

# R&S® ZNL VECTOR NETWORK ANALYZER

## Specifications

3  
year  
warranty



Data Sheet  
Version 07.00

**ROHDE & SCHWARZ**

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# Definitions

## General

Product data applies under the following conditions:

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

## Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , 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.



## 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/3GPP2 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.

# Specifications

## Measurement range

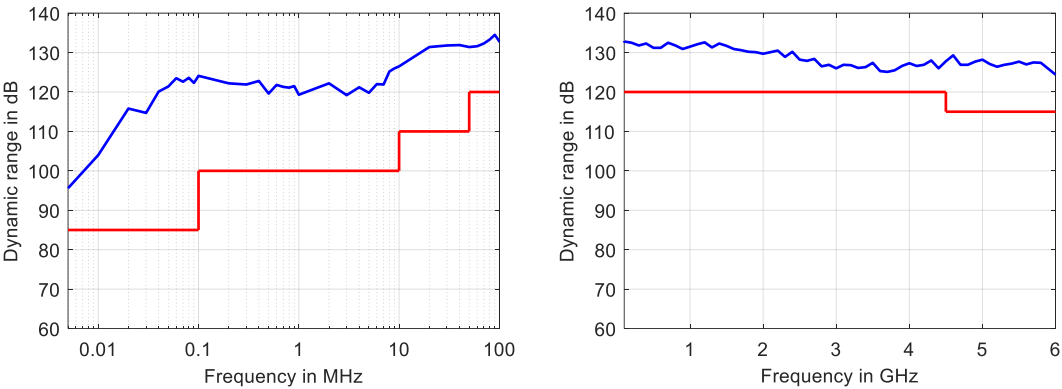
|                              |                                           |                  |
|------------------------------|-------------------------------------------|------------------|
| Impedance                    |                                           | 50 $\Omega$      |
| Test port connector          | R&S®ZNL3, R&S®ZNL4 R&S®ZNL6 and R&S®ZNL14 | N female         |
|                              | R&S®ZNL20                                 | 3.5 mm, male     |
| Number of test ports         |                                           | 2                |
| Frequency range <sup>1</sup> | R&S®ZNL3                                  | 5 kHz to 3 GHz   |
|                              | R&S®ZNL4                                  | 5 kHz to 4.5 GHz |
|                              | R&S®ZNL6                                  | 5 kHz to 6 GHz   |
|                              | R&S®ZNL14                                 | 5 kHz to 14 GHz  |
|                              | R&S®ZNL20                                 | 5 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®FPL-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®FPL-B4 precision frequency reference option | $\pm 1 \times 10^{-8}$                                                                      |
| Achievable initial calibration accuracy | standard                                             | $\pm 5 \times 10^{-7}$                                                                      |
|                                         | with R&S®FPL-B4 precision frequency reference option | $\pm 5 \times 10^{-8}$                                                                      |

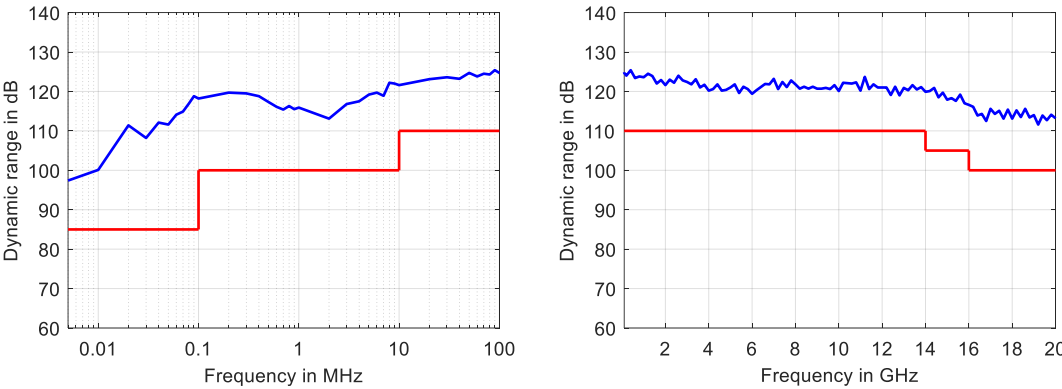
|                              |                     |                 |
|------------------------------|---------------------|-----------------|
| Frequency resolution         |                     | 1 Hz            |
| Number of measurement points | per trace           | 1 to 100 001    |
| Measurement bandwidth        | 1/1.5/2/3/5/7 steps | 1 Hz to 500 kHz |

<sup>1</sup> Specified and typical data given in this data sheet applies to the R&S®ZNL3, R&S®ZNL4, R&S®ZNL6, R&S®ZNL14 and R&S®ZNL20; please note their respective frequency ranges.

| Dynamic range <sup>2</sup> |                                 | specification | typical |
|----------------------------|---------------------------------|---------------|---------|
|                            | R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6 |               |         |
|                            | 5 kHz to 100 kHz                | > 85 dB       | 110 dB  |
|                            | 100 kHz to 10 MHz               | > 100 dB      | 120 dB  |
|                            | 10 MHz to 50 MHz                | > 110 dB      | 120 dB  |
|                            | 50 MHz to 4.5 GHz               | > 120 dB      | 130 dB  |
|                            | 4.5 GHz to 6 GHz                | > 115 dB      | 125 dB  |
|                            | R&S®ZNL14 and R&S®ZNL20         |               |         |
|                            | 5 kHz to 100 kHz                | > 85 dB       | 110 dB  |
|                            | 100 kHz to 10 MHz               | > 100 dB      | 120 dB  |
|                            | 10 MHz to 14 GHz                | > 110 dB      | 120 dB  |
|                            | 14 GHz to 16 GHz                | > 105 dB      | 120 dB  |
|                            | 16 GHz to 20 GHz                | > 100 dB      | 117 dB  |



Measured dynamic range in dB versus frequency for the R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6



Measured dynamic range in dB versus frequency for the R&S®ZNL14 and R&S®ZNL20

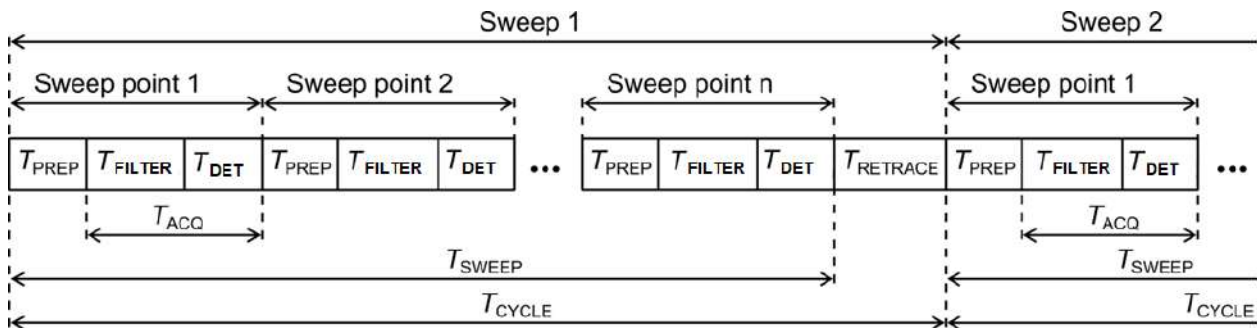
<sup>2</sup> The dynamic range is defined as the difference between 0 dBm source power and the RMS value of the data trace of the transmission magnitude, which is produced by noise and crosstalk with the test ports short-circuited. The specification applies at 10 Hz measurement bandwidth, without system error correction. The dynamic range can be increased by using a measurement bandwidth of 1 Hz.

## Measurement speed

|                                                        |                                                                                                              |                                |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Measurement time</b>                                | sweep type: CW, center frequency: 1 GHz, meas.: S11,<br>bandwidth: selectivity normal, number of points: 201 |                                |
| Time per sweep ( $T_{\text{SWEEP}}$ )                  | bandwidth 500 kHz                                                                                            | 920 $\mu\text{s}$              |
|                                                        | bandwidth 100 kHz                                                                                            | 2.65 ms                        |
| Sweep cycle time ( $T_{\text{CYCLE}}$ )                | bandwidth 500 kHz                                                                                            | 1.6 ms (meas.)                 |
|                                                        | bandwidth 100 kHz                                                                                            | 3.6 ms (meas.)                 |
| Preparation time per sweep point ( $T_{\text{PREP}}$ ) |                                                                                                              | 0.6 $\mu\text{s}$ <sup>3</sup> |
| Acquisition time per point ( $T_{\text{ACQ}}$ )        | bandwidth 500 kHz                                                                                            | 4.0 $\mu\text{s}$              |
|                                                        | bandwidth 100 kHz                                                                                            | 12.7 $\mu\text{s}$             |
| Total time per point ( $T_{\text{POINT}}$ )            | bandwidth 500 kHz                                                                                            | 4.6 $\mu\text{s}$              |
|                                                        | bandwidth 100 kHz                                                                                            | 13.2 $\mu\text{s}$             |

|                                                                                                                        |                                                                                               |               |                            |                |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------|----------------------------|----------------|
| <b>Data transfer time</b>                                                                                              | sweep type: CW, center frequency: 1 GHz, meas.: S11,<br>bandwidth: 500 kHz selectivity normal |               |                            |                |
|                                                                                                                        |                                                                                               | IEC/IEEE      | VXI11<br>over 1 Gbit/s LAN | HiSLIP         |
| Time for measurement and data transfer<br>(magnitude, REAL32) <sup>4</sup> ,<br>includes all necessary remote commands | for 201 measurements points                                                                   | 10 ms (meas.) | 8 ms (meas.)               | 8 ms (meas.)   |
|                                                                                                                        | for 5001 measurements points                                                                  | 46 ms (meas.) | 31 ms (meas.)              | 31 ms (meas.)  |
| Data transfer time (magnitude, REAL32),<br>includes all necessary remote commands                                      | for 201 measurements points                                                                   | 4 ms (meas.)  | 2.5 ms (meas.)             | 2.5 ms (meas.) |
|                                                                                                                        | for 5001 measurements points                                                                  | 18 ms (meas.) | 3.5 ms (meas.)             | 3.5 ms (meas.) |

Measurement sequence



|                      |                                                                                 |
|----------------------|---------------------------------------------------------------------------------|
| $T_{\text{PREP}}$    | Preparation time required to set up the internal hardware components            |
| $T_{\text{FILTER}}$  | Filter settling time (settling time of the digital filters)                     |
| $T_{\text{DET}}$     | Detector time (additional time for averaging of detector sample, normally 0)    |
| $T_{\text{ACQ}}$     | Data acquisition time ( $T_{\text{ACQ}} = T_{\text{FILTER}} + T_{\text{DET}}$ ) |
| $T_{\text{POINT}}$   | Total time for one sweep point                                                  |
| $T_{\text{SWEEP}}$   | Time required for one sweep                                                     |
| $T_{\text{RETRACE}}$ | Time between two sweeps                                                         |
| $T_{\text{CYCLE}}$   | Sweep cycle time ( $T_{\text{CYCLE}} = T_{\text{SWEEP}} + T_{\text{RETRACE}}$ ) |

<sup>3</sup> Only sweep type "CW". When sweep type "Lin Freq" or "Log Freq" preparation time increases.

<sup>4</sup> In continuous mode, no additional time for data transfer is needed, as data transfer takes place simultaneously with the measurement.

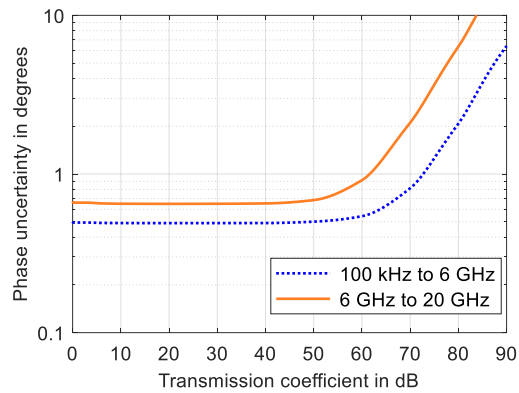
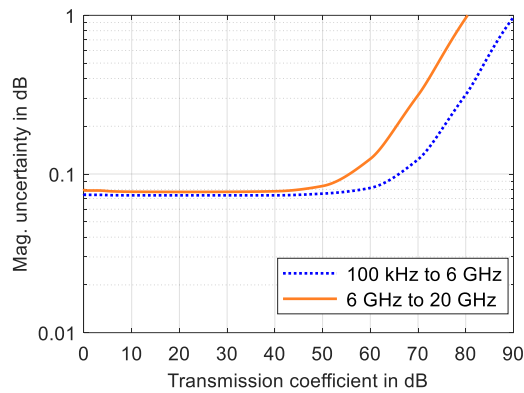
| Nominal sweep times in ms versus number of measurements                       |      |      |      |      |       |
|-------------------------------------------------------------------------------|------|------|------|------|-------|
| Number of measurement points                                                  | 51   | 201  | 401  | 1601 | 5001  |
| <b>R&amp;S®ZNL3, R&amp;S®ZNL4 and R&amp;S®ZNL6</b>                            |      |      |      |      |       |
| 800 MHz start frequency, 1 GHz stop frequency, 100 kHz measurement bandwidth  |      |      |      |      |       |
| With correction switched off                                                  | 2.4  | 4.9  | 8.7  | 31.2 | 94    |
| With 2-port TOSM calibration                                                  | 3.9  | 9.6  | 16.7 | 61.7 | 189   |
| 800 MHz start frequency, 1 GHz stop frequency, 1 kHz measurement bandwidth    |      |      |      |      |       |
| With correction switched off                                                  | 66   | 258  | 515  | 2055 | 6400  |
| With 2-port TOSM calibration                                                  | 132  | 515  | 1028 | 4100 | 12780 |
| 100 MHz start frequency, 3 GHz stop frequency, 100 kHz measurement bandwidth  |      |      |      |      |       |
| With correction switched off                                                  | 3.9  | 9.1  | 14.5 | 36.7 | 102   |
| With 2-port TOSM calibration                                                  | 7.3  | 17.7 | 28.8 | 73.3 | 206   |
| 100 MHz start frequency, 3 GHz stop frequency, 1 kHz measurement bandwidth    |      |      |      |      |       |
| With correction switched off                                                  | 68   | 262  | 519  | 2055 | 6390  |
| With 2-port TOSM calibration                                                  | 136  | 524  | 1040 | 4110 | 12800 |
| 100 MHz start frequency, 6 GHz stop frequency, 100 kHz measurement bandwidth  |      |      |      |      |       |
| With correction switched off                                                  | 3.9  | 9.5  | 15.4 | 47   | 104   |
| With 2-port TOSM calibration                                                  | 7.3  | 18.8 | 30.5 | 95   | 209   |
| 100 MHz start frequency, 6 GHz stop frequency, 1 kHz measurement bandwidth    |      |      |      |      |       |
| With correction switched off                                                  | 68   | 263  | 521  | 2070 | 6400  |
| With 2-port TOSM calibration                                                  | 136  | 525  | 1042 | 4120 | 12800 |
| <b>R&amp;S®ZNL14 and R&amp;S®ZNL20</b>                                        |      |      |      |      |       |
| 9 GHz start frequency, 10 GHz stop frequency, 100 kHz measurement bandwidth   |      |      |      |      |       |
| With correction switched off                                                  | 5.3  | 11.8 | 18.8 | 59   | 174   |
| With 2-port TOSM calibration                                                  | 9.9  | 22.7 | 36.5 | 117  | 347   |
| 9 GHz start frequency, 10 GHz stop frequency, 1 kHz measurement bandwidth     |      |      |      |      |       |
| With correction switched off                                                  | 69.4 | 265  | 524  | 2077 | 6491  |
| With 2-port TOSM calibration                                                  | 138  | 529  | 1047 | 4159 | 13524 |
| 100 MHz start frequency, 14 GHz stop frequency, 100 kHz measurement bandwidth |      |      |      |      |       |
| With correction switched off                                                  | 12.7 | 31.1 | 52.4 | 140  | 287   |
| With 2-port TOSM calibration                                                  | 24.7 | 61.4 | 104  | 281  | 577   |
| 100 MHz start frequency, 14 GHz stop frequency, 1 kHz measurement bandwidth   |      |      |      |      |       |
| With correction switched off                                                  | 76.9 | 284  | 558  | 2160 | 6614  |
| With 2-port TOSM calibration                                                  | 153  | 568  | 1115 | 4326 | 13800 |
| 100 MHz start frequency, 20 GHz stop frequency, 100 kHz measurement bandwidth |      |      |      |      |       |
| With correction switched off                                                  | 12.7 | 31.4 | 51.4 | 134  | 294   |
| With 2-port TOSM calibration                                                  | 24.8 | 62.2 | 102  | 269  | 589   |
| 100 MHz start frequency, 20 GHz stop frequency, 1 kHz measurement bandwidth   |      |      |      |      |       |
| With correction switched off                                                  | 76.9 | 285  | 556  | 2154 | 6622  |
| With 2-port TOSM calibration                                                  | 153  | 569  | 1113 | 4314 | 13819 |

## 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 on the use of an R&S®ZV-Z270 or R&S®ZN-Z235 calibration kit, depending on port connector. Calibration method is TOSM/SOLT. 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 |
|------------------------------------------|------------------|-----------|-------|
| 100 kHz to 6 GHz                         | 0 dB to –20 dB   | 0.08 dB   | 0.5°  |
|                                          | –20 dB to –30 dB | 0.08 dB   | 0.5°  |
|                                          | –30 dB to –40 dB | 0.08 dB   | 0.5°  |
|                                          | –40 dB to –50 dB | 0.09 dB   | 0.6°  |
|                                          | –50 dB to –60 dB | 0.19 dB   | 1.2°  |
| 6 GHz to 20 GHz                          | 0 dB to –20 dB   | 0.08 dB   | 0.7°  |
|                                          | –20 dB to –30 dB | 0.08 dB   | 0.7°  |
|                                          | –30 dB to –40 dB | 0.09 dB   | 0.7°  |
|                                          | –40 dB to –50 dB | 0.12 dB   | 0.9°  |
|                                          | –50 dB to –60 dB | 0.31 dB   | 2.1°  |

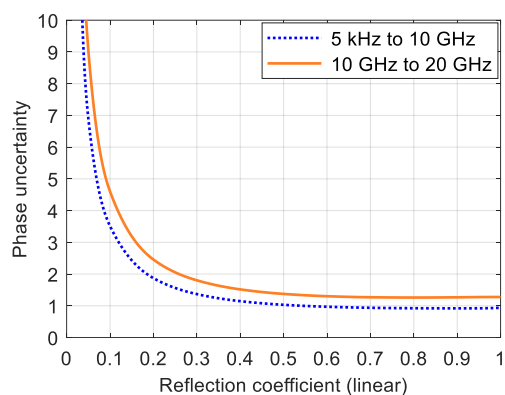
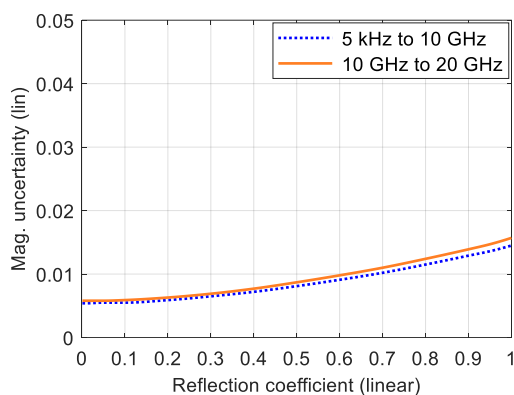
Specifications are based on a matched DUT, a measurement bandwidth of 10 Hz and a nominal source power of –10 dBm.



Measured uncertainty of transmission magnitude and transmission phase measurements for the R&S®ZNL <sup>1</sup>;  
analysis conditions:  $S_{11} = S_{22} = 0$ , calibrated power –10 dBm, measured power –10 dBm

| Uncertainty of reflection measurements | Logarithmic      |           |       | Linear           |           |
|----------------------------------------|------------------|-----------|-------|------------------|-----------|
|                                        | Reflection level | Magnitude | Phase | Reflection range | Magnitude |
| 5 kHz to 10 GHz                        | 0 dB             | 0.14 dB   | 0.9°  | 0 dB to -3 dB    | 0.016     |
|                                        | -3 dB            | 0.14 dB   | 0.9°  | -3 dB to -6 dB   | 0.011     |
|                                        | -6 dB            | 0.15 dB   | 1.0°  | -6 dB to -15 dB  | 0.009     |
|                                        | -15 dB           | 0.31 dB   | 1.9°  | -15 dB to -25 dB | 0.006     |
|                                        | -25 dB           | 0.89 dB   | 6.9°  | -25 dB to -35 dB | 0.006     |
|                                        | -35 dB           | 2.53 dB   | 34.3° | -35 dB           | 0.006     |
| 10 GHz to 20 GHz                       | 0 dB             | 0.18 dB   | 1.3°  | 0 dB to -3 dB    | 0.021     |
|                                        | -3 dB            | 0.18 dB   | 1.3°  | -3 dB to -6 dB   | 0.015     |
|                                        | -6 dB            | 0.20 dB   | 1.4°  | -6 dB to -15 dB  | 0.012     |
|                                        | -15 dB           | 0.41 dB   | 2.5°  | -15 dB to -25 dB | 0.009     |
|                                        | -25 dB           | 1.14 dB   | 9.0°  | -25 dB to -35 dB | 0.008     |
|                                        | -35 dB           | 3.19 dB   | 45.0° | -35 dB           | 0.008     |

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



Measured uncertainty of reflection magnitude and reflection phase measurements for the R&S® ZNL <sup>1</sup>;  
analysis conditions:  $S_{12} = S_{21} = 0$ , calibrated power -10 dBm, measured 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. Validity of the data is conditional on the use of a calibration kit R&S®ZV-Z270 or R&S®ZN-Z235, depending on port connector. Calibration method is TOSM/SOLT. 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). The data is based on a source power of –10 dBm and a measurement bandwidth of 10 Hz.

|                       | 5 kHz to 10 GHz | 10 GHz to 20 GHz |
|-----------------------|-----------------|------------------|
| Directivity           | ≥ 46 dB         | ≥ 42 dB          |
| Source match          | ≥ 40 dB         | ≥ 37 dB          |
| Load match            | ≥ 42 dB         | ≥ 38 dB          |
| Reflection tracking   | ≤ 0.07 dB       | ≤ 0.09 dB        |
| Transmission tracking | ≤ 0.06 dB       | ≤ 0.06 dB        |

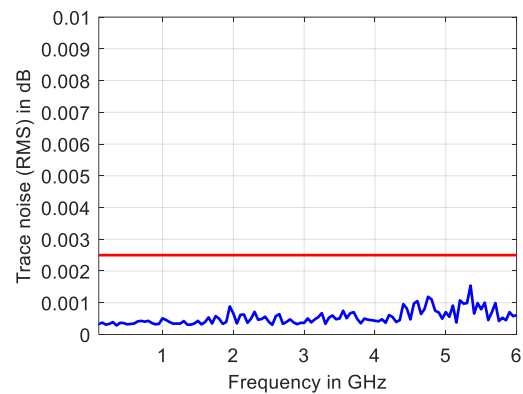
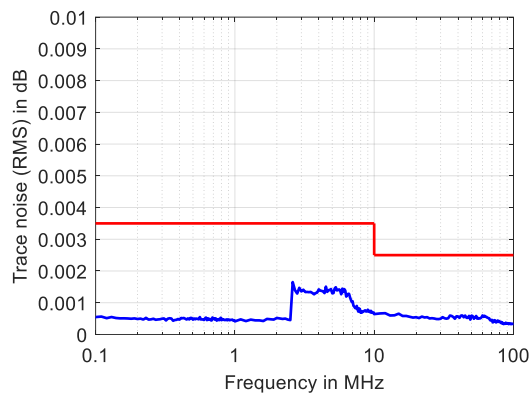
## Factory-calibrated system data

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.

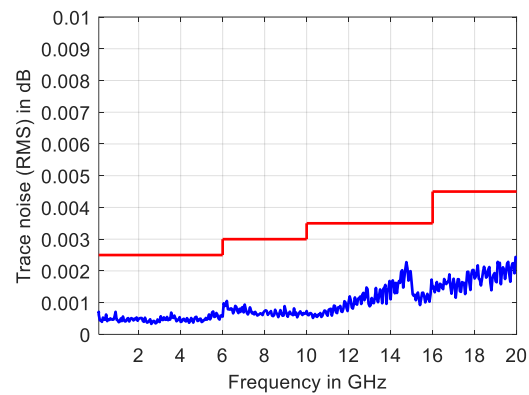
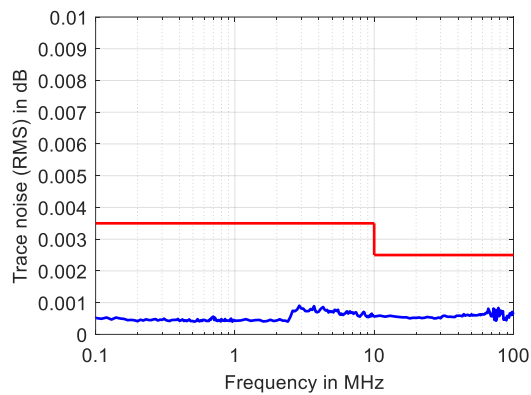
|                                  |                                 | specification | typical |
|----------------------------------|---------------------------------|---------------|---------|
| Directivity                      | 100 kHz to 20 GHz               | ≥ 20 dB       | 35 dB   |
| Source match                     | 100 kHz to 20 GHz               | ≥ 20 dB       | 35 dB   |
| Reflection tracking              | 100 kHz to 6 GHz                | ≤ 1 dB        | 0.1 dB  |
|                                  | 6 GHz to 20 GHz                 | ≤ 1.5 dB      | 0.1 dB  |
| Transmission tracking            | 100 kHz to 3 GHz                | ≤ 1 dB        | 0.1 dB  |
|                                  | 3 GHz to 20 GHz                 | ≤ 1.5 dB      | 0.2 dB  |
| Load match (raw test port match) | R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6 |               |         |
|                                  | 100 kHz to 3 GHz                | ≥ 14 dB       | 20 dB   |
|                                  | 3 GHz to 6 GHz                  | ≥ 12 dB       | 16 dB   |
|                                  | R&S®ZNL14 and R&S®ZNL20         |               |         |
|                                  | 100 kHz to 1 GHz                | ≥ 17 dB       | 24 dB   |
|                                  | 1 GHz to 3 GHz                  | ≥ 13 dB       | 20 dB   |
|                                  | 3 GHz to 10 GHz                 | ≥ 10 dB       | 16 dB   |
|                                  | 10 GHz to 20 GHz                | ≥ 7 dB        | 15 dB   |

## Trace stability

|                                          |                                                       | specification | typical   |
|------------------------------------------|-------------------------------------------------------|---------------|-----------|
| Trace noise magnitude (RMS) <sup>5</sup> | source power 0 dBm, 0 dB reflection, bandwidth 10 kHz |               |           |
|                                          | 100 kHz to 10 MHz                                     | < 0.0035 dB   | 0.0005 dB |
|                                          | 10 MHz to 6 GHz                                       | < 0.0025 dB   | 0.0005 dB |
|                                          | 6 GHz to 10 GHz                                       | < 0.0030 dB   | 0.0010 dB |
|                                          | 10 GHz to 16 GHz                                      | < 0.0035 dB   | 0.0015 dB |
|                                          | 16 GHz to 20 GHz                                      | < 0.0045 dB   | 0.0025 dB |
| Trace noise phase (RMS) <sup>5</sup>     | source power 0 dBm, 0 dB reflection, bandwidth 10 kHz |               |           |
|                                          | 100 kHz to 10 MHz                                     | < 0.05°       | 0.005°    |
|                                          | 10 MHz to 10 GHz                                      | < 0.03°       | 0.005°    |
|                                          | 10 GHz to 16 GHz                                      | < 0.035°      | 0.01°     |
|                                          | 16 GHz to 20 GHz                                      | < 0.045°      | 0.02°     |



Measured trace noise (RMS) in dB versus frequency of the R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6



Measured trace noise (RMS) in dB versus frequency of the R&S®ZNL14 and R&S®ZNL20

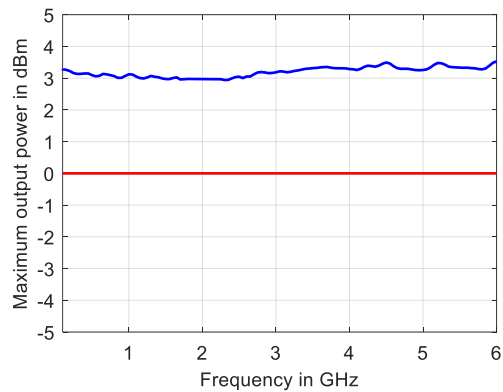
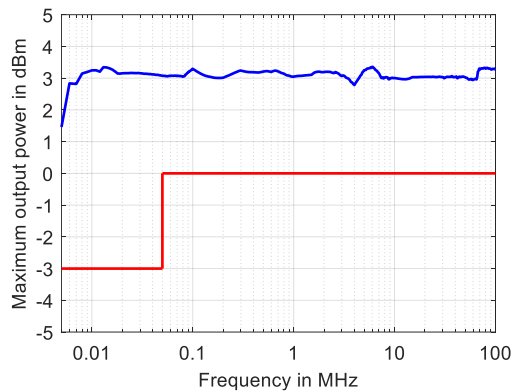
|                                |                                                       | magnitude  | phase       |
|--------------------------------|-------------------------------------------------------|------------|-------------|
| Measured temperature stability | source power -10 dBm, 0 dB transmission or reflection |            |             |
|                                | R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6                       |            |             |
|                                | 5 kHz to 6 GHz                                        | 0.03 dB/K  | 0.8°/K      |
|                                | R&S®ZNL14 and R&S®ZNL20                               |            |             |
|                                | 5 kHz to 100 kHz                                      | 0.024 dB/K | 0.24°/K     |
|                                | 100 kHz to 10 GHz                                     | 0.016 dB/K | 0.15°/GHz/K |
|                                | 10 GHz to 20 GHz                                      | 0.024 dB/K | 0.15°/GHz/K |

<sup>5</sup> The RMS value describes trace noise, which is produced by noise.

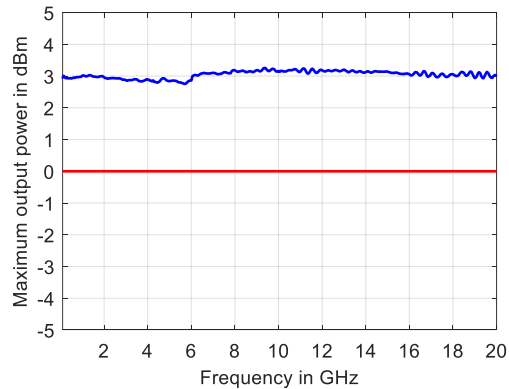
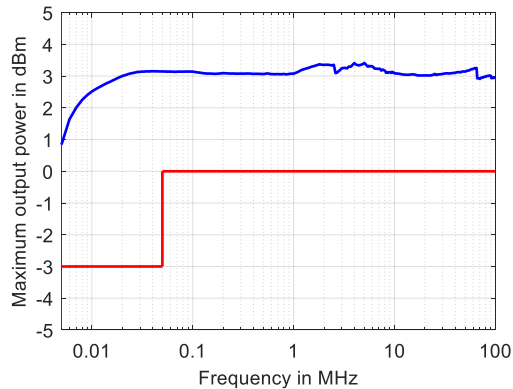
## Test port output

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

|                  |                                                              | specification     | typical      |
|------------------|--------------------------------------------------------------|-------------------|--------------|
| Power range      | without R&S®ZNL-B22 extended power range option <sup>1</sup> |                   |              |
|                  | 5 kHz to 50 kHz                                              | –10 dBm to –3 dBm | up to +3 dBm |
|                  | 50 kHz to 20 GHz                                             | –10 dBm to 0 dBm  | up to +3 dBm |
|                  | with R&S®ZNL-B22 extended power range option <sup>1</sup>    |                   |              |
|                  | 5 kHz to 50 kHz                                              | –40 dBm to –3 dBm | up to +3 dBm |
| Power accuracy   | source power –10 dBm                                         |                   |              |
|                  | 5 kHz to 50 kHz                                              | ≤ 3 dB            |              |
|                  | 50 kHz to 20 GHz                                             | ≤ 2 dB            | 0.5 dB       |
| Power linearity  | referenced to –10 dBm                                        |                   |              |
|                  | 100 kHz to 6 GHz                                             | ≤ 1 dB            | 0.1 dB       |
|                  | 6 GHz to 20 GHz                                              | ≤ 1.5 dB          | 0.2 dB       |
| Power resolution |                                                              | 0.01 dB           |              |
| Second harmonics | source power –10 dBm                                         |                   |              |
|                  | R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6                              |                   |              |
|                  | 100 kHz to 6 GHz                                             | ≤ –25 dBc         | –40 dBc      |
|                  | R&S®ZNL14                                                    |                   |              |
|                  | 10 MHz to 9 GHz                                              | ≤ –20 dBc         | –35 dBc      |
|                  | R&S®ZNL20                                                    |                   |              |
| Third harmonics  | source power –10 dBm                                         |                   |              |
|                  | R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6                              |                   |              |
|                  | 100 kHz to 6 GHz                                             | ≤ –25 dBc         | –40 dBc      |
|                  | R&S®ZNL14                                                    |                   |              |
|                  | 10 MHz to 6 GHz                                              | ≤ –25 dBc         | –40 dBc      |
|                  | R&S®ZNL20                                                    |                   |              |
|                  | 10 MHz to 8.5 GHz                                            | ≤ –25 dBc         | –40 dBc      |



Measured maximum output power in dBm versus frequency for the R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6



Measured maximum output power in dBm versus frequency for the R&S®ZNL14 and R&S®ZNL20

## Test port input

|                             |                                                 | specification     | typical         |
|-----------------------------|-------------------------------------------------|-------------------|-----------------|
| Maximum nominal input level |                                                 | 0 dBm             |                 |
| Power measurement accuracy  | at −10 dBm without power calibration            |                   |                 |
|                             | 9 kHz to 100 kHz                                | ≤ 2 dB            | 0.3 dB          |
|                             | 100 kHz to 20 GHz                               | ≤ 1.5 dB          | 0.3 dB          |
| Receiver linearity          | referenced to −10 dBm                           |                   |                 |
|                             | +10 dB to +5 dB                                 | ≤ 0.25 dB         | 0.1 dB          |
|                             | +5 dB to −40 dB                                 | ≤ 0.15 dB         | 0.05 dB         |
| Damage level                |                                                 | +27 dBm           |                 |
| Damage DC voltage           |                                                 | 30 V              |                 |
| Noise level <sup>6</sup>    | measurement bandwidth 1 kHz, normalized to 1 Hz |                   |                 |
|                             | R&S®ZNL3, R&S®ZNL4 and R&S®ZNL6                 |                   |                 |
|                             | 5 kHz to 100 kHz                                | < −95 dBm (1 Hz)  | −120 dBm (1 Hz) |
|                             | 100 kHz to 50 MHz                               | < −120 dBm (1 Hz) | −130 dBm (1 Hz) |
|                             | 50 MHz to 4.5 GHz                               | < −130 dBm (1 Hz) | −140 dBm (1 Hz) |
|                             | 4.5 GHz to 6 GHz                                | < −125 dBm (1 Hz) | −135 dBm (1 Hz) |
|                             | R&S®ZNL14 and R&S®ZNL20                         |                   |                 |
|                             | 5 kHz to 100 kHz                                | < −95 dBm (1 Hz)  | −120 dBm (1 Hz) |
|                             | 100 kHz to 50 MHz                               | < −120 dBm (1 Hz) | −135 dBm (1 Hz) |
|                             | 50 MHz to 6 GHz                                 | < −125 dBm (1 Hz) | −135 dBm (1 Hz) |
|                             | 6 GHz to 16 GHz                                 | < −120 dBm (1 Hz) | −132 dBm (1 Hz) |
|                             | 16 GHz to 20 GHz                                | < −115 dBm (1 Hz) | −125 dBm (1 Hz) |

<sup>6</sup> The noise level is defined as the RMS value of the specified noise floor.

## Display

|                    |                                                          |
|--------------------|----------------------------------------------------------|
| Screen             | 26.4 cm (10.1") diagonal WXGA color LCD with touchscreen |
| Resolution         | 1280 × 800 × 262144 (high color, 125 dpi)                |
| Pixel failure rate | $< 1 \times 10^{-5}$                                     |

## Front panel connectors

|     |                                                                                                                               |
|-----|-------------------------------------------------------------------------------------------------------------------------------|
| USB | two universal serial bus connectors, for connecting USB devices (USB 2.0);<br>two additional USB 3.0 connectors on rear panel |
|-----|-------------------------------------------------------------------------------------------------------------------------------|

## Rear panel connectors

|     |                                                               |
|-----|---------------------------------------------------------------|
| LAN | local area network connector, 10/100/1000BASE-T, 8-pin, RJ-45 |
|-----|---------------------------------------------------------------|

|     |                                                                                                                                |
|-----|--------------------------------------------------------------------------------------------------------------------------------|
| USB | two universal serial bus connectors, for connecting USB devices (USB 3.0);<br>two additional USB 2.0 connectors on front panel |
|-----|--------------------------------------------------------------------------------------------------------------------------------|

|         |                                        |
|---------|----------------------------------------|
| MONITOR | DVI-D connector (for external monitor) |
|---------|----------------------------------------|

|                               |                                               |                            |
|-------------------------------|-----------------------------------------------|----------------------------|
| <b>REF IN</b>                 | input for external frequency reference signal |                            |
| Connector type                |                                               | BNC, female                |
| Input frequency               |                                               | 10 MHz                     |
| Maximum permissible deviation |                                               | 1 kHz                      |
| Input power                   |                                               | −10 dBm to +15 dBm at 50 Ω |
| Input impedance               |                                               | > 10 kΩ                    |

|                           |                                                |                       |
|---------------------------|------------------------------------------------|-----------------------|
| <b>REF OUT</b>            | output for external frequency reference signal |                       |
| Connector type            |                                                | BNC, female           |
| Output frequency          |                                                | 10 MHz                |
| Output frequency accuracy |                                                | 80 Hz                 |
| Output power              |                                                | +6 dBm ± 4 dB at 50 Ω |

|                                                   |                            |                      |
|---------------------------------------------------|----------------------------|----------------------|
| <b>EXT TRIG IN</b>                                | trigger input for analyzer |                      |
| Connector type                                    |                            | BNC, female          |
| TTL signal<br>(edge-triggered 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®ZNL3-B1, R&S®ZNL4-B1, R&S®ZNL6-B1, R&S®ZNL14-B1 and R&S®ZNL20-B1 spectrum analysis

### Input

|                             |                                                     |                               |
|-----------------------------|-----------------------------------------------------|-------------------------------|
| <b>RF input</b>             |                                                     |                               |
| Impedance                   |                                                     | 50 $\Omega$                   |
| Connector                   | see section: Measurement range, test port connector |                               |
| VSWR                        | 10 MHz $\leq f \leq$ 3 GHz                          | < 1.5 (nom.)                  |
|                             | 3 GHz < f $\leq$ 6 GHz                              | < 1.7 (nom.)                  |
|                             | 6 GHz < f $\leq$ 20 GHz                             | < 2.0 (nom.)                  |
|                             | 20 GHz < f $\leq$ 26.5 GHz                          | < 2.5 (nom.)                  |
| Setting range of attenuator |                                                     | 0 dB to 30 dB, in 10 dB steps |

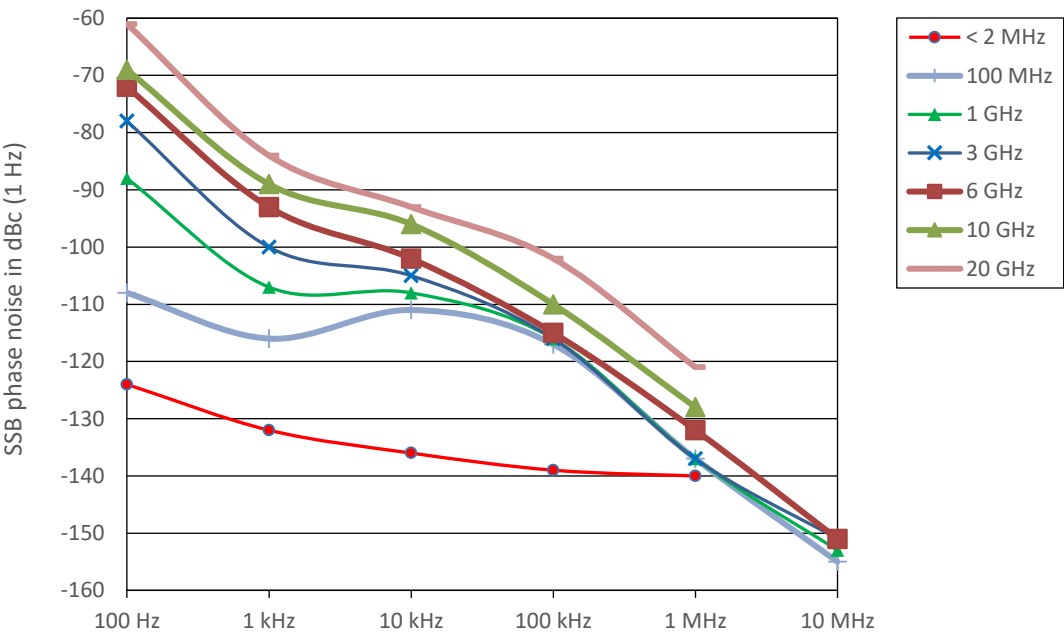
### Frequency

|                             |              |                   |
|-----------------------------|--------------|-------------------|
| <b>Frequency range</b>      | R&S®ZNL3-B1  | 5 kHz to 3 GHz    |
|                             | R&S®ZNL4-B1  | 5 kHz to 4.5 GHz  |
|                             | R&S®ZNL6-B1  | 5 kHz to 6 GHz    |
|                             | R&S®ZNL14-B1 | 5 kHz to 14 GHz   |
|                             | R&S®ZNL20-B1 | 5 kHz to 26.5 GHz |
| <b>Frequency resolution</b> |              | 0.01 Hz           |

|                                      |                                |
|--------------------------------------|--------------------------------|
| <b>Reference frequency, internal</b> | see section: Measurement range |
|--------------------------------------|--------------------------------|

|                                   |                                 |                                                                                                                                                                                    |
|-----------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency readout</b>          |                                 |                                                                                                                                                                                    |
| Marker resolution                 |                                 | 0.01 Hz                                                                                                                                                                            |
| Uncertainty                       |                                 | $\pm(\text{marker frequency} \times \text{reference uncertainty} + 10 \% \times \text{resolution bandwidth} + \frac{1}{2} (\text{span}/(\text{sweep points} - 1)) + 1 \text{ Hz})$ |
| Number of sweep (trace) points    | default value                   | 1001                                                                                                                                                                               |
|                                   | range                           | 101 to 100001                                                                                                                                                                      |
| Marker tuning frequency step size | marker step size = sweep points | $\text{span}/(\text{sweep points} - 1)$                                                                                                                                            |
|                                   | marker step size = standard     | $\text{span}/(\text{default sweep points} - 1)$                                                                                                                                    |
| Frequency counter resolution      |                                 | 1 Hz                                                                                                                                                                               |
| Count accuracy                    |                                 | $\pm(\text{frequency} \times \text{reference uncertainty} + \frac{1}{2} (\text{last digit}))$                                                                                      |
| Display range for frequency axis  |                                 | 0 Hz, 10 Hz to max. frequency                                                                                                                                                      |
| Resolution                        |                                 | 0.1 Hz                                                                                                                                                                             |
| Maximum span deviation            |                                 | 0.1 %                                                                                                                                                                              |

| Spectral purity<br>SSB phase noise | frequency = 1000 MHz,<br>carrier offset | specification     | typical         | nominal         |
|------------------------------------|-----------------------------------------|-------------------|-----------------|-----------------|
|                                    | 100 Hz                                  |                   |                 | -88 dBc (1 Hz)  |
|                                    | 1 kHz                                   | < -99 dBc (1 Hz)  |                 |                 |
|                                    | 10 kHz                                  | < -105 dBc (1 Hz) | -108 dBc (1 Hz) |                 |
|                                    | 100 kHz                                 | < -110 dBc (1 Hz) | -115 dBc (1 Hz) |                 |
|                                    | 1 MHz                                   | < -130 dBc (1 Hz) | -135 dBc (1 Hz) |                 |
|                                    | 10 MHz                                  |                   |                 | -152 dBc (1 Hz) |



Measured SSB phase noise at different center frequencies

Sweep time

|                     |                                       |                                   |
|---------------------|---------------------------------------|-----------------------------------|
| Range               | span = 0 Hz                           | 1 $\mu$ s to 8000 s               |
|                     | span $\geq$ 10 Hz, RBW $\geq$ 100 kHz | 1 ms to 8000 s <sup>7</sup>       |
|                     | span $\geq$ 10 Hz, RBW < 100 kHz      | 75 $\mu$ s to 8000 s <sup>8</sup> |
| Sweep time accuracy | span = 0 Hz                           | 0.1 % (nom.)                      |
|                     | span $\geq$ 10 Hz, RBW $\geq$ 100 kHz | 3 % (nom.)                        |

<sup>7</sup> Net sweep time without additional hardware settling time.

<sup>8</sup> Time for data acquisition for FFT calculation.

**Resolution bandwidths**

| <b>Sweep filters and FFT filters</b>         |                                                                               |                                                                                                       |
|----------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Resolution bandwidths (–3 dB)                | sweep filters                                                                 | 100 kHz to 10 MHz in 1/2/3/5 sequence                                                                 |
|                                              | FFT filters                                                                   | 1 Hz to 50 kHz in 1/2/3/5 sequence                                                                    |
| Bandwidth uncertainty                        |                                                                               | < 3 % (nom.)                                                                                          |
| Shape factor 60 dB:3 dB                      |                                                                               | < 5 (nom.)                                                                                            |
| <b>Channel filters</b>                       |                                                                               |                                                                                                       |
| Bandwidths (–3 dB)                           |                                                                               | 100/200/300/500 Hz                                                                                    |
|                                              |                                                                               | 1/1.5/2/2.4/2.7/3/3.4/4/4.5/5/6/7.5/8.5/9/10/12.5/14/15/16/20/21/25/30/50/100/150/192/200/300/500 kHz |
|                                              |                                                                               | 1/1.228/1.5/2/3/3.75/5/10 MHz                                                                         |
|                                              |                                                                               |                                                                                                       |
| Bandwidth uncertainty                        |                                                                               | < 2 % (nom.)                                                                                          |
| Shape factor 60 dB:3 dB                      |                                                                               | < 2 (nom.)                                                                                            |
| <b>Video bandwidths</b>                      |                                                                               |                                                                                                       |
|                                              | standard                                                                      | 1 Hz to 10 MHz in 1/2/3/5 sequence                                                                    |
| <b>Signal analysis bandwidth (equalized)</b> |                                                                               |                                                                                                       |
|                                              | standard                                                                      | 10 MHz (nom.)                                                                                         |
|                                              | f < 6 GHz<br>with R&S®FPL1-B40 option                                         | 40 MHz (nom.)                                                                                         |
|                                              | f ≥ 6 GHz<br>with R&S®FPL1-B40 and R&S®FPL1-B11 options, YIG preselector: off | 40 MHz (nom.)                                                                                         |

**Level**

|               |  |                                     |
|---------------|--|-------------------------------------|
| Display range |  | displayed noise floor up to +30 dBm |
|---------------|--|-------------------------------------|

|                                   |                                                                                                         |                         |
|-----------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------|
| <b>Intermodulation</b>            |                                                                                                         |                         |
| Third order intercept point (TOI) | RF attenuation 0 dB, level $2 \times -20$ dBm, $\Delta f > 5 \times$ RBW or 10 kHz, whichever is larger |                         |
|                                   | $10 \text{ MHz} \leq f_{\text{in}} < 300 \text{ MHz}$                                                   | > 13 dBm, 20 dBm (typ.) |
|                                   | $300 \text{ MHz} \leq f_{\text{in}} < 3 \text{ GHz}$                                                    | > 16 dBm, 22 dBm (typ.) |
|                                   | $3 \text{ GHz} \leq f_{\text{in}} < 6 \text{ GHz}$                                                      | > 13 dBm, 18 dBm (typ.) |
|                                   | $6 \text{ GHz} \leq f_{\text{in}} < 20 \text{ GHz}$                                                     | > 11 dBm, 17 dBm (typ.) |
|                                   | $20 \text{ GHz} \leq f_{\text{in}} < 26.5 \text{ GHz}$                                                  | 11 dBm (nom.)           |
| Second harmonic intercept (SHI)   | RF attenuation 0 dB, level -13 dBm                                                                      |                         |
|                                   | $1 \text{ MHz} < f_{\text{in}} \leq 900 \text{ MHz}$                                                    | 45 dBm (nom.)           |
|                                   | $900 \text{ MHz} < f_{\text{in}} \leq 13.25 \text{ GHz}$                                                | 70 dBm (nom.)           |

|                                             |                                                                                                                            |                             |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Displayed average noise level (DANL)</b> | termination 50 $\Omega$ , log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, sample detector, +18 °C to +28 °C |                             |
| RF attenuation 0 dB                         | $5 \text{ kHz} \leq f < 100 \text{ kHz}$                                                                                   | -130 dBm (typ.)             |
|                                             | $100 \text{ kHz} \leq f < 5 \text{ MHz}$                                                                                   | < -135 dBm, -145 dBm (typ.) |
|                                             | $5 \text{ MHz} \leq f < 4.5 \text{ GHz}$                                                                                   | < -140 dBm, -150 dBm (typ.) |
|                                             | $4.5 \text{ GHz} \leq f < 6 \text{ GHz}$                                                                                   | < -137 dBm, -147 dBm (typ.) |
|                                             | $6 \text{ GHz} \leq f \leq 14 \text{ GHz}$                                                                                 | < -135 dBm, -143 dBm (typ.) |
|                                             | $14 \text{ GHz} < f < 20 \text{ GHz}$                                                                                      | < -124 dBm, -133 dBm (typ.) |
|                                             | $20 \text{ GHz} \leq f \leq 26.5 \text{ GHz}$                                                                              | < -112 dBm, -120 dBm (typ.) |

|                                   |                                                                                                     |                  |
|-----------------------------------|-----------------------------------------------------------------------------------------------------|------------------|
| <b>Spurious responses</b>         | RF attenuation 0 dB, mixer level $\leq -13$ dBm, sweep optimization: auto or dynamic                |                  |
| Image response                    | $10 \text{ MHz} \leq f \leq 3 \text{ GHz}$                                                          |                  |
|                                   | $f_{\text{in}} - 2 \times 4020.4 \text{ MHz}$ (first IF)                                            | < -90 dBc (nom.) |
|                                   | $f_{\text{in}} - 2 \times 820.4 \text{ MHz}$ (second IF)                                            | < -80 dBc        |
|                                   | $f_{\text{in}} - 2 \times 20.4 \text{ MHz}$ (third IF), RBW $\leq 3 \text{ MHz}$                    | < -80 dBc        |
|                                   | $3 \text{ GHz} < f \leq 14 \text{ GHz}$ , RBW $\leq 3 \text{ MHz}$                                  | < -70 dBc (nom.) |
|                                   | $14 \text{ GHz} < f \leq 26.5 \text{ GHz}$ , RBW $\leq 3 \text{ MHz}$                               | < -60 dBc (nom.) |
| Intermediate frequency response   | $2 \text{ MHz} \leq f \leq 3 \text{ GHz}$                                                           |                  |
|                                   | first IF (4020.4 MHz)                                                                               | < -80 dBc (nom.) |
|                                   | second IF (820.4 MHz)                                                                               | < -80 dBc        |
|                                   | third IF (20.4 MHz)                                                                                 | < -80 dBc        |
| Residual spurious response        | $3 \text{ GHz} < f \leq 26.5 \text{ GHz}$                                                           | < -70 dBc (nom.) |
|                                   | $f < 1 \text{ MHz}$                                                                                 | < -90 dBm (nom.) |
|                                   | $1 \text{ MHz} \leq f \leq 18 \text{ GHz}$                                                          | < -90 dBm        |
| Local oscillator related spurious | $f > 18 \text{ GHz}$                                                                                | < -90 dBm (nom.) |
|                                   | $f < 3 \text{ GHz}$                                                                                 |                  |
|                                   | $1 \text{ kHz} \leq$ carrier offset $\leq 10 \text{ MHz}$                                           | < -70 dBc (nom.) |
|                                   | carrier offset $> 10 \text{ MHz}$                                                                   | < -80 dBc (nom.) |
|                                   | $3 \text{ GHz} < f < 14 \text{ GHz}$                                                                | < -70 dBc (nom.) |
| Other interfering signals         | $14 \text{ GHz} \leq f < 26.5 \text{ GHz}$                                                          | < -67 dBc (nom.) |
|                                   | Subharmonic of first LO                                                                             |                  |
|                                   | $20 \text{ MHz} \leq f < 3 \text{ GHz}$ , spurious at $4020.4 \text{ MHz} - 2 \times f_{\text{in}}$ | < -80 dBc (nom.) |
| Harmonic of first LO              | mixer level $< -25$ dBm, spurious at $f_{\text{in}} - 2010.2 \text{ MHz}$                           | < -80 dBc (nom.) |

| <b>Level display</b>             |  |                                                                                 |
|----------------------------------|--|---------------------------------------------------------------------------------|
| Logarithmic level axis           |  | 1 dB to 200 dB, in 1 dB steps                                                   |
| Linear level axis                |  | 10 % of reference level per level division, 10 divisions or logarithmic scaling |
| Number of traces                 |  | 6                                                                               |
| Trace detector                   |  | Max. peak, min. peak, auto peak (normal), sample, RMS, average                  |
| Trace functions                  |  | clear/write, max. hold, min. hold, average, view                                |
| Setting range of reference level |  | –130 dBm to (–10 dBm + RF attenuation) in steps of 0.01 dB                      |
| Units of level axis              |  | dBm, dBμV, dBmV, dBμA, dBpW, V, A, W                                            |

| <b>Level measurement uncertainty</b>                                                 |                                                                            |                                |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------|
| Absolute level uncertainty at 50 MHz                                                 | RBW = 10 kHz, level –10 dBm, reference level –10 dBm, RF attenuation 10 dB |                                |
|                                                                                      | +18 °C to +28 °C                                                           | < 0.5 dB ( $\sigma = 0.1$ dB)  |
|                                                                                      | +5 °C to +40 °C                                                            | < 1 dB ( $\sigma = 0.17$ dB)   |
| R&S®ZNL3, frequency response referenced to 50 MHz                                    | RF attenuation 0 dB, 10 dB, 20 dB, 30 dB, +18 °C to +28 °C                 |                                |
|                                                                                      | 5 kHz ≤ f ≤ 3 MHz                                                          | < 1 dB (nom.)                  |
|                                                                                      | 3 MHz < f ≤ 10 MHz                                                         | < 0.8 dB (nom.)                |
|                                                                                      | 10 MHz < f ≤ 3 GHz                                                         | < 0.8 dB ( $\sigma = 0.1$ dB)  |
| R&S®ZNL4, R&S®ZNL6, R&S®ZNL14 and R&S®ZNL20, frequency response referenced to 50 MHz | RF attenuation 0 dB, 10 dB, 20 dB, 30 dB, +18 °C to +28 °C                 |                                |
|                                                                                      | 5 kHz ≤ f ≤ 3 MHz                                                          | < 1 dB (nom.)                  |
|                                                                                      | 3 MHz < f ≤ 10 MHz                                                         | < 0.8 dB (nom.)                |
|                                                                                      | 10 MHz < f ≤ 2.9 GHz                                                       | < 0.8 dB ( $\sigma = 0.1$ dB)  |
|                                                                                      | 2.9 GHz < f ≤ 6 GHz                                                        | < 1.3 dB ( $\sigma = 0.2$ dB)  |
|                                                                                      | 6 GHz < f ≤ 14 GHz                                                         | < 2.0 dB ( $\sigma = 0.5$ dB)  |
|                                                                                      | 14 GHz < f ≤ 20 GHz                                                        | < 2.5 dB ( $\sigma = 0.66$ dB) |
|                                                                                      | 20 GHz < f ≤ 26.5 GHz                                                      | < 3.0 dB ( $\sigma = 0.66$ dB) |
| Attenuator switching uncertainty                                                     | f = 50 MHz, 0 dB to 30 dB, referenced to 10 dB attenuation                 | < 0.3 dB ( $\sigma = 0.07$ dB) |
| Uncertainty of reference level setting                                               |                                                                            | 0 dB <sup>9</sup>              |
| Bandwidth switching uncertainty                                                      | referenced to RBW = 10 kHz                                                 |                                |
|                                                                                      | RBW ≥ 1 MHz                                                                | < 0.3 dB (nom.)                |
|                                                                                      | 100 kHz ≤ RBW < 1 MHz                                                      | < 0.2 dB (nom.)                |
|                                                                                      | RBW < 100 kHz                                                              | < 0.1 dB (nom.)                |

| <b>Nonlinearity of displayed level</b> |                             |                                |
|----------------------------------------|-----------------------------|--------------------------------|
| Logarithmic level display              | S/N > 16 dB, 0 dB to –50 dB | < 0.2 dB ( $\sigma = 0.07$ dB) |
| Linear level display                   | S/N > 16 dB, 0 dB to –70 dB | 5 % of reference level (nom.)  |

|                                             |                                                                                                                                                                                                  |        |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <b>Total measurement uncertainty</b>        | signal level 0 dB to –50 dB below reference level, S/N > 20 dB, sweep time auto, sweep type = sweep, RF attenuation 10 dB, 20 dB, 30 dB, span/RBW < 100, 95 % confidence level, +18 °C to +28 °C |        |
| R&S®ZNL3                                    | 3 MHz < f ≤ 3 GHz                                                                                                                                                                                | 1 dB   |
| R&S®ZNL4, R&S®ZNL6, R&S®ZNL14 and R&S®ZNL20 | 3 MHz < f ≤ 2.9 GHz                                                                                                                                                                              | 1 dB   |
|                                             | 2.9 GHz < f ≤ 6 GHz                                                                                                                                                                              | 1.5 dB |
|                                             | 6 GHz < f ≤ 14 GHz                                                                                                                                                                               | 2.2 dB |
|                                             | 14 GHz < f ≤ 20 GHz                                                                                                                                                                              | 2.7 dB |
|                                             | 20 GHz < f ≤ 26.5 GHz                                                                                                                                                                            | 3.2 dB |

<sup>9</sup> The setting of the reference level affects only the graphical representation of the measurement result on the display, not the measurement itself. Therefore, the reference level setting causes no additional uncertainty in measurement results.

## Measurement speed

|                                                                   |                                                      |                        |
|-------------------------------------------------------------------|------------------------------------------------------|------------------------|
| Local measurement and display update rate                         | 1001 sweep points, sweep optimization set to "speed" | 1 ms (1000/s) (nom.)   |
| Maximum sweep rate, remote operation <sup>10, 11</sup>            | trace average = on                                   | 0.9 ms (1100/s) (nom.) |
| Remote measurement and LAN transfer <sup>10</sup>                 |                                                      | 2.8 ms (357/s) (nom.)  |
| Marker peak search <sup>10</sup>                                  |                                                      | 1.3 ms (nom.)          |
| Center frequency tune + sweep + sweep data transfer <sup>10</sup> |                                                      | 15 ms (nom.)           |

## Trigger functions

|                                     |                   |                                                                   |
|-------------------------------------|-------------------|-------------------------------------------------------------------|
| <b>Trigger</b>                      |                   |                                                                   |
| Trigger source                      |                   | free run, video, external, IF power                               |
| Trigger offset                      | span $\geq$ 10 Hz | 50 ns to 40 s, min. resolution 50 ns (or 0.5 % of offset)         |
|                                     | span = 0 Hz       | (–sweep time) to 40 s, min. resolution 50 ns (or 0.5 % of offset) |
| Maximum deviation of trigger offset |                   | $\pm(7.8125 \text{ ns} + (0.1 \% \times \text{trigger offset}))$  |
| <b>IF power trigger</b>             |                   |                                                                   |
| Sensitivity                         | min. signal power | –60 dBm + RF attenuation                                          |
|                                     | max. signal power | –15 dBm + RF attenuation                                          |
| IF power trigger bandwidth          | RBW > 5 MHz       | 40 MHz (nom.)                                                     |
|                                     | RBW $\leq$ 5 MHz  | 6 MHz (nom.)                                                      |
| <b>Gated sweep</b>                  |                   |                                                                   |
| Gate source                         |                   | video, external, IF power                                         |
| Gate delay                          |                   | 50 ns to 30 s, min. resolution 50 ns (or 0.5 % of delay)          |
| Gate length                         |                   | 125 ns to 30 s, min. resolution 50 ns (or 0.5 % of gate length)   |
| Maximum deviation of gate length    |                   | $\pm(7.8125 \text{ ns} + (0.1 \% \times \text{gate length}))$     |

## I/Q data

|                                               |                         |                             |
|-----------------------------------------------|-------------------------|-----------------------------|
| Interface                                     |                         | GPIO or LAN interface       |
| Memory length                                 |                         | max. 25 Msample I and Q     |
| Word length of I/Q samples                    |                         | 14 bit                      |
| Sampling rate                                 | standard                | 100 Hz to 45 MHz            |
|                                               | with R&S®FPL-B40 option | 100 Hz to 100 MHz           |
| Maximum signal analysis bandwidth (equalized) | standard                | 10 MHz                      |
|                                               | with R&S®FPL-B40 option | 40 MHz                      |
| Signal analysis bandwidth $\leq$ 10 MHz       |                         |                             |
| Amplitude flatness                            |                         | $\pm 0.3 \text{ dB}$ (nom.) |
| Deviation from linear phase                   |                         | $\pm 1^\circ$ (nom.)        |
| Signal analysis bandwidth $\leq$ 40 MHz       |                         |                             |
| Amplitude flatness                            |                         | $\pm 0.5 \text{ dB}$ (nom.) |
| Deviation from linear phase                   |                         | $\pm 1.5^\circ$ (nom.)      |

<sup>10</sup> Measured with personal computer equipped with Intel® Core™ i7 2.8 GHz and Gbit LAN interface.

<sup>11</sup> Measurement is performed with a sweep count of 1000. The indicated speed is the average speed of 1 sweep.

## R&S® ZNL3-B22, R&S® ZNL4-B22, R&S® ZNL6-B22, R&S® ZNL14-B22 and R&S® ZNL20-B22 extended power range

| Extended power range                      |                  | specification     | typical      |
|-------------------------------------------|------------------|-------------------|--------------|
| Frequency range                           | R&S® ZNL3-B22    | 5 kHz to 3 GHz    |              |
|                                           | R&S® ZNL4-B22    | 5 kHz to 4.5 GHz  |              |
|                                           | R&S® ZNL6-B22    | 5 kHz to 6 GHz    |              |
|                                           | R&S® ZNL14-B22   | 5 kHz to 14 GHz   |              |
|                                           | R&S® ZNL20-B22   | 5 kHz to 20 GHz   |              |
| Power range for the R&S® ZNL <sup>1</sup> | 5 kHz to 50 kHz  | –40 dBm to –3 dBm | up to +3 dBm |
|                                           | 50 kHz to 18 GHz | –40 dBm to +0 dBm | up to +3 dBm |
|                                           | 18 GHz to 20 GHz | –40 dBm to –3 dBm | up to +3 dBm |

## R&S® ZNL3-B31/-B32, R&S® ZNL4-B31/-B32, R&S® ZNL6-B31/-B32, R&S® ZNL14-B31/-B32 and R&S® ZNL20-B31/-B32 receiver step attenuators

| Receiver step attenuators |                               |                  |
|---------------------------|-------------------------------|------------------|
| Frequency range           | R&S® ZNL3-B31/R&S® ZNL3-B32   | 5 kHz to 3 GHz   |
|                           | R&S® ZNL4-B31/R&S® ZNL4-B32   | 5 kHz to 4.5 GHz |
|                           | R&S® ZNL6-B31/R&S® ZNL6-B32   | 5 kHz to 6 GHz   |
|                           | R&S® ZNL14-B31/R&S® ZNL14-B32 | 5 kHz to 14 GHz  |
|                           | R&S® ZNL20-B31/R&S® ZNL20-B32 | 5 kHz to 20 GHz  |
| Attenuation               | 0 dB to 30 dB in 10 dB steps  |                  |

## R&S®FPL1-B5 additional interfaces

| User port |  |                                     |
|-----------|--|-------------------------------------|
| Connector |  | 25-pin D-Sub female                 |
| Output    |  | TTL-compatible, 0 V/5 V, max. 15 mA |
| Input     |  | TTL-compatible, max. 5 V            |

| Noise source control |  |                                                            |
|----------------------|--|------------------------------------------------------------|
| Connector            |  | BNC female                                                 |
| Output               |  | 0 V/28 V, max. 100 mA, switchable, supply for noise source |

| Power sensor |  |                                                             |
|--------------|--|-------------------------------------------------------------|
| Connector    |  | 6-pin LEMOSA female for supported R&S®NRP-Zxx power sensors |

| IF/video/demod out |                                                                                        |                          |
|--------------------|----------------------------------------------------------------------------------------|--------------------------|
| Connector          |                                                                                        | BNC female, 50 Ω         |
| IF out             |                                                                                        |                          |
| Bandwidth          |                                                                                        | equal to RBW setting     |
| IF frequency       |                                                                                        | 25 MHz                   |
| Output level       | center frequency > 10 MHz, span = 0 Hz, signal at reference level and center frequency | 0 dBm (nom.)             |
| Video out          |                                                                                        |                          |
| Bandwidth          |                                                                                        | equal to VBW setting     |
| Output scaling     | log. display scale                                                                     | logarithmic              |
|                    | lin. display scale                                                                     | linear                   |
| Output level       | center frequency > 10 MHz, span = 0 Hz, signal at reference level and center frequency | 1 V (nom.), open circuit |

| Audio output         |  |                         |
|----------------------|--|-------------------------|
| Loudspeaker          |  | built-in, adjustable    |
| AF out               |  |                         |
| Connector            |  | 3.5 mm mini jack        |
| Output impedance     |  | 10 Ω                    |
| Open-circuit voltage |  | up to 1.5 V, adjustable |

## R&S®FPL1-B4 precision frequency reference (OCXO)

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

## R&S®FPL1-B10 GPIB interface

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

**R&S®FPL1-B30 DC power input 12 V/24 V**

|                     |                                                                                                         |                                          |
|---------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------|
| Input voltage range |                                                                                                         | 10.4 V to 28 V, switch-on voltage > 11 V |
| Input current       | $V_{in} = 12 \text{ V/24 V}$ , operating mode, without internal batteries (R&S®FPL1-B31) <sup>12</sup>  | 5.5 A/2.7 A (nom.)                       |
|                     | $V_{in} = 12 \text{ V/24 V}$ , operating mode internal, batteries in charge mode <sup>12</sup>          | 11 A/5 A (nom.)                          |
|                     | $V_{in} = 12 \text{ V/24 V}$ , instrument standby mode, internal batteries in charge mode <sup>12</sup> | 6.5 A/3 A (nom.)                         |
| Temperature         | operating temperature range                                                                             | +5 °C to +40 °C                          |
|                     | storage temperature range                                                                               | –20 °C to +70 °C                         |

**R&S®FPL1-B31 internal lithium-ion battery**

|                |                                                 |                                |
|----------------|-------------------------------------------------|--------------------------------|
| Operating time | depends on options installed                    | 3.5 h (nom.)                   |
| Charge time    | standby mode, AC supply                         | < 2 h (nom.)                   |
|                | standby mode, external DC supply (R&S®FPL1-B30) | < 2 h (nom.)                   |
|                | operating mode                                  | < 4 h (nom.)                   |
| Temperature    | operating temperature                           | +5 °C to +40 °C                |
|                | storage temperature range                       | –20 °C to +60 °C <sup>13</sup> |

**R&S®FSV-B34 charger (only necessary to charge spare batteries)**

|                        |           |                                                      |
|------------------------|-----------|------------------------------------------------------|
| AC input voltage range |           | 100 V to 240 V, $\pm 10\%$ (nom.)                    |
| AC supply frequency    |           | 50 Hz to 60 Hz (nom.)                                |
| Power consumption      |           | max. 300 W (nom.)                                    |
| Number of charger bays |           | 4                                                    |
| Dimensions             | W × H × D | 400 mm × 127 mm × 203 mm<br>(15.75 in × 5 in × 8 in) |
| Net weight             |           | 3.1 kg (6.9 lb)                                      |

<sup>12</sup> Depends on options installed.<sup>13</sup> The battery packs should be stored in an environment with low humidity, free from corrosive gas at a recommended temperature range < +21 °C. Extended exposure to temperatures above +40°C could degrade battery performance and life.

## General data

| Data storage |          |                                            |
|--------------|----------|--------------------------------------------|
| Internal     | standard | solid-state drive 32 GByte (nom.)          |
| External     |          | supports USB 2.0-compatible memory devices |

| Environmental conditions |                             |                                                                                |
|--------------------------|-----------------------------|--------------------------------------------------------------------------------|
| Temperature              | operating temperature range | +5 °C to +40 °C                                                                |
|                          | storage temperature range   | –20 °C to +70 °C                                                               |
| Climatic loading         |                             | +40 °C at 85 % rel. humidity, in line with EN 60068-2-30, without condensation |

| Mechanical resistance |            |                                                                                             |
|-----------------------|------------|---------------------------------------------------------------------------------------------|
| Vibration             | sinusoidal | 5 Hz to 55 Hz, 0.15 mm constant amplitude (1.8 g at 55 Hz), in line with EN 60068-2-6       |
|                       |            | 55 Hz to 150 Hz, acceleration: 0.5 g constant, in line with EN 60068-2-6                    |
|                       | random     | 10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64                       |
| Shock                 |            | 40 g shock spectrum, in line with MIL-STD-810E method No. 516.4 procedure I, MIL-PRF-28800F |

|     |  |                                                                                                                                                                            |
|-----|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMC |  | in line with EMC Directive 2014/30/EU, including IEC/EN 61326-1 <sup>14, 15</sup> , IEC/EN 61326-2-1, CISPR 11/EN 55011 <sup>14</sup> , IEC/EN 61000-3-2, IEC/EN 61000-3-3 |
|-----|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

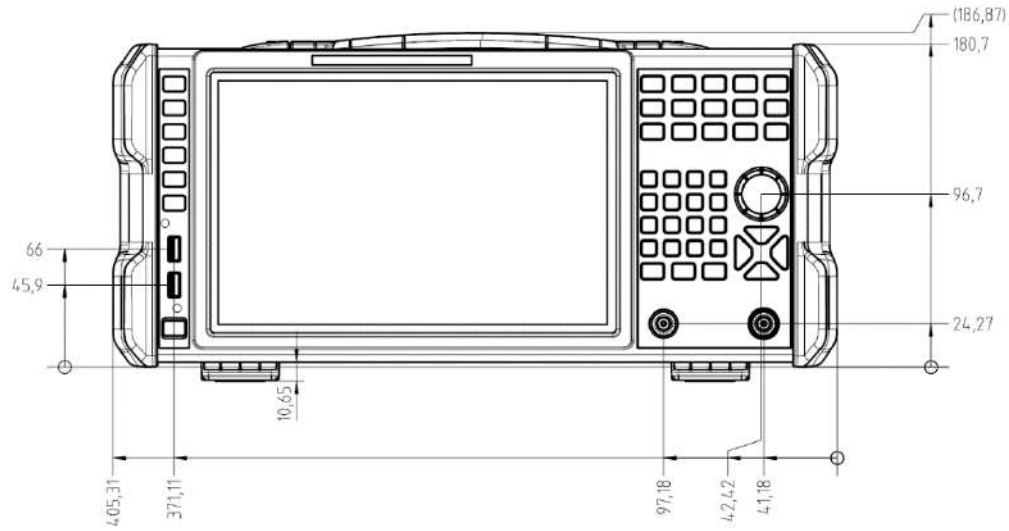
|                                  |  |        |
|----------------------------------|--|--------|
| Recommended calibration interval |  | 1 year |
|----------------------------------|--|--------|

| Power supply        |                                                            |                                                                                                      |
|---------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| AC supply           | without battery option                                     | 100 V to 240 V ± 10 %, 50 Hz to 60 Hz ± 5 %, 400 Hz ± 5% class of protection I, in line with VDE 411 |
|                     | with battery option                                        | 100 V to 240 V ± 10 %, 50 Hz to 60 Hz ± 5 %                                                          |
| Current consumption | without options                                            | 1.7 A to 0.8 A                                                                                       |
|                     | with internal battery (R&S®FPL1-B31 option) in charge mode | 3 A to 1.5 A                                                                                         |
| Power consumption   | depends on options installed                               | max. 300 W, 90 W (nom.)                                                                              |
| Safety              |                                                            | in line with EN 61010-1, IEC 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1                          |
| Test mark           | without battery option                                     | CE, cCSA <sub>US</sub> , KCC                                                                         |
|                     | with battery option                                        | CE, cCSA <sub>US</sub>                                                                               |

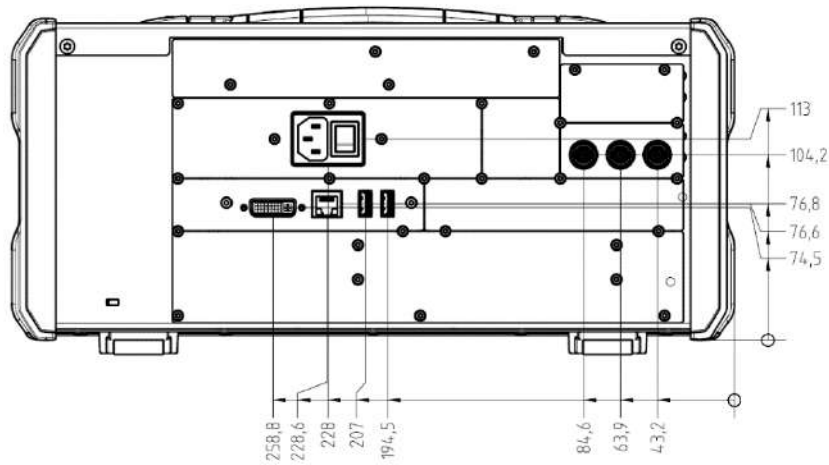
| Dimensions and weight |                       |                                                         |
|-----------------------|-----------------------|---------------------------------------------------------|
| Dimensions            | W × H × D             | 408 mm × 186 mm × 235 mm (16.06 in × 7.32 in × 9.25 in) |
| Net weight, nominal   | without options       | 6 kg (13.22 lb)                                         |
|                       | with internal battery | 7.3 kg (16 lb)                                          |

<sup>14</sup> Emission limits for class A equipment.<sup>15</sup> Immunity test requirement for industrial environment (EN 61326 table 2).

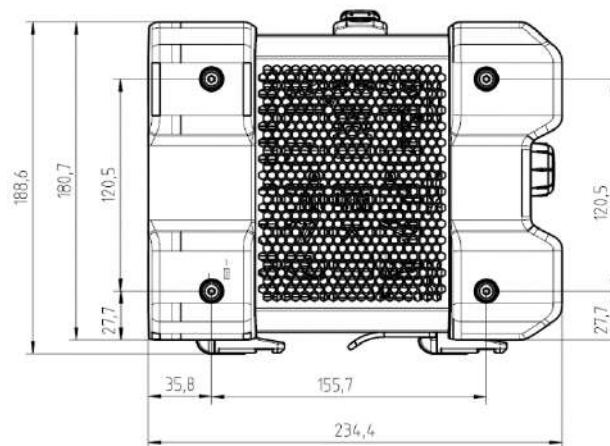
## Dimensions (in mm)



Front view of the R&S®ZNL



Rear view of the R&S®ZNL



Side view of the R&S®ZNL

# Ordering information

| Designation                                                                         | Type          | Retrofit <sup>16</sup> | On Site <sup>17</sup> | Order No.    |
|-------------------------------------------------------------------------------------|---------------|------------------------|-----------------------|--------------|
| <b>Base units</b>                                                                   |               |                        |                       |              |
| Vector network analyzer, 3 GHz, N connectors                                        | R&S®ZNL3      |                        |                       | 1323.0012.03 |
| Vector network analyzer, 4.5 GHz, N connectors                                      | R&S®ZNL4      |                        |                       | 1323.0012.04 |
| Vector network analyzer, 6 GHz, N connectors                                        | R&S®ZNL6      |                        |                       | 1323.0012.06 |
| Vector network analyzer, 14 GHz, N connectors                                       | R&S®ZNL14     |                        |                       | 1323.0012.14 |
| Vector network analyzer, 20 GHz, 3.5 mm connectors                                  | R&S®ZNL20     |                        |                       | 1323.0012.20 |
| <b>Options</b>                                                                      |               |                        |                       |              |
| Spectrum analysis, for R&S®ZNL3                                                     | R&S®ZNL3-B1   | •                      |                       | 1323.1802.02 |
| Spectrum analysis, for R&S®ZNL4                                                     | R&S®ZNL4-B1   | •                      |                       | 1303.8099.02 |
| Spectrum analysis, for R&S®ZNL6                                                     | R&S®ZNL6-B1   | •                      |                       | 1323.2067.02 |
| Spectrum analysis, for R&S®ZNL14                                                    | R&S®ZNL14-B1  | • <sup>18</sup>        |                       | 1303.8082.02 |
| Spectrum analysis, for R&S®ZNL20                                                    | R&S®ZNL20-B1  | • <sup>18</sup>        |                       | 1303.8101.02 |
| <b>Extended power range</b>                                                         |               |                        |                       |              |
| Extended power range, for R&S®ZNL3                                                  | R&S®ZNL3-B22  | •                      |                       | 1323.1860.02 |
| Extended power range, for R&S®ZNL4                                                  | R&S®ZNL4-B22  | •                      |                       | 1303.8118.02 |
| Extended power range, for R&S®ZNL6                                                  | R&S®ZNL6-B22  | •                      |                       | 1323.2021.02 |
| Extended power range, for R&S®ZNL14                                                 | R&S®ZNL14-B22 | •                      |                       | 1303.8153.02 |
| Extended power range, for R&S®ZNL20                                                 | R&S®ZNL20-B22 | •                      |                       | 1303.9089.02 |
| <b>Receiver step attenuators</b>                                                    |               |                        |                       |              |
| Receiver step attenuator, port 1, for R&S®ZNL3                                      | R&S®ZNL3-B31  | •                      |                       | 1323.1848.02 |
| Receiver step attenuator, port 2, for R&S®ZNL3                                      | R&S®ZNL3-B32  | •                      |                       | 1323.1854.02 |
| Receiver step attenuator, port 1, for R&S®ZNL4                                      | R&S®ZNL4-B31  | •                      |                       | 1303.8124.02 |
| Receiver step attenuator, port 2, for R&S®ZNL4                                      | R&S®ZNL4-B32  | •                      |                       | 1303.8130.02 |
| Receiver step attenuator, port 1, for R&S®ZNL6                                      | R&S®ZNL6-B31  | •                      |                       | 1323.2038.02 |
| Receiver step attenuator, port 2, for R&S®ZNL6                                      | R&S®ZNL6-B32  | •                      |                       | 1323.2044.02 |
| Receiver step attenuator, port 1, for R&S®ZNL14                                     | R&S®ZNL14-B31 | •                      |                       | 1303.8160.02 |
| Receiver step attenuator, port 2, for R&S®ZNL14                                     | R&S®ZNL14-B32 | •                      |                       | 1303.8176.02 |
| Receiver step attenuator, port 1, for R&S®ZNL20                                     | R&S®ZNL20-B31 | •                      |                       | 1303.9095.02 |
| Receiver step attenuator, port 2, for R&S®ZNL20                                     | R&S®ZNL20-B32 | •                      |                       | 1303.9108.02 |
| Precision frequency reference (OCXO)                                                | R&S®FPL1-B4   | •                      |                       | 1323.1902.02 |
| Additional interface                                                                | R&S®FPL1-B5   | •                      | •                     | 1323.1883.02 |
| GPIO interface                                                                      | R&S®FPL1-B10  | •                      | •                     | 1323.1890.02 |
| YIG preselector bypass <sup>19</sup>                                                | R&S®FPL1-B11  | •                      | •                     | 1323.1619.02 |
| Second hard disk (SSD),<br>remark: mounted on PC board, including analyzer firmware | R&S®ZNL-B19   | •                      | •                     | 1323.2938.02 |
| DC power supply 12 V/24 V                                                           | R&S®FPL1-B30  | •                      |                       | 1323.1877.02 |
| Internal lithium-ion battery                                                        | R&S®FPL1-B31  | •                      |                       | 1323.1725.02 |
| 40 MHz analysis bandwidth <sup>20</sup>                                             | R&S®FPL1-B40  | •                      | •                     | 1323.1931.02 |
| <b>Firmware/software</b>                                                            |               |                        |                       |              |
| Time domain analysis                                                                | R&S®ZNL-K2    | •                      | •                     | 1323.1819.02 |
| Distance-to-fault measurement                                                       | R&S®ZNL-K3    | •                      | •                     | 1323.1825.02 |
| Independent CW Source <sup>21</sup>                                                 | R&S®ZNL-K14   | •                      | •                     | 1303.8182.02 |
| AM/FM/φM measurement demodulator <sup>20</sup>                                      | R&S®FPL1-K7   | •                      | •                     | 1323.1731.02 |
| Power sensor measurement, with R&S®NRP power sensors <sup>20</sup>                  | R&S®FPL1-K9   | •                      | •                     | 1323.1754.02 |
| Noise figure and gain measurements <sup>22</sup>                                    | R&S®FPL1-K30  | •                      | •                     | 1323.1760.02 |

<sup>16</sup> Option may also be ordered at a later stage, upgrade in service.

<sup>17</sup> Option may be installed by the customer on site.

<sup>18</sup> Retrofit not possible for devices with serial number less than 101200x.

<sup>19</sup> Requires R&S®ZNL14-B1 or R&S®ZNL20-B1 spectrum analysis option.

<sup>20</sup> Requires R&S®ZNL3-B1, R&S®ZNL4-B1, R&S®ZNL6-B1, R&S®ZNL14-B1 or R&S®ZNL20-B1 spectrum analysis option.

<sup>21</sup> Available for the R&S®ZNL3, R&S®ZNL4, R&S®ZNL6, R&S®ZNL14 and R&S®ZNL20. Requires R&S®ZNL3-B1, R&S®ZNL4-B1, R&S®ZNL6-B1, R&S®ZNL14-B1 or R&S®ZNL20-B1 spectrum analysis option. Maximum output frequency for the R&S®ZNL20-K14 is 20GHz.

<sup>22</sup> Requires R&S®ZNL3-B1, R&S®ZNL4-B1, R&S®ZNL6-B1, R&S®ZNL14-B1 or R&S®ZNL20-B1 spectrum analysis option + R&S®FPL1-B5 additional interface.

## Recommended extras

| Designation                                                                                             | Type         | Order No.                                                                        |
|---------------------------------------------------------------------------------------------------------|--------------|----------------------------------------------------------------------------------|
| Protective hard cover                                                                                   | R&S®FPL1-Z1  | 1323.1960.02                                                                     |
| Soft carrying bag, for transport and outdoor operation                                                  | R&S®FPL1-Z2  | 1323.1977.02                                                                     |
| Carrying vest holster (requires R&S®FPL1-Z2)                                                            | R&S®FPL1-Z3  | 1323.1683.02                                                                     |
| Spare lithium-ion battery pack <sup>23</sup>                                                            | R&S®FPL1-Z4  | 1323.1677.02                                                                     |
| Anti-glare display film for outdoor operation                                                           | R&S®FPL1-Z5  | 1323.1690.02                                                                     |
| Lithium-ion battery charger, for charging spare batteries <sup>14</sup>                                 | R&S®FSV-B34  | 1321.3950.02                                                                     |
| 19" rackmount kit                                                                                       | R&S®FPL1-Z6  | 1323.1954.02                                                                     |
| Broadband limiter, N (m to f), 50 Ω, 50 MHz to 6 GHz                                                    | R&S®ZN-B13   | 1303.7840.02                                                                     |
| Headphones                                                                                              |              | 0708.9010.00                                                                     |
| <b>Matching pads, 50/75 Ω</b>                                                                           |              |                                                                                  |
| L section, matching at both ends                                                                        | R&S®RAM      | 0358.5414.02                                                                     |
| Series resistor, 25 Ω, matching at one end<br>(taken into account in instrument function RF INPUT 75 Ω) | R&S®RAZ      | 0358.5714.02                                                                     |
| <b>Smart noise source</b>                                                                               |              |                                                                                  |
| Smart noise source, for noise figure and gain measurements<br>(requires R&S® FPL1-K30)                  | R&S®FS-SNS26 | 1338.8008.26                                                                     |
| <b>High-power attenuators</b>                                                                           |              |                                                                                  |
| Attenuator 100 W, 3/6/10/20/30 dB, 1 GHz                                                                | R&S®RBU100   | 1073.8495.03,<br>1073.8495.06,<br>1073.8495.10,<br>1073.8495.20,<br>1073.8495.30 |
| Attenuator 50 W, 3/6/10/20/30 dB, 2 GHz                                                                 | R&S®RBU50    | 1073.8695.03,<br>1073.8695.06,<br>1073.8695.10,<br>1073.8695.20,<br>1073.8695.30 |
| Attenuator 50 W, 20 dB, 6 GHz                                                                           | R&S®RDL50    | 1035.1700.52                                                                     |
| <b>Connectors and cables</b>                                                                            |              |                                                                                  |
| N-type adapter, for R&S®RT-Zx probes                                                                    | R&S®RT-ZA9   | 1417.0909.02                                                                     |
| IEC/IEEE bus cable, length: 1 m                                                                         | R&S®PCK      | 0292.2013.10                                                                     |
| IEC/IEEE bus cable, length: 2 m                                                                         | R&S®PCK      | 0292.2013.20                                                                     |
| <b>DC block</b>                                                                                         |              |                                                                                  |
| DC block, 10 kHz to 18 GHz (type N)                                                                     | R&S®FSE-Z4   | 1084.7443.02                                                                     |
| <b>Calibration kits</b>                                                                                 |              |                                                                                  |
| Calibration kit, N (m), 50 Ω, 0 Hz to 18 GHz                                                            | R&S®ZN-Z170  | 1328.8163.02                                                                     |
| Calibration kit, N (f), 50 Ω, 0 Hz to 18 GHz                                                            | R&S®ZN-Z170  | 1328.8163.03                                                                     |
| Calibration kit, 3.5 mm (m), 50 Ω, 0 Hz to 26.5 GHz                                                     | R&S®ZN-Z135  | 1328.8157.02                                                                     |
| Calibration kit, 3.5 mm (f), 50 Ω, 0 Hz to 26.5 GHz                                                     | R&S®ZN-Z135  | 1328.8157.03                                                                     |
| <b>Calibration units</b>                                                                                |              |                                                                                  |
| Calibration unit, 1 port, N (f), 2 MHz to 4 GHz                                                         | R&S®ZN-Z103  | 1321.1828.02                                                                     |
| Calibration unit, 1 port, N (f), 1 MHz to 6 GHz                                                         | R&S®ZN-Z103  | 1321.1828.12                                                                     |
| Calibration unit, 2 configurable ports, 5 kHz to 4.5 GHz                                                | R&S®ZN-ZE104 | 1350.8040.04                                                                     |
| Calibration unit, 2 configurable ports, 5 kHz to 9 GHz                                                  | R&S®ZN-ZE109 | 1350.8040.09                                                                     |
| Calibration unit, 2 configurable ports, 5 kHz to 18 GHz                                                 | R&S®ZN-ZE118 | 1350.8040.18                                                                     |
| Calibration unit, 2 configurable ports, 5 kHz to 26.5 GHz                                               | R&S®ZN-ZE126 | 1350.8040.26                                                                     |

<sup>23</sup> Requires R&S®FPL1-B31 internal lithium-ion battery.

| Designation                                                                            | Type         | Order No.    |
|----------------------------------------------------------------------------------------|--------------|--------------|
| <b>Recommended power sensors supported by the R&amp;S®FPL1-K9 option <sup>24</sup></b> |              |              |
| Universal power sensor, 10 MHz to 8 GHz, 200 mW                                        | R&S®NRP-Z11  | 1138.3004.02 |
| Universal power sensor, 10 MHz to 18 GHz, 200 mW                                       | R&S®NRP-Z21  | 1137.6000.02 |
| Universal power sensor, 10 MHz to 18 GHz, 2 W                                          | R&S®NRP-Z22  | 1137.7506.02 |
| Power sensor module with power splitter,<br>DC to 18 GHz, 500 mW                       | R&S®NRP-Z27  | 1169.4102.02 |
| Power sensor module with power splitter,<br>DC to 26.5 GHz, 500 mW                     | R&S®NRP-Z37  | 1169.3206.02 |
| Thermal power sensor, 0 Hz to 18 GHz, 100 mW                                           | R&S®NRP18T   | 1424.6115.02 |
| Thermal power sensor, 0 Hz to 33 GHz, 100 mW                                           | R&S®NRP33T   | 1424.6138.02 |
| Wideband power sensor, 50 MHz to 18 GHz, 100 mW                                        | R&S®NRP-Z81  | 1137.9009.02 |
| Average power sensor, 9 kHz to 6 GHz, 200 mW                                           | R&S®NRP-Z91  | 1168.8004.02 |
| Average power sensor, 9 kHz to 6 GHz, 2 W                                              | R&S®NRP-Z92  | 1171.7005.02 |
| Two-path diode power sensor, 10 MHz to 8 GHz, 100 mW                                   | R&S®NRP-Z211 | 1417.0409.02 |
| Two-path diode power sensor, 10 MHz to 18 GHz, 100 mW                                  | R&S®NRP-Z221 | 1417.0309.02 |
| Three-path diode power sensor, 100 pW to 200 mW,<br>10 MHz to 8 GHz                    | R&S®NRP8S    | 1419.0006.02 |
| Three-path diode power sensor, 100 pW to 200 mW,<br>10 MHz to 8 GHz, LAN version       | R&S®NRP8SN   | 1419.0012.02 |
| Three-path diode power sensor, 100 pW to 200 mW,<br>10 MHz to 18 GHz                   | R&S®NRP18S   | 1419.0029.02 |
| Three-path diode power sensor, 100 pW to 200 mW,<br>10 MHz to 18 GHz, LAN version      | R&S®NRP18SN  | 1419.0035.02 |
| Three-path diode power sensor, 100 pW to 200 mW,<br>10 MHz to 33 GHz                   | R&S®NRP33S   | 1419.0064.02 |
| Three-path diode power sensor, 100 pW to 200 mW,<br>10 MHz to 33 GHz, LAN version      | R&S®NRP33SN  | 1419.0070.02 |

<sup>24</sup> For average power measurement only. For a complete list of power sensors supported by the R&S®FPL1-K9 option refer to the R&S®NRP brochure (PD 3606.7147.32).

## Warranty

| Warranty                                                          |         |                                                         |
|-------------------------------------------------------------------|---------|---------------------------------------------------------|
| Base unit                                                         |         | 3 years                                                 |
| All other items <sup>25</sup>                                     |         | 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 accredited calibration coverage, one year  | R&S®AW1 |                                                         |
| Extended warranty with accredited calibration coverage, two years | R&S®AW2 |                                                         |

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

Repairs carried out during the contract term are free of charge <sup>26</sup>. 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 <sup>26</sup> and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

### Extended warranty with accredited calibration (AW1 and AW2)

Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs <sup>26</sup> and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

<sup>25</sup> For options installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

<sup>26</sup> 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

## Rohde & Schwarz

The Rohde & Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test & measurement, technology systems, and networks & cybersecurity. Founded more than 85 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

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## Sustainable product design

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

Certified Quality Management  
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## Rohde & Schwarz training

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## Rohde & Schwarz customer support

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