

R&S® CABLE RIDER ZPH CABLE AND ANTENNA ANALYZER

Specifications



Specifications
Version 10.00

ROHDE & SCHWARZ

Make ideas real



CONTENTS

| | |
|--|-----------|
| Definitions | 3 |
| Specifications..... | 4 |
| Frequency | 4 |
| Measurements..... | 4 |
| Sweep time..... | 6 |
| Bandwidths..... | 6 |
| Level..... | 6 |
| Trigger functions..... | 7 |
| General data..... | 7 |
| Inputs and outputs..... | 9 |
| Maximum rated input levels | 9 |
| R&S®ZPH-B10 built-in GPS receiver (model .02 only) | 9 |
| R&S®ZPH-K1 spectrum analyzer (model .12 only)..... | 10 |
| R&S®ZPH-K7 analog modulation analysis AM/FM (model .12 only)..... | 11 |
| R&S®ZPH-K19 channel power meter (model .02 only)..... | 11 |
| R&S®ZPH-K19 channel power meter (model .12 only)..... | 12 |
| R&S®ZPH-K105 EMF measurement application (model .12 only)..... | 12 |
| R&S®ZPH-K57 advanced gated trigger measurement (model .12 only) | 12 |
| Equivalence of specifications for different R&S®Cable Rider ZPH part numbers | 12 |
| Ordering information | 13 |
| Options..... | 13 |
| Accessories..... | 13 |
| Antennas and antenna accessories | 13 |
| Power sensors supported by the R&S®ZPH-K9 option | 14 |
| Optical power sensors and accessories..... | 15 |
| Warranty and service..... | 15 |

Definitions

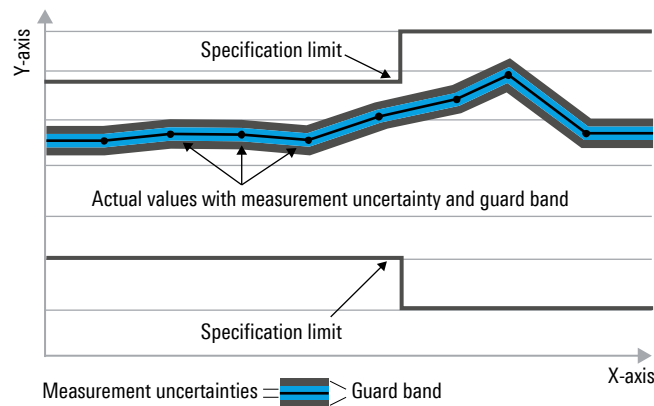
General

Product data applies under the following conditions:

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

Specifications with limits

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



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

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

Specifications without limits

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

Typical data (typ.)

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

Nominal values (nom.)

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

Measured values (meas.)

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

Uncertainties

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

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

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

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

Specifications

Frequency

| | | |
|----------------------|----------------------------------|----------------|
| Frequency range | | 2 MHz to 3 GHz |
| | with R&S®ZPH-B4 option installed | 2 MHz to 4 GHz |
| Frequency resolution | | 1 Hz |

| | | |
|---|------------------|---|
| Reference frequency, internal | | |
| Total reference accuracy | | $\pm(\text{time since last adjustment} \times \text{aging rate})$ + temperature drift + calibration accuracy |
| Aging per year | | $\pm 1 \times 10^{-6}$ |
| Temperature drift | 0 °C to +30 °C | $\pm 1 \times 10^{-6}$ |
| | +30 °C to +50 °C | $\pm 3 \times 10^{-6}$ |
| Achievable initial calibration accuracy | | $\pm 5 \times 10^{-7}$ |

Measurements

| | | |
|--|-----------|---------------------------|
| Individual | | reflection (S_{11}) |
| | | one-port cable loss |
| | | distance-to-fault |
| | model .12 | transmission (S_{21}) |
| Measurement wizard | | |
| Guides the user through a sequence of individual measurements. Uses the R&S®InstrumentView PC software to configure the measurement sequence including hints displayed on the screen. R&S®InstrumentView is also used to combine the measurement results into user-configurable reports. | | |

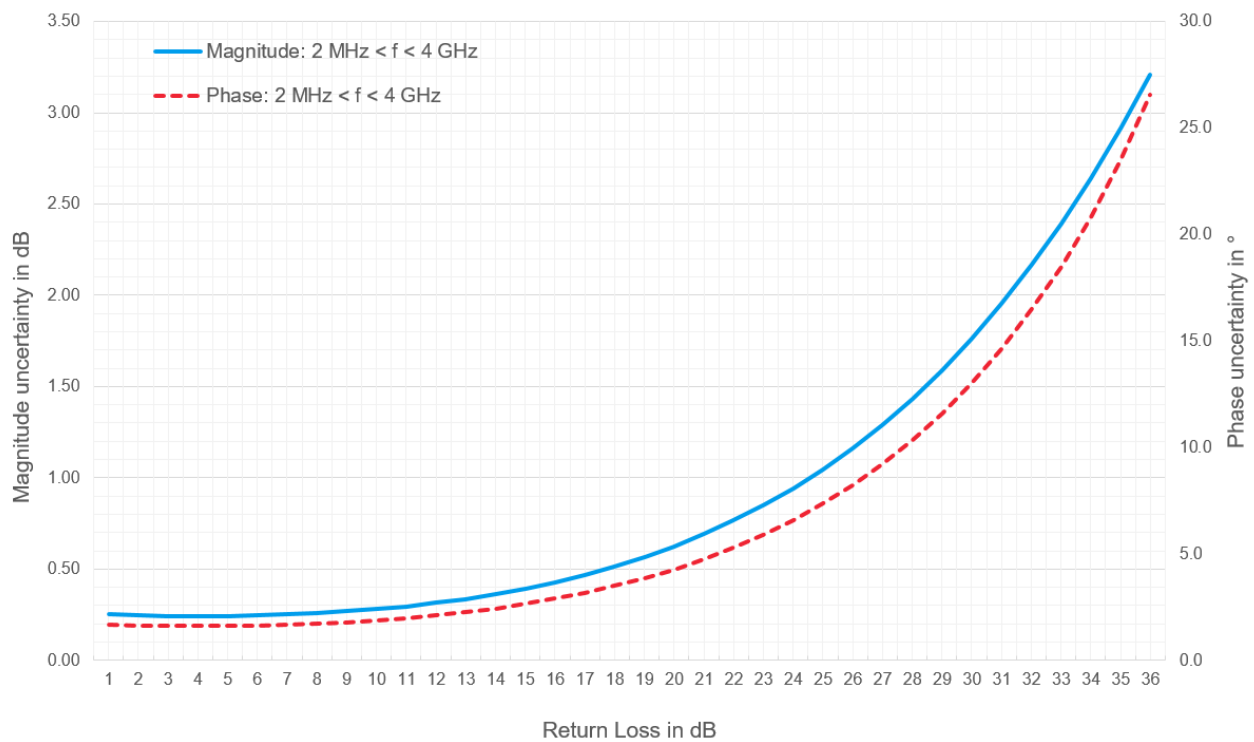
| | | |
|--------------------------|---------------------------------------|--|
| Measurement setup | | |
| Port output power | model .02 | -10 dBm (nom.) |
| | model .12 | -3 dBm to -30 dBm step 1 dB (nom.) |
| Data points | selectable | 101 to 2501 |
| Measurement bandwidth | reflection measurement (S_{11}) | 10 kHz |
| | transmission measurement (S_{21}) | 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz |
| Trace modes | | clear/write, average |

| | | |
|---|-----------------------------|--|
| Reflection measurement S_{11} | | |
| Result formats | | magnitude, SWR, magnitude and distance-to-fault, SWR and distance-to-fault, smith chart, phase |
| Magnitude | | |
| Range | | 1/2/3/5/10/20/30/50/100/120/130/150 dB, linear 100 % |
| Resolution | | 0.1 dB |
| SWR | | |
| Range | selectable | 1 to 1.1/1.5/2/3/6/11/21/71 |
| Measurement speed | | 0.3 ms per point |
| Corrected directivity with R&S®ZN-Z103 | 2 MHz \leq f \leq 4 GHz | > 42 dB (nom.) |
| Corrected test port match with R&S®ZN-Z103 | 2 MHz \leq f \leq 4 GHz | > 36 dB (nom.) |
| Measurement uncertainty with R&S®ZN-Z103 | | see figure Uncertainty of reflection measurement |

| | | |
|--|------------|-----------------------|
| One-port cable loss measurement | | |
| Result format | | magnitude |
| Range | selectable | 1/2/5/10/20/50/100 dB |
| Resolution | | 0.1 dB |

| Distance-to-fault analysis | | |
|-------------------------------------|---|--|
| Result formats | | return loss, SWR, split screen DTF and SWR, split screen DTF and return loss |
| Return loss | | |
| Range | | 1/2/3/5/10/20/30/50/100/120/130/150 dB, linear 100 % |
| Resolution | | 0.01 dB |
| SWR | | |
| Range | selectable | 1 to 1.1/1.5/2/3/6/11/21/71 |
| Fault resolution | | $(1.5 \times 10^8 \times \text{velocity factor} / \text{span})$ m |
| Maximum cable length | depending on cable loss | 1500 m (nom.) |
| Immunity to interference | | |
| Maximum permissible spurious signal | measurement = reflection (S_{11}), one-port cable loss and distance-to-fault analysis | |
| | +17 dBm (nom.) | |

Uncertainty of reflection measurements with R&S®ZN-Z103
Temp: +18 °C to +25 °C, RBW: 10 Hz, Power: -10dBm



Uncertainty of reflection measurement with R&S®ZN-Z103 calibration unit

| Accuracy of reflection measurements | | |
|--|-----------------------|--------------------|
| 2 MHz to 4 GHz | 0 dB to -15 dB | < 0.3 dB or < 2.1° |
| | -15 dB to -25 dB | < 1.0 dB or < 7.5° |
| | -25 dB to -35 dB | < 3.1 dB or < 26° |
| Dynamic of transmission measurements (model .12 only) | | |
| RF attenuation = 5 dB, tracking generator level = -3 dBm, RBW = 10 kHz | 100 kHz ≤ f < 20 MHz | > 60 dB (nom.) |
| | 20 MHz ≤ f < 1.5 GHz | > 90 dB (nom.) |
| | 1.5 GHz ≤ f < 2.5 GHz | > 70 dB (nom.) |
| | 2.5 GHz ≤ f < 4 GHz | > 60 dB (nom.) |

Sweep time

| | | |
|-------------|--|---|
| Sweep time | span = 0 Hz | 56.8 μ s to 3000 s ¹ |
| | span \geq 10 Hz, RBW \leq 10 kHz, FFT ^{1,2} | 382 μ s to 1500 s ^{1,3} |
| | 10 Hz \leq span \leq 600 MHz, swept ¹ | 20 ms to 1500 s ¹ |
| | span > 600 MHz, swept ¹ | (20 ms \times span / 1600 MHz) to 1500 s ¹ |
| Uncertainty | span = 0 Hz | 1 % (nom.) |
| | span \geq 10 Hz | 3 % (nom.) |

Bandwidths

| | | |
|------------------------------|--------------------------------|-------------------------------|
| Resolution bandwidths | | |
| Range | -3 dB bandwidths | 1 Hz to 3 MHz in 1/3 sequence |
| Bandwidth accuracy | 1 Hz \leq RBW \leq 300 kHz | < 5 % (nom.) |
| | 300 kHz < RBW \leq 1 MHz | < 10 % (nom.) |
| Selectivity 60 dB:3 dB | Gaussian type filters | < 5 (nom.) |
| Video filters | | |
| Range | -3 dB bandwidths | 1 Hz to 3 MHz in 1/3 sequence |
| | zero span ¹ | 5 MHz additionally |

Level

| | | |
|--------------------------------------|---|----------------------------------|
| Display range | | displayed noise floor to +30 dBm |
| Maximum rated input level | | |
| DC voltage | | 50 V |
| CW RF power | | 33 dBm (= 2 W) |
| Peak RF power | duration < 3 s | 36 dBm (= 4 W) |
| Maximum pulse voltage | | 150 V |
| Maximum pulse energy | pulse width 10 μ s | 10 mWs |
| Intermodulation | | |
| Third-order intercept (TOI) | intermodulation-free dynamic range, signal level = -20 dBm (both), RF attenuation = 0 dB, RF preamplifier = off | |
| | f = 1 GHz | +7 dBm (meas.) |
| | f = 2.4 GHz | +10 dBm (meas.) |
| Second-harmonic intercept (SHI) | RF attenuation = 0 dB, RF preamplifier = off, signal level = -40 dBm | |
| | f _{in} = 20 MHz to 1.5 GHz | -60 dBc (nom.) |
| | f _{in} = 1.5 GHz to 2 GHz | -80 dBc (nom.) |
| Displayed average noise level | 0 dB RF attenuation, termination 50 Ω , RBW = 1 kHz, VBW = 10 Hz, sample detector, logarithmic scaling, normalized to 1 Hz | |
| | preamplifier = off | |
| | 1 MHz to 10 MHz | < -128 dBm, -133 dBm (typ.) |
| | 10 MHz to 1 GHz | < -142 dBm, -146 dBm (typ.) |
| | 1 GHz to 2.5 GHz | < -139 dBm, -143 dBm (typ.) |
| | 2.5 GHz to 3 GHz | < -137 dBm, -141 dBm (typ.) |
| | 3 GHz to 4 GHz | < -140 dBm, -144 dBm (typ.) |
| | preamplifier = on | |
| | 1 MHz to 10 MHz | < -150 dBm, -160 dBm (typ.) |
| 10 MHz to 3 GHz | < -158 dBm, -163 dBm (typ.) | |
| 3 GHz to 4 GHz | < -153 dBm, -158 dBm (typ.) | |

¹ Starting from firmware version V2.30.

² At specific spans and when RBW \leq 10kHz, the device automatically switches to FFT mode to deliver faster sweep speeds.

³ Time for data acquisition to perform FFT computation.

| Immunity to interference, nominal values | | |
|--|---|---|
| Image frequencies | $f_{in} - 2 \times 30.15 \text{ MHz}$ | < -70 dBc (nom.) |
| | $f_{in} - 2 \times 830.15 \text{ MHz}$ | < -70 dBc (nom.) |
| | $f < 3 \text{ GHz}, f_{in} - 2 \times 830.15 \text{ MHz}$ | < -70 dBc (nom.) |
| | $f < 3 \text{ GHz}, f_{in} - 2 \times 4042.65 \text{ MHz}$ | -60 dBc (nom.) |
| | $f \geq 3 \text{ GHz}, f_{in} + 2 \times 830.15 \text{ MHz}$ | -60 dBc (nom.) |
| Intermediate frequencies | 30.15 MHz, 830.15 MHz, 4042.65 MHz | < -60 dBc (nom.) |
| Other interfering signals, signal level – RF attenuation < -30 dBm | $f \leq 3 \text{ GHz}$, spurious at $f_{in} - 2021.325 \text{ MHz}$ | < -60 dBc (nom.) |
| Other interfering signals, related to local oscillators | $\Delta f \geq 300 \text{ kHz}$ f: receive frequency | < -60 dBc (nom.) |
| Residual spurious response | input matched with 50 Ω , without input signal, RBW $\leq 30 \text{ kHz}$, $f \geq 3 \text{ MHz}$, RF attenuation = 0 dB | < -90 dBm (nom.) |
| Level display | | |
| Logarithmic level axis | | 1/2/3/5/10/20/30/50/100/120/150 dB, 10 divisions |
| Linear level axis | | 0 % to 100 %, 10 divisions |
| Number of traces | | 4 ¹ |
| Trace detectors | | max. peak, min. peak, auto peak, sample, RMS |
| Trace functions | | clear/write, max. hold, min. hold, average, view |
| Setting range of reference level | | -130 dBm to +30 dBm |
| Units of level axis | | dBm, dBmV, dB μ V, V, W |
| Level measurement uncertainty | | |
| Absolute level uncertainty at 100 MHz | temperature range from +20 °C to +30 °C | < 0.3 dB |
| Frequency response ⁴ | temperature range from +20 °C to +30 °C | |
| | 5 kHz $\leq f < 10 \text{ MHz}$ | < 1.5 dB (nom.) |
| | 10 MHz $\leq f \leq 4 \text{ GHz}$ | < 1 dB |
| Attenuator uncertainty | | < 0.3 dB |
| Uncertainty of reference level setting | | < 0.1 dB (nom.) |
| Display nonlinearity | SNR > 16 dB, 0 dB to -50 dB, logarithmic level display | < 0.3 dB |
| Bandwidth switching uncertainty | reference: RBW = 10 kHz | < 0.1 dB (nom.) |
| Total measurement uncertainty | 95 % confidence level, +20 °C to +30 °C, SNR > 16 dB, 0 dB to -50 dB below reference level, RF attenuation auto | |
| | 10 MHz $\leq f \leq 4 \text{ GHz}$ | 0.74 dB |

Trigger functions

| Trigger | | |
|---------------------------------------|-----------------------|--|
| Trigger source | | free run, video, external |
| External trigger level threshold | low → high transition | 2.4 V |
| | high → low transition | 0.7 V |
| | maximum | 3.0 V |
| Gated trigger (model .12 only) | | |
| Gate delay | | 1 μ s to 100 s, resolution min. 1 μ s (or 1 % of delay) |
| Gate length | | 1 μ s to 100 s, resolution min. 1 μ s (or 1 % of gate length) |

General data

| Manual operation | | |
|-------------------------|--|--|
| Languages | | Chinese, Chinese Traditional, English, French, German, Italian, Hungarian, Japanese, Korean, Portuguese, Russian, Spanish |
| Remote control | | |
| Command set | | SCPI 1997.0 |
| LAN interface | | 10/100BASE-T, RJ-45 |
| USB | | mini B plug, version 2.0 |

⁴ For RBW > 1 MHz, stated frequency responses are nominal values.

| | | |
|--|--|--|
| Display | | |
| Resolution | | WVGA, 800 × 480 pixel |
| Audio | | |
| Speaker | | internal |
| USB interface | | type A plug, version 2.0 |
| | number of interfaces | 2 |
| Mass memory | | |
| Mass memory | | USB flash drive/microSD card (not supplied), size ≤ 32 Gbyte, USB version 1.1 or 2.0 |
| Data storage | internal | > 160 instrument settings and traces |
| | on USB flash drive or microSD card, ≥ 1 Gbyte | > 10000 instrument settings and traces |
| Temperature range | operating temperature | -10 °C to +55 °C |
| | storage temperature | -20 °C to +50 °C |
| | battery charging mode | 0 °C to +40 °C |
| Climatic loading | relative humidity | +25 °C/+55 °C at 95 % relative humidity, in line with EN 60068-2-30 |
| | class of protection | IP51 |
| Altitude | operating with battery | 15000 m (49210 ft) |
| | operating with AC to DC adapter | |
| | normal operation | 3000 m (9840 ft) |
| | with derating ⁵ | 4600 m (15091 ft) |
| Mechanical resistance | | |
| Vibration | sinusoidal | in line with EN 60068-2-6, MIL-PRF-28800F class 2 |
| | random | in line with EN 60068-2-64, MIL-PRF-28800F class 2 |
| Shock | | 40 g shock spectrum, in line with MIL-STD-810F, method 516.4, procedure I, MIL-PRF-28800F |
| Power supply | | |
| R&S®HA-Z301 AC power supply | input | 100 V to 240 V AC ± 10 %, 50 Hz to 60 Hz, 1.0 A to 0.5 A |
| | output | 15 V, 2.67 A, max. 40 W |
| | test marks | CE, UL, PSE, TUV |
| External DC voltage | | 15 V |
| Battery | | lithium-ion battery |
| Capacity | R&S®HA-Z306 version E | 72 Wh |
| | R&S®HA-Z306 version F and above | 74.5 Wh |
| Voltage | R&S®HA-Z306 version E | 11.25 V (nom.) |
| | R&S®HA-Z306 version F and above | 10.8 V (nom.) |
| Operating time with new, fully charged battery | model .02 | 9 h |
| | model .12 (default mode) | 6.5 h |
| | model .12 (spectrum analyzer mode) | 9 h |
| | instrument switched off or charge with R&S®HA-Z203 battery charger | 3.5 h |
| | instrument switched on | 4.5 h |
| Life time | charging cycles | > 80 % of its initial capacity after 300 charge/discharge cycles |
| Power consumption | model .02 | 8 W (meas.) |
| | model .12 (default mode) | 11 W (meas.) |
| | model .12 (spectrum analyzer mode) | 8 W (meas.) |
| Safety | | IEC 61010-1:2010/AMD:2016, EN 61010-1:2010/A1:2019, UL 61010-1 (third edition), CAN/CSA-C22.2 No. 61010-1:12 |
| Test marks | | VDE, cCSA _{US} , KC |

⁵ Expected ambient temperature derating for the AC to DC adapter at this altitude.

| | | |
|--------------------------------------|--|--|
| Electromagnetic compatibility | in line with European EMC Directive 2014/30/EU including | <ul style="list-style-type: none"> EN 61326-1 class B (emission) EN 61326-1 (immunity, industrial) CISPR 11/EN 55011/group 1 class B (emission) |
|--------------------------------------|--|--|

| | | |
|-----------------------|---|-------------------------------------|
| EU legislation | EU: in line with Data Act – Regulation (EU) 2023/2854 | for details, see user documentation |
|-----------------------|---|-------------------------------------|

| | | |
|---|-----------|--|
| Dimensions and weight | | |
| Dimensions | W × H × D | 202 mm × 294 mm × 76 mm (8.0 in × 11.6 in × 3 in) |
| Weight | | 2.5 kg (5.5 lb) |
| Recommended calibration interval | | 1 year |

Inputs and outputs

| | | |
|-----------------------------------|---------------------------------|-------------------------------------|
| Port 1 | | |
| Impedance | | 50 Ω |
| Connector | | type N, female |
| VSWR | 2 MHz ≤ f ≤ 4 GHz (model .02) | < 1.2 (nom.) |
| | 100 kHz ≤ f ≤ 1 GHz (model .12) | < 1.5 (nom.) |
| | 1 GHz < f ≤ 4 GHz (model .12) | < 2 (nom.) |
| Port 2 | | |
| Impedance | | 50 Ω |
| Connector | | type N, female |
| VSWR | 2 MHz ≤ f ≤ 4 GHz (model .02) | < 1.5 (nom.) |
| | 2 MHz ≤ f < 100 MHz (model .12) | < 2.0 (nom.) |
| | 100 MHz ≤ f ≤ 4 GHz (model .12) | < 1.5 (nom.) |
| DC bias (model .12 only) | | |
| Mode | | type N or BNC |
| Output port | | port 2 |
| Output voltage | mode: internal | +2 V to +32 V in 0.1 V steps (nom.) |
| Accuracy | < +3 V | < 1 V (nom) |
| | ≥ +3 V | < 0.5 V (nom) |
| Maximum output power | mode: internal | |
| | operated with battery | 7 W |
| | operated with AC mains | 7 W |
| Maximum continuous output current | mode: internal | 650 mA |

Maximum rated input levels

| | | |
|----------------------------------|------------------------------|------------------|
| Maximum rated input level | | |
| DC voltage | | 50 V |
| CW RF power | port 1 (power meter input) | 30 dBm (= 1 W) |
| | port 2 (reflectometer input) | 23 dBm (= 0.2 W) |
| Peak RF power | < 3 s duration, port 1 | 33 dBm (= 2 W) |
| | < 3 s duration, port 2 | 26 dBm (= 0.4 W) |
| Maximum pulse voltage | | 150 V |
| Maximum pulse energy | pulse width 10 μs | 10 mWs |

R&S® ZPH-B10 built-in GPS receiver (model .02 only)

| | | |
|-------------------------|--|-----------------------------|
| GPS location indication | | latitude, longitude, height |
|-------------------------|--|-----------------------------|

R&S®ZPH-K1 spectrum analyzer (model .12 only)

| | | |
|---|----------------------------------|--|
| Frequency range | | 5 kHz to 3 GHz |
| | with R&S®ZPH-B4 option installed | 5 kHz to 4 GHz |
| Frequency resolution | | 1 Hz |
| Reference frequency, internal | | |
| Aging per year | | 1×10^{-6} |
| Temperature drift | 0 °C to +50 °C | 1×10^{-6} |
| Achievable initial calibration accuracy | | 5×10^{-7} |
| Total reference uncertainty | | (time since last adjustment × aging rate) + temperature drift + calibration accuracy |
| Frequency readout | | |
| Marker resolution | | 0.1 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 | | 711 |
| Marker tuning frequency step size | | span / 710 |
| Frequency counter resolution | selectable | 0.1 Hz (low), 0.1 mHz (high) |
| Count uncertainty | SNR > 25 dB | $\pm(\text{frequency} \times \text{reference uncertainty} + \frac{1}{2} (\text{last digit}))$ |
| Frequency span | | 0 Hz, 10 Hz to 3 GHz |
| | with R&S®ZPH-B4 option installed | 0 Hz, 10 Hz to 4 GHz |
| Span uncertainty | | 1 % (nom.) |
| Spectral purity SSB phase noise | | |
| | | f = 500 MHz |
| Carrier offset | 30 kHz | < -88 dBc (1 Hz), -95 dBc (1 Hz) (typ.) |
| | 100 kHz | < -98 dBc (1 Hz), -105 dBc (1 Hz) (typ.) |
| | 1 MHz | < -118 dBc (1 Hz), -125 dBc (1 Hz) (typ.) |

R&S® ZPH-K7 analog modulation analysis AM/FM (model .12 only)

| Measurement of analog modulation signals | | |
|--|----|--|
| Center frequency | | 500 kHz to 4 GHz |
| Demodulation bandwidth | | 2 MHz, 1 MHz, 500 kHz, 300 kHz, 200 kHz, 100 kHz, 50 kHz, 30 kHz, 20 kHz, 10 kHz (nom.) |
| Bandwidth accuracy | | < ±5 % (nom.) |
| Display | AM | carrier power, carrier frequency offset, AM modulation depth, modulation frequency, THD, SINAD |
| | FM | carrier power, carrier frequency offset, FM deviation, modulation frequency, THD, SINAD |

| Carrier power | | |
|------------------------------------|--|---|
| Carrier power measurement accuracy | | add 0.2 dB, see Level measurement uncertainty |
| Display resolution | | 0.1 dB |

| AF modulation frequency ⁶ | | |
|--------------------------------------|---|----------------------------------|
| Measurement range | AM | 20 Hz to 100 kHz (nom.) |
| | FM | 20 Hz to 200 kHz (nom.) |
| Resolution | | 1 Hz |
| Measurement uncertainty | 1 kHz ≤ AF ≤ 200 kHz | ±(1 % of measured value) (nom.) |
| | 20 Hz ≤ AF < 1 kHz | ±1 Hz (nom.) |
| AF filters | | |
| Lowpass | audio decimation | bypass, 1/10, 1/30, 1/100 (nom.) |
| Deemphasis | FM demodulation, demodulation bandwidth 200 kHz and 300 kHz | off, 50 μs, 75 μs (nom.) |

| AM demodulation ⁷ | | |
|------------------------------|------------------|--------------------|
| Measurement range | modulation depth | 5 % to 95 % (nom.) |
| Modulation depth uncertainty | | ±4 % (nom.) |

| FM demodulation ⁸ | | |
|------------------------------|---------------------|---|
| Measurement range | frequency deviation | 10 kHz to 400 kHz (nom.), max. 0.4 × demodulation bandwidth |
| Deviation uncertainty | | ±(0.04 × (AF + deviation)) (nom.) |

| Modulation distortion ^{6, 7, 8} | | |
|--|-----------|-------------------------|
| Measurement functions | | THD, SINAD |
| Measurement range | THD | -50 dB to 0 dB |
| | SINAD, AM | 0 dB to 50 dB |
| | SINAD, FM | 0 dB to 40 dB |
| Display resolution | | 0.1 dB |
| Measurement uncertainty | | 1 dB (nom.) |
| AF frequency range | | 20 Hz to 100 kHz (nom.) |

R&S® ZPH-K19 channel power meter (model .02 only)

| | | |
|----------------------|--------------------------------------|--------------------|
| Frequency range | | 2 MHz to 3 GHz |
| | with R&S® ZPH-B4 option installed | 2 MHz to 4 GHz |
| Measurement range | | -20 dBm to +30 dBm |
| Measurement accuracy | +20 °C to +30 °C, 2 MHz ≤ f < 10 MHz | < 2 dB (nom.) |
| | +20 °C to +30 °C, 10 MHz ≤ f ≤ 4 GHz | < 0.8 dB |
| | -20 °C to +50 °C, 10 MHz ≤ f ≤ 4 GHz | < 1.2 dB |

⁶ Minimum and maximum detectable audio frequency and harmonics depend on the demodulation bandwidth and audio filter settings.

⁷ Modulation frequency = 1 kHz sine, AM modulation depth: 50 %, carrier level = 0 dBm, center frequency = 499 MHz, reference level = 6 dBm, demodulation bandwidth = 20 kHz, SNR > 60 dB, audio filter = bypass.

⁸ Modulation frequency = 1 kHz sine, FM deviation = 75 kHz, carrier level = 0 dBm, center frequency = 499 MHz, reference level = 6 dBm, demodulation bandwidth = 300 kHz, SNR > 60 dB, audio filter = 1/10, deemphasis = off.

R&S®ZPH-K19 channel power meter (model .12 only)

| | | |
|---------------------------------------|----------------------------------|--|
| Frequency range | | 5 kHz to 3 GHz |
| | with R&S®ZPH-B4 option installed | 5 kHz to 4 GHz |
| Channel bandwidth | | 100 kHz to 1 GHz |
| Amplitude | | offset, dB relative, zeroing |
| Unit | | dBm, W |
| Limits | | on/off, upper limit, lower limit, beep on fail |
| Measurement range | | -120 dBm to +30 dBm |
| Level measurement uncertainty | | |
| Absolute level uncertainty at 100 MHz | +20 °C to +30 °C | < 0.3 dB |
| Frequency response | +20 °C to +30 °C | |
| | 100 kHz ≤ f < 10 MHz | < 1.5 dB (nom.) |
| | 10 MHz ≤ f ≤ 4 GHz | < 1.25 dB |

R&S®ZPH-K105 EMF measurement application (model .12 only)

The R&S®ZPH-K105 requires R&S®ZPH-K1 option.

| EMF measurements | R&S®ZPH-K105 |
|---------------------------|--|
| Mode | <ul style="list-style-type: none"> • spectrum • channel power (10 MHz) |
| Sequence of measurements | • |
| Fixed frequency | • |
| Set of frequencies | • |
| Results | |
| Table of field strengths | • |
| Total field strength | • |
| Calculation of exposition | • |
| EMF limit check | • |
| ISO antenna measurement | • |

The setup of the EMF measurement sequence and the detailed result evaluation is done via the R&S®InstrumentView software.

R&S®ZPH-K57 advanced gated trigger measurement (model .12 only)

The specifications have not been checked separately and are not verified during instrument calibration. Advanced gated trigger measurements are used for analysis of periodic time domain signal measurements and applicable only to the below mentioned measurement modes.

| Measurements | R&S®ZPH-K57 |
|---------------------------------------|-------------|
| Occupied bandwidth (OBW) | • |
| Spectrum emission mask (SEM) | • |
| Adjacent channel leakage ratio (ACLR) | • |

| | | |
|-----------------------|---|---------------------------------|
| Frequency range | | see basic instrument |
| Resolution bandwidths | -3 dB bandwidths | 30 kHz to 3 MHz in 1/3 sequence |
| Video bandwidths | | 30 kHz to 3 MHz in 1/3 sequence |
| Detectors | | see basic instrument |
| Auto gate detection | minimum distance, high level to low level | 10 dB |

Equivalence of specifications for different R&S®Cable Rider ZPH part numbers

The specifications for part number 1321.1211.02 are equivalent to part number 1321.1211.52 and 1321.1211P01.

Ordering information

| Designation | Type | Order No. |
|---|---------------------|--------------|
| Cable and antenna analyzer, 2 MHz to 3 GHz | R&S®Cable Rider ZPH | 1321.1211.02 |
| Cable and antenna analyzer, combi model, 2 MHz to 3 GHz | R&S®Cable Rider ZPH | 1321.1211.12 |
| Accessories supplied | | |
| Lithium-ion battery pack, USB cable, AC power supply with country specific adapters for EU, GB, US, AUS, CH, getting started manual, side strap | | |

Options

| Designation | Type | Order No. |
|---|---------------------------|--------------|
| Frequency upgrade from 3 GHz to 4 GHz | R&S®ZPH-B4 | 1321.0380.02 |
| Spectrum analyzer (model .12 only) | R&S®ZPH-K1 | 1334.5604.02 |
| GPS support (model .02 only) | R&S®ZPH-B10 | 1321.0396.02 |
| Spectrum analyzer preamplifier (model .12 only) | R&S®ZPH-B22 ⁹ | 1334.5627.02 |
| Analog modulation analysis AM/FM (model .12 only) | R&S®ZPH-K7 ⁹ | 1334.5633.02 |
| Power sensor support | R&S®ZPH-K9 | 1321.0415.02 |
| Interference analysis (model .12 only) | R&S®ZPH-K15 ⁹ | 1334.5640.02 |
| Signal strength mapping (model .12 only) | R&S®ZPH-K16 ⁹ | 1334.5656.02 |
| Channel power meter | R&S®ZPH-K19 | 1321.0409.02 |
| Pulse measurements with power sensor | R&S®ZPH-K29 | 1321.0421.02 |
| Advanced gated trigger measurements | R&S®ZPH-K57 ⁹ | 1334.5685.02 |
| EMF measurement | R&S®ZPH-K105 ⁹ | 1334.7207.02 |

Accessories

| Designation | Type | Order No. |
|--|-------------|--------------|
| Calibration unit | R&S®ZN-Z103 | 1321.1828.02 |
| Combined open/short/50 Ω load calibration standard, for calibrating the VSWR and DTF measurements, DC to 3.6 GHz | R&S®FSH-Z29 | 1300.7510.03 |
| Battery charger for R&S®HA-Z306 ^{10, 11} | R&S®HA-Z303 | 1321.1328.02 |
| Battery charger ¹⁰ | R&S®HA-Z403 | 1321.1486.02 |
| Lithium-ion battery pack, 6.4 Ah | R&S®HA-Z306 | 1321.1334.02 |
| Spare power supply, incl. mains plug for EU, GB, US, AUS, CH | R&S®HA-Z301 | 1321.1386.02 |
| Car adapter | R&S®HA-Z302 | 1321.1340.02 |
| Headphones | R&S®FSH-Z36 | 1145.5838.02 |
| Spare USB cable | R&S®HA-Z211 | 1309.6169.00 |
| Spare Ethernet cable | R&S®HA-Z210 | 1309.6152.00 |
| Soft carrying bag | R&S®HA-Z220 | 1309.6175.00 |
| Hard case | R&S®HA-Z321 | 1321.1357.02 |
| Hard shell protective carrying case | R&S®RTH-Z4 | 1326.2774.02 |
| Carrying holster | R&S®HA-Z322 | 1321.1370.02 |
| Rainproof carrying holster | R&S®HA-Z322 | 1321.1370.03 |

Antennas and antenna accessories

| Designation | Type | Order No. |
|--|--------------|--------------|
| Handheld directional antenna (with antenna handle) | R&S®HE400BC | 4104.6000.04 |
| Cable set for R&S®HE400BC (R&S®HE300USB required) | R&S®HE400-KB | 4104.7770.04 |
| Handheld directional antenna (with antenna handle) | R&S®HE400 | 4104.6000.02 |
| Cable set for R&S®HE400 (R&S®HE300USB required) | R&S®HE400-K | 4104.7770.02 |
| HF antenna module, 8.3 kHz to 30 MHz | R&S®HE400HF | 4104.8002.02 |
| VHF antenna module, 20 MHz to 200 MHz | R&S®HE400VHF | 4104.8202.02 |
| UWB antenna module, 30 MHz to 6 GHz | R&S®HE400UWB | 4104.6900.02 |
| Log-periodic antenna module, 450 MHz to 8 GHz | R&S®HE400LP | 4104.8402.02 |
| Cellular antenna module, 700 MHz to 2500 MHz | R&S®HE400CEL | 4104.7306.02 |
| USB adapter | R&S®HE300USB | 4080.9440.02 |
| Log-periodic OEM antenna, 700 MHz to 4 GHz | R&S®HA-Z350 | 1321.1405.02 |
| Yagi antenna, 1710 MHz to 1990 MHz | R&S®HA-Z1900 | 1328.6825.02 |
| Yagi antenna, 824 MHz to 960 MHz | R&S®HA-Z900 | 1328.6283.02 |
| Portable EMF measurement system, hard case | R&S®TS-EMF | 1158.9295.05 |

⁹ Additional R&S®ZPH-K1 option is required to activate this option.

¹⁰ The battery charger is dedicated for charging an additional battery outside the instrument. The battery can be charged via the instrument as well.

¹¹ Product to be discontinued and replaced by R&S®HA-Z403.

| Designation | Type | Order No. |
|---|----------------------------|--------------|
| Isotropic antenna, 30 MHz to 3 GHz, for R&S [®] TS-EMF | R&S [®] TSEMF-B1 | 1074.5719.02 |
| Isotropic antenna, 700 MHz to 6 GHz, for R&S [®] TS-EMF | R&S [®] TSEMF-B2 | 1074.5702.02 |
| Isotropic antenna, 700 MHz to 8 GHz, for R&S [®] TS-EMF | R&S [®] TSEMF-B2E | 1074.5702.03 |
| Isotropic antenna, 9 kHz to 200 MHz, for R&S [®] TS-EMF | R&S [®] TSEMF-B3 | 1074.5690.02 |
| Converter cable | R&S [®] TSEMF-CV | 1158.9250.02 |
| RF cable (length: 1 m), DC to 6 GHz, type N (m) to type N (m) connectors | R&S [®] HA-Z901 | 3626.2757.02 |
| Carrying bag, for R&S [®] HA-Z900 or R&S [®] HA-Z1900 Yagi antenna | R&S [®] HA-Z902 | 1328.6883.02 |
| Compact probe set for E and H near-field measurements, 30 MHz to 3 GHz | R&S [®] HZ-15 | 1147.2736.02 |
| Near-field probe set for H field | R&S [®] HZ-17 | 1339.4141.02 |
| Preamplifier (3 GHz, 20 dB), power adapter (100 V to 230 V), for R&S [®] HZ-15 | R&S [®] HZ-16 | 1147.2720.02 |
| RF cable (length: 1 m), DC to 8 GHz, armored, type N (m) to type N (f) connectors | R&S [®] FSH-Z320 | 1309.6600.00 |
| RF cable (length: 3 m), DC to 8 GHz, armored, type N (m) to type N (f) connectors | R&S [®] FSH-Z321 | 1309.6617.00 |
| Matching pad, 50/75 Ω, L section | R&S [®] RAM | 0358.5414.02 |
| Matching pad, 50/75 Ω, series resistor 25 Ω | R&S [®] RAZ | 0358.5714.02 |
| Matching pad, 50/75 Ω, L section, type N to BNC | R&S [®] FSH-Z38 | 1300.7740.02 |
| Adapter, type N (m) to BNC (f) | | 0118.2812.00 |
| Adapter, type N (m) to type N (m) | | 0092.6581.00 |
| Adapter, type N (m) to SMA (f) | | 4012.5837.00 |
| Adapter, type N (m) to 7/16 (f) | | 3530.6646.00 |
| Adapter, type N (m) to 7/16 (m) | | 3530.6630.00 |
| Adapter, type N (m) to FME (f) | | 4048.9790.00 |
| Adapter, BNC (m) to banana plug (f) | | 0017.6742.00 |
| Attenuator, 50 W, 20 dB, 50 Ω, DC to 6 GHz, type N (f) to type N (m) | R&S [®] RDL50 | 1035.1700.52 |
| Attenuator, 100 W, 20 dB, 50 Ω, DC to 2 GHz, type N (f) to type N (m) | R&S [®] RBU100 | 1073.8495.20 |
| Attenuator, 100 W, 30 dB, 50 Ω, DC to 2 GHz, type N (f) to type N (m) | R&S [®] RBU100 | 1073.8495.30 |

Power sensors supported by the R&S[®]ZPH-K9 option ¹²

| Designation | Type | Order No. |
|--|---------------------------|--------------|
| Directional power sensors | | |
| 30 mW to 300 W, 25 MHz to 1 GHz | R&S [®] FSH-Z14 | 1444.0029.02 |
| 30 mW to 300 W, 200 MHz to 4 GHz | R&S [®] FSH-Z44 | 1444.0035.02 |
| Universal power sensors | | |
| 1 nW to 100 mW, 10 MHz to 8 GHz, two-path | R&S [®] NRP-Z211 | 1417.0409.02 |
| 1 nW to 100 mW, 10 MHz to 18 GHz, two-path | R&S [®] NRP-Z221 | 1417.0309.02 |
| Thermal power sensors | | |
| 300 nW to 100 mW, DC to 18 GHz | R&S [®] NRP18T | 1424.6115.02 |
| 300 nW to 100 mW, DC to 33 GHz | R&S [®] NRP33T | 1424.6138.02 |
| 300 nW to 100 mW, DC to 40 GHz | R&S [®] NRP40T | 1424.6150.02 |
| 300 nW to 100 mW, DC to 50 GHz | R&S [®] NRP50T | 1424.6173.02 |
| 300 nW to 100 mW, DC to 67 GHz | R&S [®] NRP67T | 1424.6196.02 |
| 300 nW to 100 mW, DC to 110 GHz | R&S [®] NRP110T | 1424.6215.02 |
| Average power sensors | | |
| 100 pW to 200 mW, 8 kHz to 6 GHz | R&S [®] NRP6A | 1424.6796.02 |
| 100 pW to 200 mW, 8 kHz to 18 GHz | R&S [®] NRP18A | 1424.6815.02 |
| Three-path diode power sensors | | |
| 100 pW to 200 mW, 10 MHz to 8 GHz | R&S [®] NRP8S | 1419.0006.02 |
| 100 pW to 200 mW, 10 MHz to 18 GHz | R&S [®] NRP18S | 1419.0029.02 |
| 100 pW to 200 mW, 10 MHz to 33 GHz | R&S [®] NRP33S | 1419.0064.02 |
| 100 pW to 200 mW, 10 MHz to 40 GHz | R&S [®] NRP40S | 1419.0041.02 |
| 100 pW to 200 mW, 10 MHz to 50 GHz | R&S [®] NRP50S | 1419.0087.02 |
| Pulse power sensors ¹³ | | |
| 1 nW to 100 mW, 50 MHz to 18 GHz | R&S [®] NRP18P | 1444.1190.02 |
| 1 nW to 100 mW, 50 MHz to 40 GHz, 2.92 mm | R&S [®] NRP40P | 1444.1290.02 |
| 1 nW to 100 mW, 50 MHz to 50 GHz, 2.40 mm | R&S [®] NRP50P | 1444.1390.02 |

¹² For average power measurements only.

¹³ Peak power measurements supported by the R&S[®]ZPH-K29 option.

| Wideband power sensors ¹³ | | |
|---|--------------|--------------|
| 1 nW to 100 mW, 50 MHz to 18 GHz ¹⁴ | R&S®NRP-Z81 | 1137.9009.02 |
| 1 nW to 100 mW, 50 MHz to 40 GHz, 2.92 mm ¹⁴ | R&S®NRP-Z85 | 1411.7501.02 |
| 1 nW to 100 mW, 50 MHz to 40 GHz, 2.40 mm ¹⁴ | R&S®NRP-Z86 | 1417.0109.40 |
| 1 nW to 100 mW, 50 MHz to 44 GHz, 2.40 mm ¹⁴ | R&S®NRP-Z86 | 1417.0109.44 |
| R&S®NRP-Zxx power sensors require the following adapter cable for operation on the R&S®Cable Rider ZPH | | |
| USB adapter cable, for R&S®FSH-Z14/R&S®FSH-Z44 power sensors | R&S®FSH-Z144 | 1145.5909.02 |
| USB adapter cable (passive), length: 2 m, to connect R&S®NRP-Zxx S/SN power sensors to the R&S®Cable Rider ZPH | R&S®NRP-Z4 | 1146.8001.02 |
| R&S®NRP power sensors require the following adapter cable for operation on the R&S®Cable Rider ZPH | | |
| USB interface cable, length: 1.5 m, to connect R&S®NRP sensors to the R&S®Cable Rider ZPH | R&S®NRP-ZKU | 1419.0658.03 |

Optical power sensors and accessories

| Designation | Type | Order No. |
|---|-------------|--------------|
| OEM USB optical power meter (Germanium) | R&S®HA-Z360 | 1334.5162.00 |
| OEM USB optical power meter (filtered InGaAs) | R&S®HA-Z361 | 1334.5179.00 |
| SC adapter for optical power meter | R&S®HA-Z362 | 1334.5185.00 |
| LC adapter for optical power meter | R&S®HA-Z363 | 1334.5191.00 |
| 2.5 mm universal adapter for optical power meter | R&S®HA-Z364 | 1334.5204.00 |
| 1.25 mm universal adapter for optical power meter | R&S®HA-Z365 | 1334.5210.00 |
| Patch cord SC-LC SM, SX, length: 1 m | R&S®HA-Z366 | 1334.5227.00 |
| Patch cord SC-SC SM, SX, length: 1 m | R&S®HA-Z367 | 1334.5233.00 |

Warranty and service

| Warranty | | |
|--|--------------------------------|-----------------------|
| Base unit | | 3 years |
| All other items | | 1 year |
| Service options | | |
| | Service plans | On demand |
| Calibration | up to five years ¹⁵ | pay per calibration |
| Warranty and repair | up to five years ¹⁵ | standard price repair |
| Contact your Rohde & Schwarz sales office for further details. | | |

¹⁴ Product discontinued.

¹⁵ For extended periods, contact your Rohde & Schwarz sales office.

Service at Rohde & Schwarz
You're in great hands

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

Rohde & Schwarz

The Rohde&Schwarz technology group is among the trail-blazers 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 90 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.

www.rohde-schwarz.com

Sustainable product design

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

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

More certificates of Rohde & Schwarz



Rohde & Schwarz training

www.training.rohde-schwarz.com

Rohde & Schwarz customer support

www.rohde-schwarz.com/support

