearity referenced to –10 dBm | R&S®ZNB3004, with or without frequency upgrade option | | |
| | source power ≥ –55 dBm | ≤ 1 dB | 0.3 dB |
| | source power < –55 dBm | ≤ 2 dB | |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | source power ≥ –30 dBm | ≤ 1 dB | |
| | source power < –30 dBm | ≤ 2 dB | |
| Power resolution | | 0.01 dB | |
| Second harmonics at 0 dBm and harmonic frequency | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 40 kHz to 200 MHz | | –30 dBc |
| | 200 MHz to 9.0 GHz | | –35 dBc |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 18 kHz to 20 MHz | | –20 dBc |
| | 20 MHz to 26.5 GHz | | –30 dBc |
| Third harmonics at 0 dBm and harmonic frequency | R&S®ZNB3004, with or without frequency upgrade option | | |
| | 60 kHz to 300 MHz | | –30 dBc |
| | 300 MHz to 9.0 GHz | | –35 dBc |
| | R&S®ZNB3020, with or without frequency upgrade option | | |
| | 27 kHz to 30 MHz | | –20 dBc |
| | 30 MHz to 26.5 GHz | | –30 dBc |

Test port input

| Parameter | Frequency range | Specification | Typical | Nominal |
|--|---|------------------|----------|---------|
| Match | R&S®ZNB3004, with or without frequency upgrade option | | | |
| | 9 kHz to 50 kHz | > 10 dB | | |
| | 50 kHz to 9.0 GHz | > 20 dB | | |
| | R&S®ZNB3020, with or without frequency upgrade option | | | |
| | 9 kHz to 50 kHz | > 5 dB | 9 dB | |
| | 50 kHz to 1 MHz | > 15 dB | 20 dB | |
| | 1 MHz to 100 MHz | > 25 dB | 35 dB | |
| | 100 MHz to 10 GHz | > 12 dB | 18 dB | |
| | 10 GHz to 26.5 GHz | > 10 dB | 16 dB | |
| Maximum nominal input level | | | | +13 dBm |
| Power measurement accuracy at –10 dBm, without power calibration | R&S®ZNB3004, with or without frequency upgrade option | | | |
| | 9 kHz to 100 kHz | < 2 dB | | |
| | 100 kHz to 9.0 GHz | < 1 dB | | |
| | R&S®ZNB3020, with or without frequency upgrade option | | | |
| | 9 kHz to 100 kHz | < 2 dB | | |
| | 100 kHz to 20 GHz | < 1 dB | | |
| | 20 GHz to 26.5 GHz | < 2 dB | | |
| Compression at test port input, input level: > 0 dBm, referenced to –10 dBm | R&S®ZNB3004, with or without frequency upgrade option | | | |
| | 9 kHz to 7.5 GHz | 0 dBm to +10 dBm | < 0.2 dB | |
| | 7.5 GHz to 9 GHz | 0 dBm to +8 dBm | < 0.2 dB | |
| | R&S®ZNB3020, with or without frequency upgrade option | | | |
| | 9 kHz to 100 kHz | 0 dBm to +4 dBm | < 0.2 dB | |
| | 100 kHz to 1 MHz | 0 dBm to +8 dBm | < 0.2 dB | |
| | 1 MHz to 10 MHz | 0 dBm to +10 dBm | < 0.2 dB | |
| | 10 MHz to 1 GHz | 0 dBm to +11 dBm | < 0.2 dB | |
| | 1 GHz to 10 GHz | 0 dBm to +13 dBm | < 0.2 dB | |
| | 10 GHz to 15 GHz | 0 dBm to +11 dBm | < 0.2 dB | |
| | 15 GHz to 20 GHz | 0 dBm to +10 dBm | < 0.2 dB | |
| | 20 GHz to 26.5 GHz | 0 dBm to +8 dBm | < 0.2 dB | |
| Linearity at test port input, input level: –50 dBm to 0 dBm, referenced to –10 dBm | R&S®ZNB3004, R&S®ZNB3020, with or without frequency upgrade option | | | |
| | 9 kHz to 9.0 GHz | < 0.1 dB | | |
| | 9.0 GHz to 26.5 GHz | < 0.1 dB | | |
| Damage level | | +27 dBm | | |
| Damage DC voltage | | 30 V | | |
| Noise level ¹¹ , at 1 kHz measurement bandwidth, normalized to 1 Hz | R&S®ZNB3004, with or without frequency upgrade option | | | |
| | 9 kHz to 100 kHz | < –120 dBm | –130 dBm | |
| | 100 kHz to 4 GHz | < –130 dBm | –140 dBm | |
| | 4 GHz to 7 GHz | < –125 dBm | –138 dBm | |
| | 7 GHz to 9.0 GHz | < –120 dBm | –132 dBm | |
| | R&S®ZNB3020, with or without frequency upgrade option ¹² | | | |
| | 9 kHz to 300 kHz | < –125 dBm | –135 dBm | |
| | 300 kHz to 1 MHz | < –130 dBm | –140 dBm | |
| | 1 MHz to 10 MHz ¹³ | < –135 dBm | –145 dBm | |
| | 10 MHz to 100 MHz | < –140 dBm | –147 dBm | |
| | 100 MHz to 3 GHz | < –140 dBm | –147 dBm | |
| | 3 GHz to 9 GHz | < –138 dBm | –146 dBm | |
| | 9 GHz to 17 GHz | < –139 dBm | –146 dBm | |
| | 17 GHz to 26.5 GHz | < –139 dBm | –147 dBm | |

¹¹ The noise level is defined as the RMS value of the specified noise floor. For different bandwidth add $[10 \times \log_{10}(\text{bandwidth} / 1 \text{ Hz})]$ to the given noise level.

¹² Without enhanced dynamic range mode the nominal noise level is reduced by 15 dB to 20 dB.

¹³ It may typically be degraded at 2 MHz.

Additional front panel connectors

| | | |
|-----|--|--|
| USB | | 2 ports, type A plug, USB 2.0, max. current 0.9A 2 ports, type C plug, USB 2.0, max. current 1.5A |
|-----|--|--|

Display

| | | |
|--------------------|--|---|
| Screen | | 30.7 cm (12.1") diagonal WXGA, 18-bit color LCD with touchscreen |
| Resolution | | 1280 × 800 pixel, 125 dpi |
| Pixel failure rate | | $< 1 \times 10^{-5}$ |

Rear panel connectors

| | | |
|----------|--|-----------------------------------|
| LAN | | 8-pin, RJ-45, 2.5 Gbit/s |
| USB host | | 2 ports, type A plug, version 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 ± 4 dB at 50 Ω |

| | | |
|-------------------------|--|---------------------|
| External monitor | | |
| Connector types | | HDMI DisplayPort |

| | | |
|--------------------------------|-----------------------------|--|
| 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 | | 3.3 V (typ.) |

Options

R&S®ZNB3-B1

| Bias tee for the R&S®ZNB3004, with or without frequency upgrade option | | |
|--|--|---|
| Connector type | | BNC, female |
| Maximum nominal input voltage | | 30 V |
| Maximum nominal input current | | 400 mA |
| Damage voltage | | 30 V |
| Damage current | | 420 mA |
| Frequency range | R&S®ZNB3004 with R&S®ZNB3-B1 | 100 kHz to 4.5 GHz |
| | R&S®ZNB3004 with R&S®ZNB3-B1/ R&S®ZNB3-B08x | 100 kHz to 9.0 GHz |
| Frequency response data | | typical and specified data is valid for the limited frequency range given above |

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.

| | Frequency range | Specification | Typical |
|-----------------------|--------------------|---------------|---------|
| Directivity | 100 kHz to 4.5 GHz | ≥ 30 dB | 50 dB |
| | 4.5 GHz to 9.0 GHz | ≥ 30 dB | 50 dB |
| Source match | 100 kHz to 500 kHz | ≥ 20 dB | 30 dB |
| | 500 kHz to 9.0 GHz | ≥ 30 dB | 50 dB |
| Reflection tracking | 100 kHz to 9.0 GHz | ≤ 0.5 dB | 0.1 dB |
| Load match | 100 kHz to 500 kHz | ≥ 10 dB | 15 dB |
| | 500 kHz to 9.0 GHz | ≥ 18 dB | 25 dB |
| Transmission tracking | 100 kHz to 9.0 GHz | ≤ 0.5 dB | 0.1 dB |

R&S®ZNB-B4

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

R&S®ZNB-B10

| | | |
|----------------|--|--|
| GPIO interface | | remote control interface in line with IEEE 488, IEC 60625; 24-pin |
|----------------|--|--|

R&S®ZNB-B12

| Device control | | |
|-----------------------|--|---------------------------|
| DIRECT CTRL interface | | direct control bus output |

R&S®ZN-B14

| | | |
|--|---|---|
| Handler I/O | | several control and trigger signals, 36-pin Centronics connector, TTL compatible, for controlling external devices, limit checks, sweep signals, etc. |
| Keysight handler interface compatibility | | type 3 |
| Input signals | pin 2, pin 18 | TTL compatible |
| Output signals | pin 3 to pin 17, pin 19 to pin 21, pin 30 to pin 34, pin 36 | TTL compatible |
| Input/output signals | pin 22 to pin 29 | TTL compatible |
| +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®ZNB3-B22/-B24

| Extended power range | | Specification | Typical |
|---|--------------------|----------------------|----------------|
| Power range for the R&S®ZNB3004, with or without frequency upgrade 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 9.0 GHz | –85 dBm to +8 dBm | up to +12 dBm |
| Power range for the R&S®ZNB3020, with or without frequency upgrade option | 9 kHz to 100 kHz | –60 dBm to +4 dBm | up to +6 dBm |
| | 100 kHz to 1 MHz | –60 dBm to +8 dBm | up to +12 dBm |
| | 1 MHz to 10 MHz | –60 dBm to +10 dBm | up to +15 dBm |
| | 10 MHz to 1 GHz | –60 dBm to +11 dBm | up to +18 dBm |
| | 1 GHz to 6 GHz | –60 dBm to +13 dBm | up to +16 dBm |
| | 6 GHz to 10 GHz | –60 dBm to +13 dBm | up to +15 dBm |
| | 10 GHz to 15 GHz | –60 dBm to +11 dBm | up to +14 dBm |
| | 15 GHz to 20 GHz | –60 dBm to +10 dBm | up to +12 dBm |
| | 20 GHz to 26.5 GHz | –60 dBm to +8 dBm | up to +11 dBm |

R&S®ZNB3-B31/-B32/-B33/-B34

| Receiver step attenuators | | |
|----------------------------------|---|--------------------------------------|
| Frequency range | R&S®ZNB3004, without R&S®ZNB3-B08x R&S®ZNB3004, with R&S®ZNB3-B08x | 9 kHz to 4.5 GHz 9 kHz to 9.0 GHz |
| Attenuation | | 0 dB to 30 dB, in 10 dB steps |

R&S®ZNB3-B52/-B54

| Extended dynamic range | | Specification | Typical |
|---|--------------------|----------------------|----------------|
| Power range, without optional extended power range | 9 kHz to 100 kHz | –55 dBm to +8 dBm | |
| | 100 kHz to 6.5 GHz | –55 dBm to +10 dBm | |
| | 6.5 GHz to 7.5 GHz | –55 dBm to +8 dBm | |
| | 7.5 GHz to 8.5 GHz | –55 dBm to +6 dBm | |
| | 8.5 GHz to 9.0 GHz | –55 dBm to +2 dBm | |
| Minimum power level using optional extended power range (see Options) | 9 kHz to 9.0 GHz | –85 dBm | |
| Second and third harmonics at 0 dBm | 20 kHz to 100 MHz | | –20 dBc |
| | 100 MHz to 9.0 GHz | | –35 dBc |
| System dynamic range ¹⁴ | 9 kHz to 50 MHz | ≥ 130 dB | 140 dB |
| | 50 MHz to 6.5 GHz | ≥ 140 dB | 150 dB |
| | 6.5 GHz to 8.5 GHz | ≥ 130 dB | 138 dB |
| | 8.5 GHz to 9.0 GHz | ≥ 125 dB | |

¹⁴ 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 apply 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 between port 1 and port 2 and between port 3 and port 4 (4-port model). Otherwise the dynamic range performance is typical.

| Test port input | | Specification | |
|--|--------------------|---------------------------------|----------|
| Match | 9 kHz to 50 kHz | ≥ 10 dB | |
| | 50 kHz to 8.5 GHz | ≥ 18 dB | |
| | 8.5 GHz to 9.0 GHz | ≥ 15 dB | |
| Maximum nominal input level | | +10 dBm | |
| Compression at test port input, input level: > 0 dBm, referenced to -10 dBm | | Input power at test port | |
| | 9 kHz to 100 kHz | +8 dBm | < 0.2 dB |
| | 100 kHz to 6.5 GHz | +10 dBm | < 0.2 dB |
| | 6.5 GHz to 7.5 GHz | +8 dBm | < 0.2 dB |
| | 7.5 GHz to 8.5 GHz | +6 dBm | < 0.2 dB |
| | 8.5 GHz to 9.0 GHz | +2 dBm | < 0.2 dB |
| Linearity at test port input, input level: -50 dBm to 0 dBm, referenced to -10 dBm | | 9 kHz to 9.0 GHz | |
| | | ≤ 0.1 dB | |
| Noise level ¹⁵ , at 1 kHz measurement bandwidth, normalized to 1 Hz | 9 kHz to 50 kHz | ≤ -125 dBm (1 Hz) | |
| | 50 kHz to 50 MHz | ≤ -130 dBm (1 Hz) | |
| | 50 MHz to 6.5 GHz | ≤ -140 dBm (1 Hz) | |
| | 6.5 GHz to 9.0 GHz | ≤ -130 dBm (1 Hz) | |

| Trace stability | | IF bandwidth | Specification | Typical |
|---|-------------------|--------------|-----------------|----------|
| Trace noise magnitude (RMS), at 0 dBm source power, 0 dB reflection | 9 kHz to 20 kHz | 1 kHz | ≤ 0.008 dB | 0.004 dB |
| | 20 kHz to 100 kHz | 1 kHz | ≤ 0.005 dB | 0.001 dB |
| | 100 kHz to 1 GHz | 10 kHz | ≤ 0.005 dB | 0.001 dB |
| | 1 GHz to 5 GHz | 10 kHz | ≤ 0.005 dB | 0.002 dB |
| | 5 GHz to 9.0 GHz | 10 kHz | ≤ 0.005 dB | 0.003 dB |

Note: The R&S®ZNBx-B52/R&S®ZNBx-B54 options cannot be combined with the R&S®ZNBx-B1 option and/or the R&S®ZNBx-B31/R&S®ZNBx-B32/R&S®ZNBx-B33/R&S®ZNBx-B34 options.

R&S®ZNB-B81

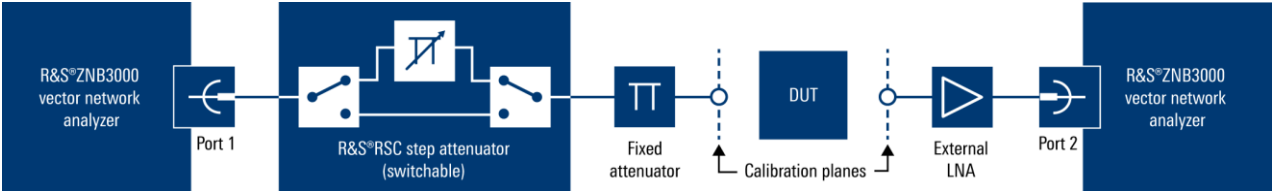
This data is valid in the temperature range from +18 °C to +28 °C and with a maximum measurement bandwidth of 10 kHz.

| DC inputs | | |
|----------------------|-------------|------------------------------------|
| Number of ports | | 4 |
| Connector type | | BNC, female |
| Voltage range | | ± 20 V, ± 3 V, ± 0.3 V |
| Measurement accuracy | ± 20 V | 2 % of reading ± 0.02 V |
| | ± 3 V | 2 % of reading ± 0.002 V |
| | ± 0.3 V | 2 % of reading ± 0.002 V |
| Input impedance | | ≥ 1 M Ω |
| Damage voltage | | 30 V |

¹⁵ The noise level is defined as the RMS value of the specified noise floor.

R&S®ZNB3-K30

| Noise figure measurement | |
|--------------------------------|--|
| Recommended setup and options | <div>R&S®ZNB3000 with 2 or 4 ports</div> <ul style="list-style-type: none">• and diode power sensor (e.g. R&S®NRP40S), see Ordering information• and step attenuator (e.g. R&S®RSC), see Ordering information• and external low noise amplifier (LNA) ¹⁶, optional: switchable• and test cables, see Ordering information• and fixed attenuators: 3 dB, 6 dB, 10 dB, etc. |
| Noise level of test port input | see section test port input |



Recommended setup for R&S®ZNB3-K30 noise figure measurement

R&S®ZNB3-K980

| Health and utilization monitoring service (HUMS) ^{17, 18} | | |
|--|---|---|
| Interfaces | protocols and interfaces supported for data readout and display | <ul style="list-style-type: none">• SNMP (v1, v2c, v3)• REST (JSON)• SCPI• device web |
| Services | information provided | <ul style="list-style-type: none">• device information (model, serial number, BIOS, date, time, system, HUMS and software information)• user-defined information tags (e.g. for asset management)• equipment information (hardware, options, software, licenses)• system operating status• instrument security information• service related information (due dates etc.)• mass storage related information• instrument utilization data• device history (event log) |

¹⁶ Contact your local Rohde & Schwarz sales office for more information.

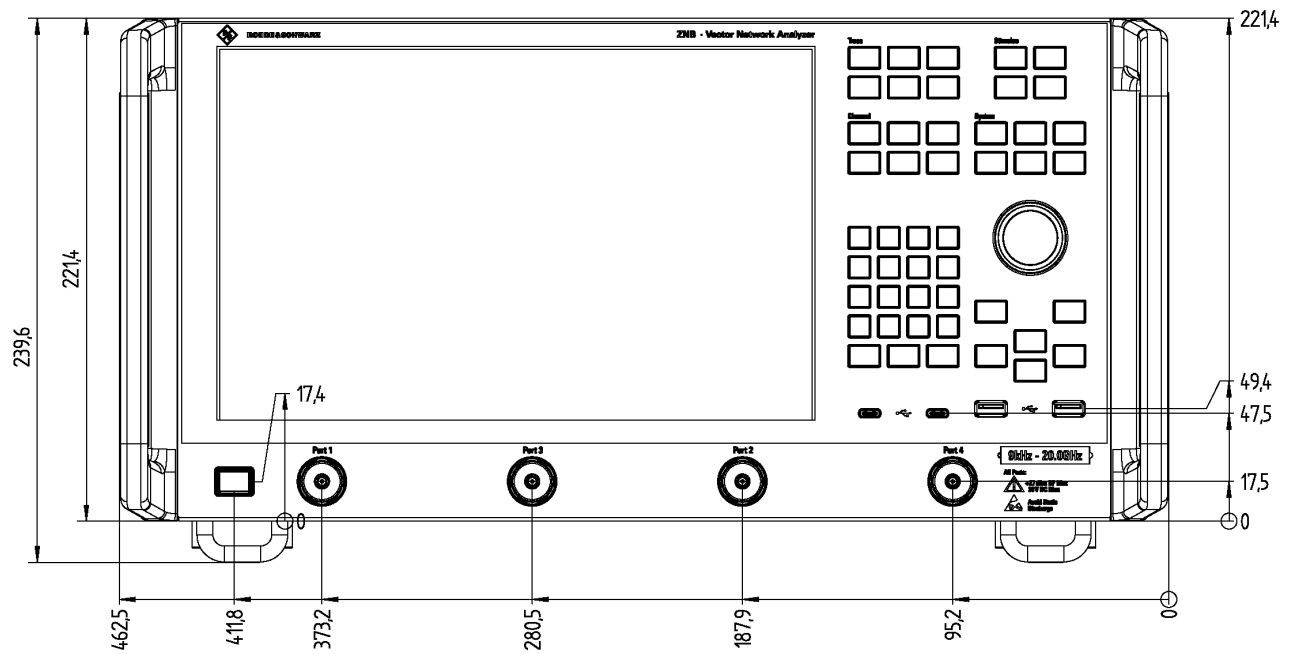
¹⁷ For details see application note under: www.rohde-schwarz.com/appnote/GFM336.

¹⁸ For use with common available asset management tools.

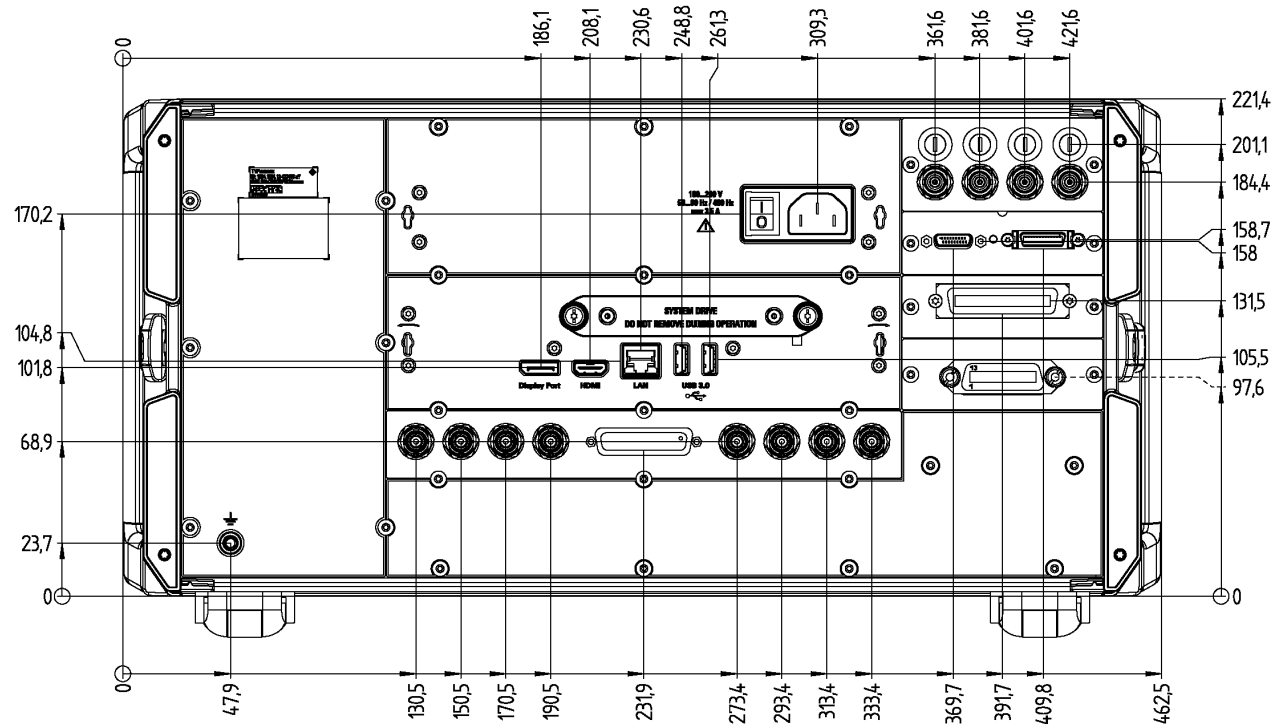
General data

| | | |
|-----------------------|--|---|
| 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 | 8 Hz to 500 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); 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 2014/30/EU 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 |
| EU legislation | for details, see user documentation | EU: in line with Data Act – Regulation (EU) 2023/2854 |
| Safety | | in line with IEC 61010-1, EN 61010-1 and UL 61010-1, CAN/CSA-C22.2 No.61010-1 |
| Power supply | | 100 V to 240 V \pm 10% 50 Hz to 60 Hz and 400 Hz, max. 3.5 A |
| Power consumption | R&S®ZNB3004, with 2 ports | max. 450 W, 120 W (typ.) |
| | R&S®ZNB3004, with 4 ports | max. 450 W, 170 W (typ.) |
| | R&S®ZNB3020, with 2 ports | max. 450 W, 145 W (typ.) |
| | R&S®ZNB3020, with 4 ports | max. 450 W, 200 W (typ.) |
| Test marks | | VDE, cCSA _{US} , KCC conformity mark, CE conformity mark |
| Dimensions | W × H × D | 462.5 mm × 239.6 mm × 361.5 mm (18.2 in × 9.4 in × 14.2 in) |
| Weight | R&S®ZNB3004, R&S®ZNB3020, with 2 ports | 14 kg (30.9 lb) |
| | R&S®ZNB3004, R&S®ZNB3020, with 4 ports | 16 kg (35.3 lb) |
| Shipping weight | R&S®ZNB3004, R&S®ZNB3020, with 2 ports | 19 kg (41.9 lb) |
| | R&S®ZNB3004, R&S®ZNB3020, with 4 ports | 21 kg (46.3 lb) |

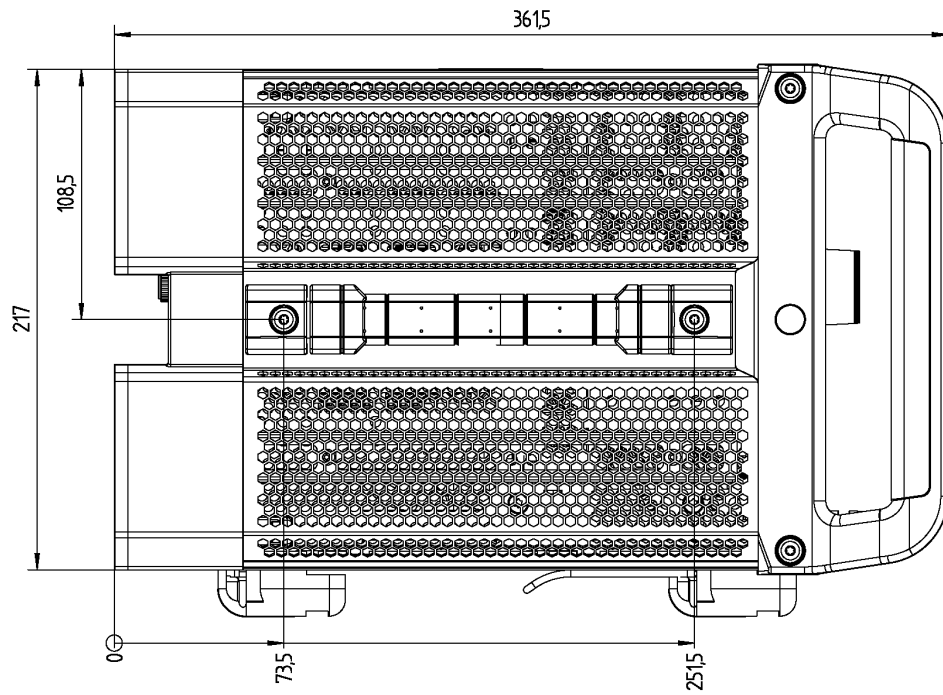
Dimensions (in mm)



Front view of the R&S®ZNB3000



Rear view of the R&S®ZNB3000



Side view of the R&S®ZNB3000

Ordering information

| Designation | Type | Retrofit ¹⁹ | On site ²⁰ | Order No. |
|---|---------------|------------------------|-----------------------|--------------|
| Base unit | | | | |
| Vector network analyzer, 2-port, 9 kHz to 4.5 GHz (N) | R&S®ZNB3004 | | | 1351.5050.02 |
| Vector network analyzer, 4-port, 9 kHz to 4.5 GHz (N) | R&S®ZNB3004 | | | 1351.5050.04 |
| Vector network analyzer, 2-port, 9 kHz to 20 GHz (PC3.5) | R&S®ZNB3020 | | | 1351.5050.22 |
| Vector network analyzer, 4-port, 9 kHz to 20 GHz (PC3.5) | R&S®ZNB3020 | | | 1351.5050.24 |
| Options | | | | |
| Frequency upgrade | | | | |
| Upgrade of 2-port R&S®ZNB3004 to 9.0 GHz | R&S®ZNB3-B082 | • | | 1351.5067.02 |
| Upgrade of 4-port R&S®ZNB3004 to 9.0 GHz | R&S®ZNB3-B084 | • | | 1351.5067.04 |
| Upgrade of 2-port R&S®ZNB3020 to 26.5 GHz | R&S®ZNB3-B262 | • | | 1351.5073.02 |
| Upgrade of 4-port R&S®ZNB3020 to 26.5 GHz | R&S®ZNB3-B264 | • | | 1351.5073.04 |
| Extended power range | | | | |
| Extended power range for 2-port R&S®ZNB3004 base unit | R&S®ZNB3-B22 | • | | 1351.5173.02 |
| Extended power range for 4-port R&S®ZNB3004 base unit | R&S®ZNB3-B24 | • | | 1351.5180.02 |
| Extended power range for 2-port R&S®ZNB3020 base unit | R&S®ZNB3-B22 | • | | 1351.5196.02 |
| Extended power range for 4-port R&S®ZNB3020 base unit | R&S®ZNB3-B24 | • | | 1351.5209.02 |
| Receiver step attenuators | | | | |
| Receiver step attenuator, port 1, for R&S®ZNB3004 base unit | R&S®ZNB3-B31 | • | | 1351.5250.02 |
| Receiver step attenuator, port 2, for R&S®ZNB3004 base unit | R&S®ZNB3-B32 | • | | 1351.5267.02 |
| Receiver step attenuator, port 3, for R&S®ZNB3004 base unit | R&S®ZNB3-B33 | • | | 1351.5273.02 |
| Receiver step attenuator, port 4, for R&S®ZNB3004 base unit | R&S®ZNB3-B34 | • | | 1351.5280.02 |
| Extended dynamic range ²¹ | | | | |
| Extended dynamic range for 2-port R&S®ZNB3004 base unit | R&S®ZNB3-B52 | | | 1351.5296.02 |
| Extended dynamic range for 4-port R&S®ZNB3004 base unit | R&S®ZNB3-B54 | | | 1351.5309.02 |
| Bias tees for 2-port R&S®ZNB3004 base unit | R&S®ZNB3-B1 | | | 1351.5115.02 |
| Bias tees for 4-port R&S®ZNB3004 base unit | R&S®ZNB3-B1 | | | 1351.5121.02 |
| Second internal generator for 4-port R&S®ZNB3004 base unit | R&S®ZNB3-B2 | • | | 1351.5138.02 |
| Second internal generator for 4-port R&S®ZNB3020 base unit | R&S®ZNB3-B2 | • | | 1351.5144.02 |
| Precision frequency reference (OCXO) | R&S®ZNB-B4 | • | | 1316.1769.02 |
| GPIO interface | R&S®ZNB-B10 | • | • | 1311.5995.04 |
| Device control | R&S®ZNB-B12 | • | • | 1319.5088.02 |
| Direct control cable | R&S®ZN-B121 | • | • | 1323.9290.00 |
| Handler I/O | R&S®ZN-B14 | • | • | 1316.2459.05 |
| RFFE GPIO interface (external) | R&S®ZN-Z15 | • | • | 1325.5905.02 |
| RFFE GPIO interface (external), including voltage/current measurement | R&S®ZN-Z15 | • | • | 1325.5905.03 |
| Additional removable SSD, 512 Gbyte | R&S®ZNB3-B19 | • | • | 1351.5821.02 |
| DC inputs | R&S®ZNB-B81 | • | | 1316.0004.02 |
| Time domain analysis | R&S®ZNB3-K2 | • | • | 1351.5367.02 |
| Extended time domain analysis | R&S®ZNB3-K20 | • | • | 1351.5373.02 |
| Distance to fault | R&S®ZNB3-K3 | • | • | 1351.5380.02 |
| Frequency conversion | R&S®ZNB3-K4 | • | • | 1351.5396.02 |
| Intermodulation measurements ²² | R&S®ZNB3-K14 | • | • | 1351.5409.02 |
| 10 MHz receiver bandwidth | R&S®ZNB3-K17 | • | • | 1351.5421.02 |
| Gain compression measurements | R&S®ZNB3-K18 | • | • | 1355.8902.02 |
| 1 mHz frequency resolution | R&S®ZNB3-K19 | • | • | 1351.5438.02 |
| Noise figure measurement | R&S®ZNB3-K30 | • | • | 1351.5444.02 |
| Real-time measurement uncertainty analysis ²³ | R&S®ZNB3-K50 | • | • | 1351.5450.02 |
| Real-time measurement uncertainty analysis, preinstalled 23 | R&S®ZNB3-K50P | | | 1351.5467.02 |
| SNP assistant | R&S®ZNB3-K100 | • | • | 1355.5432.02 |
| EaZy deembedding | R&S®ZNB3-K210 | • | • | 1351.5480.02 |
| In-situ deembedding | R&S®ZNB3-K220 | • | | 1351.5496.02 |
| Smart fixture deembedding | R&S®ZNB3-K230 | • | | 1351.5509.02 |
| Delta-L PCB characterization | R&S®ZNB3-K231 | • | | 1351.5515.02 |
| Health and utilization monitoring service (HUMS) | R&S®ZNB3-K980 | • | • | 1351.5521.02 |
| 19" rackmount kit | R&S®ZZA-KN5 | • | • | 1175.3040.00 |

¹⁹ Option may also be ordered at a later stage, upgrade in service.

²⁰ Option may be installed by the user on site.

²¹ The R&S®ZNBx-B52/-B54 options cannot be combined with the R&S®ZNBx-B1 option and/or the R&S®ZNBx-B31/-B32/-B33/-B34 options.

²² The R&S®ZNB3-K14 requires R&S®ZNB3-K4.

²³ The R&S®ZNB3-K50/-K50P does not support the enhanced dynamic range mode in the R&S®ZNB3020.

| Designation | Type | Order No. |
|--|-----------------|--------------|
| Recommended calibration accessories | | |
| Calibration kits for manual calibration – economy | | |
| Calibration kit, 0 Hz to 18 GHz, N (f) | R&S®ZN-Z170 | 1328.8163.03 |
| Calibration kit, 0 Hz to 26.5 GHz, 3.5 mm (f) | R&S®ZN-Z135 | 1328.8157.03 |
| Calibration kits for manual calibration – high-end | | |
| Calibration kit, 0 Hz to 18 GHz, N, 50 Ω | R&S®ZV-Z270 | 5011.6536.02 |
| Calibration kit, 0 Hz to 26.5 GHz, 3.5 mm | R&S®ZN-Z235 | 1336.8500.02 |
| Calibration units for automatic calibration – economy | | |
| Calibration unit, 5 kHz to 4.5 GHz, 2-port ²⁴ | R&S®ZN-ZE104 | 1350.8040.04 |
| Calibration unit, 5 kHz to 9 GHz, 2-port ²⁴ | R&S®ZN-ZE109 | 1350.8040.09 |
| Calibration unit, 5 kHz to 26.5 GHz, 2-port ²⁴ | R&S®ZN-ZE126 | 1350.8040.26 |
| Calibration unit, 100 kHz to 8.5 GHz, 4 ports, SMA (f) | R&S®ZN-Z153 | 1319.6178.34 |
| Calibration unit, 100 kHz to 8.5 GHz, 6 ports, SMA (f) | R&S®ZN-Z152 | 1319.6003.36 |
| Calibration unit, 100 kHz to 8.5 GHz, 6 ports, SMA (f) | R&S®ZN-Z154 | 1319.5120.02 |
| Additional ports 7 to 12, SMA (f) | R&S®ZN-Z154-B22 | 1319.5136.22 |
| Additional ports 13 to 18, SMA (f) | R&S®ZN-Z154-B32 | 1319.5136.32 |
| Additional ports 19 to 24, SMA (f) | R&S®ZN-Z154-B42 | 1319.5136.42 |
| Calibration units for automatic calibration – high-end | | |
| Calibration unit, 100 kHz to 8.5 GHz, 2 ports, N (f) | R&S®ZN-Z51 | 1319.5507.72 |
| Calibration unit, 100 kHz to 8.5 GHz, 4 ports, N (f) | R&S®ZN-Z51 | 1319.5507.74 |
| Calibration unit, 100 kHz to 8.5 GHz, 2 ports, 3.5 mm (f) | R&S®ZN-Z51 | 1319.5507.32 |
| Calibration unit, 100 kHz to 8.5 GHz, 4 ports, 3.5 mm (f) | R&S®ZN-Z51 | 1319.5507.34 |
| Calibration unit, 9 kHz to 9 GHz, 2 ports, 3.5 mm (f) | R&S®ZN-Z50 | 1335.6904.30 |
| Calibration unit, 9 kHz to 26.5 GHz, 2 ports, 3.5 mm (f) | R&S®ZN-Z50 | 1335.6904.32 |
| Calibration unit, 100 kHz to 26.5 GHz, 4 ports, 3.5 mm (f) | R&S®ZN-Z52 | 1335.6991.30 |
| Calibration unit, 100 kHz to 26.5 GHz, 2 ports, 3.5 mm (f) | R&S®ZN-Z53 | 1335.7046.32 |
| Calibration unit, 100 kHz to 18 GHz, 2 ports, N (f) | R&S®ZN-Z53 | 1335.7046.72 |
| Inline calibration units for automatic calibration | | |
| CAN bus controller for inline calibration units | R&S®ZN-Z30 | 1328.7609.02 |
| Inline calibration unit, 10 MHz to 8.5 GHz | R&S®ZN-Z32 | 1328.7638.02 |
| Inline calibration unit, 10 MHz to 40 GHz, characterized to 43.5 GHz | R&S®ZN-Z33 | 1328.7644.02 |
| Inline calibration unit, 10 MHz to 40 GHz, for TVAC, characterized to 43.5 GHz | R&S®ZN-Z33 | 1328.7644.03 |
| Thermal insulator, 2.92 mm | R&S®ZN-Z391 | 1350.8504.02 |
| Power sensors | | |
| Three-path diode power sensor, 10 MHz to 33 GHz, 3.5 mm | R&S®NRP33S | 1419.0064.02 |
| Attenuators | | |
| Step attenuator, 0 dB to 139 dB, 1 dB steps, DC to 6 GHz, N (f) connectors at front panel, manually switchable | R&S®RSC | 1313.8004.03 |
| External step attenuator, 0 dB to 75 dB, 5 dB steps, DC to 40 GHz | R&S®RSC-Z405 | 1313.9952.02 |
| Switch matrices | | |
| Switch matrix, 10 MHz to 8.5 GHz, 2 VNA ports to 6 test ports | R&S®ZN-Z84 | 1319.4500.02 |
| Additional test ports 7 to 12, 2 VNA ports to 12 test ports | R&S®ZN-Z84-B22 | 1319.4969.22 |
| Additional test ports 13 to 18, 2 VNA ports to 18 test ports | R&S®ZN-Z84-B32 | 1319.4969.32 |
| Additional test ports 19 to 24, 2 VNA ports to 24 test ports | R&S®ZN-Z84-B42 | 1319.4969.42 |
| Additional test ports 7 to 12, 4 VNA ports to 12 test ports | R&S®ZN-Z84-B24 | 1319.4969.24 |
| Additional test ports 13 to 18, 4 VNA ports to 18 test ports | R&S®ZN-Z84-B34 | 1319.4969.34 |
| Additional test ports 19 to 24, 4 VNA ports to 24 test ports | R&S®ZN-Z84-B44 | 1319.4969.44 |
| Switch matrix, 100 MHz to 26.5 GHz, 2 VNA ports to 6 test ports | R&S®ZN-Z86 | 1351.2216.02 |
| Additional test ports 7 to 12, 2 VNA ports to 12 test ports | R&S®ZN-Z86-B22 | 1351.2900.22 |
| Additional test ports 13 to 18, 2 VNA ports to 18 test ports ²⁵ | R&S®ZN-Z86-B32 | 1351.2900.32 |
| Additional test ports 19 to 24, 2 VNA ports to 24 test ports ²⁶ | R&S®ZN-Z86-B42 | 1351.2900.42 |
| Additional test ports 7 to 12, 4 VNA ports to 12 test ports | R&S®ZN-Z86-B24 | 1351.2900.24 |
| Additional test ports 13 to 18, 4 VNA ports to 18 test ports ²⁷ | R&S®ZN-Z86-B34 | 1351.2900.34 |
| Additional test ports 19 to 24, 4 VNA ports to 24 test ports ²⁸ | R&S®ZN-Z86-B44 | 1351.2900.44 |
| Semi-rigid cable set for R&S®ZNB, 2.92 mm (f) to 2.92 mm (m), 2 or 4 R&S®ZNB ports to R&S®ZN-Z86, benchtop operation | R&S®ZN-ZB26 | 1328.8911.02 |

²⁴ Various port options available, see R&S®ZN-ZE1xx specifications (PD 3683.5597.22).

²⁵ Requires R&S®ZN-Z86-B22.

²⁶ Requires R&S®ZN-Z86-B32.

²⁷ Requires R&S®ZN-Z86-B24.

²⁸ Requires R&S®ZN-Z86-B34.

| Designation | Type | Order No. |
|--|----------------|----------------------|
| Switch matrix, 100 MHz to 26.5 GHz, with additional RF access | R&S®ZN-Z86X | 1351.2222.02 |
| Additional test ports 1 to 12, 2 or 4 VNA ports | R&S®ZNZ86X-B24 | 1351.2222.24 |
| Additional test ports 1 to 24, 2 or 4 VNA ports | R&S®ZNZ86X-B44 | 1351.2222.44 |
| Semi-rigid cable set for R&S®ZNB, 2.92 mm (f) to 2.92 mm (m), 2 or 4 R&S®ZNB ports to R&S®ZN-Z86X, benchtop operation | R&S®ZN-ZB26 | 1328.8911.03 |
| Test cables | | |
| 0 Hz to 18 GHz, N (m) to N (m), 50 Ω, length: 0.6 m/1 m | R&S®ZV-Z91 | 1301.7572.25/.38 |
| 0 Hz to 18 GHz, N (m) to N (m), 50 Ω, length: 0.6 m/0.9 m | R&S®ZV-Z191 | 1306.4507.24/.36 |
| 0 Hz to 18 GHz, N (m) to 3.5 mm (m), 50 Ω, length: 0.6 m/1 m | R&S®ZV-Z92 | 1301.7589.25/.38 |
| 0 Hz to 18 GHz, N (m) to 3.5 mm (m), 50 Ω, length: 0.6 m/0.9 m | R&S®ZV-Z192 | 1306.4513.24/.36 |
| 0 Hz to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), length: 0.6 m/1 m | R&S®ZV-Z93 | 1301.7595.25/.38 |
| 0 Hz to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), length: 0.6 m/0.9 m/1.5 m | R&S®ZV-Z193 | 1306.4520.24/.36/.60 |

| | | |
|--|--------------------------------|-----------------------|
| Warranty | | |
| Base unit | | 1 year |
| All other items | | 1 year |
| Service options | | |
| | Service plans | On demand |
| Calibration | up to five years ²⁹ | pay per calibration |
| Warranty and repair | up to five years ²⁹ | standard price repair |
| Contact your Rohde & Schwarz sales office for further details. | | |

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²⁹ For extended periods, contact your Rohde & Schwarz sales office.

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