

R&S® RTH1002 R&S® RTH1004 Scope Rider Specifications



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Definitions

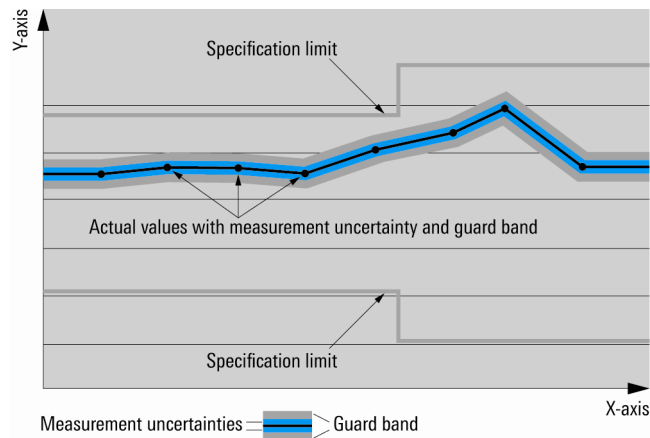
General

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.



Specifications without limits

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

Typical data (typ.)

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

Nominal values (nom.)

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

Measured values (meas.)

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

Uncertainties

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

Device settings and GUI parameters are indicated as follows: "parameter: value".

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

Base unit

Vertical system

| | | |
|---------------------------------------|--|---|
| Input channels | R&S®RTH1002 | 2 oscilloscope channels, 1 multimeter |
| | R&S®RTH1004 | 4 oscilloscope channels |
| | All inputs are floating and fully isolated in line with CAT IV 600 V, CAT III 1000 V safety rating. See figure regarding isolation rating on page 13. | |
| Input impedance | | 1 MΩ ± 1 % 12 pF ± 2 pF (meas.) |
| Analog bandwidth (–3 dB) | R&S®RTH1002 and R&S®RTH1004 | ≥ 60 MHz |
| | R&S®RTH1002 with -B221 option and R&S®RTH1004 with -B241 option | ≥ 100 MHz |
| | R&S®RTH1002 with -B222 option and R&S®RTH1004 with -B242 option | ≥ 200 MHz |
| | R&S®RTH1002 with -B223 option and R&S®RTH1004 with -B243 option | ≥ 350 MHz ¹ |
| | R&S®RTH1002 with -B224 option and R&S®RTH1004 with -B244 option | ≥ 500 MHz ¹ |
| | Measurement of analog bandwidth at input sensitivities ≥ 20 V/div is limited by input voltage rating versus frequency, see figure "Input rating: Maximum signal voltage at oscilloscope input" on page 13. | |
| | Lower frequency limit (–3 dB) at AC coupling | |
| Bandwidth limits | | 1/2/5/10/20/50/100/200/500 kHz, 1/2/5/10/20/50 MHz |
| | only with R&S®RTH-B222, -B242, -B223, -B243, -B224, -B244 options | 100 MHz |
| | only with R&S®RTH-B223, -B243, -B224, -B244 options | 200 MHz |
| Rise time (calculated) | R&S®RTH1002 and R&S®RTH1004 | < 5.8 ns |
| | R&S®RTH1002 with -B221 option and R&S®RTH1004 with -B241 option | < 3.5 ns |
| | R&S®RTH1002 with -B222 option and R&S®RTH1004 with -B242 option | < 1.75 ns |
| | R&S®RTH1002 with -B223 option and R&S®RTH1004 with -B243 option | < 1 ns ² |
| | R&S®RTH1002 with -B224 option and R&S®RTH1004 with -B244 option | < 700 ps ² |
| Vertical resolution of overall system | | 9 bit |
| DC gain accuracy | offset and position set to zero, after self-alignment | |
| | input sensitivity > 5 mV/div | ±1.5 % |
| | input sensitivity > 2 mV/div to 5 mV/div | ±2 % |
| | input sensitivity 2 mV/div | ±2.5 % |
| Input coupling | | DC, AC |
| Input sensitivity | in steps of 1, 2, 4, 5 in each decade | 2 mV/div to 100 V/div |
| Maximum input voltage | at BNC inputs | CAT IV 300 V (RMS), 424 V (peak), derates at 20 dB/decade to 5 V (RMS) above 500 kHz (see figure "Input rating: Maximum signal voltage at oscilloscope input" on page 13) |
| | with R&S®RT-Z110 or R&S®RT-Z111 probe | CAT IV 600 V, CAT III 1000 V, derating in line with probe specification |
| Position range | | ±4 div |
| Offset range | input sensitivity | |
| | ≥ 40 V/div | 0 |
| | ≥ 1 V/div to ≤ 20 V/div | ±200 V |
| | ≤ 500 mV/div | ±4 V |
| Offset accuracy | after self-alignment | ±(0.5 % × net offset + 0.1 div × input sensitivity + 1.5 mV) (net offset = offset – (position × input sensitivity)) |

¹ ≥ 200 MHz (meas.) for input sensitivities ≥ 20 V/div.

² < 1.75 ns (calculated) for input sensitivities ≥ 20 V/div.

| | | |
|---|---|---|
| DC measurement accuracy | after adequate suppression of measurement noise by using high-resolution sampling mode or waveform averaging or a combination of both | $\pm(\text{DC gain accuracy} \times \text{reading} - \text{net offset} + \text{offset accuracy})$ |
| Channel-to-channel isolation (each channel at same input sensitivity) | input frequency < analog bandwidth | > 40 dB (meas.) |

Horizontal system

| | | |
|----------------------|------|---|
| Timebase range | | selectable between 1 ns/div and 500 s/div |
| Channel deskew | | ± 100 ns |
| Reference position | | 10 %, 50 % or 90 % of measurement display area |
| Trigger offset range | max. | at least 2 s or 2000 screen widths at most 100 000 s |
| | min. | right edge of measurement display area |
| Modes | | normal, roll |
| Timebase accuracy | | ± 10 ppm |

Acquisition system

| | | |
|------------------------------------|------------------------------------|--|
| Maximum realtime sampling rate | R&S®RTH1004 | 1 channel with 5 Gsample/s 2 channels with 2.5 Gsample/s 4 channels with 1.25 Gsample/s |
| | R&S®RTH1002 | 1 channel with 5 Gsample/s 2 channels with 2.5 Gsample/s |
| Maximum acquisition length | at sampling rate of 5 Gsample/s | 500 ksample |
| | at sampling rate of 2.5 Gsample/s | 250 ksample for each channel |
| | at sampling rate of 1.25 Gsample/s | 125 ksample for each channel |
| Acquisition modes | sample | first sample in decimation interval |
| | high resolution | average value of samples in decimation interval |
| | peak detect | largest and smallest sample in decimation interval |
| | envelope | envelope of acquired waveforms; for timebases requiring decimation, peak-detect is used. |
| | average | average of acquired waveforms; for timebases requiring decimation, high resolution is used. Number of averaged waveforms can be power of 2 from 2 to 8192. |
| Realtime waveform acquisition rate | max. | 50 000 waveforms/s |

Trigger system

(see also R&S®RTH-B1 mixed signal option)

| | | |
|-----------------|-------------|-----------------------------------|
| Trigger level | range | ± 4 div from center of screen |
| Trigger modes | | auto, normal, single |
| Trigger sources | R&S®RTH1004 | CH1, CH2, CH3, CH4 |
| | R&S®RTH1002 | CH1, CH2 |
| Hold-off range | time | 8 ns to 10 s, fixed and random |
| | events | 1 to 1 000 000 000 events |

| | | |
|----------------------|---|------------------|
| Trigger types | | |
| Edge | triggers on specified slope (positive, negative or either) and level | |
| Glitch | triggers on glitches of positive, negative or either polarity that are shorter or longer than specified width | |
| | glitch width | 200 ps to 5000 s |
| Width | triggers on positive or negative pulse of specified width; width can be shorter, longer, inside or outside the interval | |
| | pulse width | 200 ps to 5000 s |

| | | |
|----------------|---|---|
| TV/video | triggers on baseband analog progressive and interlaced video signals PAL, NTSC, SECAM, PAL-M, SDTV and HDTV broadcast standards (SDTV and HDTV require R&S®RTH-K19 option) | |
| | trigger events | all fields, odd fields, even fields, all lines, line number |
| Pattern | triggers when a logical combination (and, nand, or, nor) of the input channels stays true for a period of time shorter, longer, inside or outside a specified range (requires R&S®RTH-K19 option) | |
| | pattern time | 800 ps to 5000 s |
| State | triggers when a logical combination (and, nand, or, nor) of the input channels stays true at a slope (positive, negative or either) in one selected channel; state values may be high (H), low (L) or don't care (X) (requires R&S®RTH-K19 option) | |
| Runt | triggers on pulse of positive, negative or either polarity that crosses one threshold but fails to cross a second threshold before crossing the first one again; runt pulse width can be arbitrary, shorter, longer, inside or outside the interval (requires R&S®RTH-K19 option) | |
| | runt pulse width | 200 ps to 5000 s |
| Slew rate | triggers when the time required by a signal edge to toggle between user-defined upper and lower voltage levels is shorter, longer, inside or outside the interval; edge slope may be positive, negative or either (requires R&S®RTH-K19 option) | |
| | toggle time | 200 ps to 5000 s |
| Window | triggers when signal enters or exits a specified voltage range; triggers also when signal stays inside or outside the voltage range for a specified period of time (requires R&S®RTH-K19 option) | |
| | window time | 200 ps to 5000 s |
| Data2clock | triggers on setup time and hold time violations between clock and data present on any two input channels; monitored time interval may be specified by the user with a step size of 800 ps in the range from -124 ns to 124 ns around a clock edge (requires R&S®RTH-K19 option) | |
| Serial pattern | triggers on serial data pattern up to 32 bit clocked by one input channel; pattern bits may be high (H), low (L) or don't care (X); clock edge slope may be positive, negative or either (requires R&S®RTH-K19 option) | |
| | max. data rate | < 250 Mbps |
| Timeout | triggers when signal stays high, low or unchanged for a specified period of time (requires R&S®RTH-K19 option) | |
| | timeout | 200 ps to 5000 s |
| Interval | triggers when time between two consecutive edges of same slope (positive or negative) is shorter, longer inside or outside a specified range (requires R&S®RTH-K19 option) | |
| | interval time | 200 ps to 5000 s |
| Protocol | see R&S®RTH-K1 and R&S®RTH-K2 options | |

Waveform measurements

(see also R&S®RTH-B1 mixed signal option)

| | | |
|------------------------|-------------------------------------|---|
| Automatic measurements | total number of active measurements | 4 |
| | sources | |
| | R&S®RTH1004 | CH1, CH2, CH3, CH4, math, reference |
| | R&S®RTH1002 | CH1, CH2, math, reference |
| | time based measurements | period, frequency, rise time, fall time, positive pulse width, negative pulse width, positive duty cycle, negative duty cycle, delay, phase |
| | amplitude based measurements | mean value, RMS value, crest factor, standard deviation, minimum, maximum, peak-to-peak, base level, top level, amplitude, overshoot, preshoot, AC, DC, AC+DC |
| | count based measurements | count positive pulses, count negative pulses, count rising edges, count falling edges |
| | power based measurements | active power, apparent power, reactive power, power factor |
| Cursor measurements | sources | analog channels, math and reference waveforms |
| | vertical | 2 cursors showing time, time difference and inverse time difference (frequency) |
| | horizontal | 2 cursors showing voltage and voltage difference |
| | tracking | vertical cursor additionally showing voltage and voltage difference of selected waveform |
| | measure | defines gate for automatic measurements |

Mask testing

| | | |
|-----------------------------------|-------------|--|
| Sources | R&S®RTH1004 | CH1, CH2, CH3, CH4, math |
| | R&S®RTH1002 | CH1, CH2, math |
| Mask definition | | tolerance tube based on analog input waveform or math waveform |
| Number of simultaneous mask tests | | up to 5 |
| Actions on violation | | none, beep, stop |

Waveform maths

| | | |
|--------------------------|-------------|--|
| Number of math waveforms | | 1 |
| Functions | | addition, subtraction, multiplication, square, absolute value, inverse |
| Sources | R&S®RTH1004 | CH1, CH2, CH3, CH4 |
| | R&S®RTH1002 | CH1, CH2 |

Display characteristics

| | |
|-------------------|---|
| Diagram types | Yt, XY, zoom |
| XY mode | parallel display of XY diagram, Xt and Yt |
| Zoom | horizontal zoom with overview bar graph showing location of zoom window |
| Interpolation | sin(x)/x |
| Persistence | 50 ms to 10 s; infinite |
| Reference signals | up to 1 reference signal |

Protocol and logic

| | | |
|------------------------|----------------------------|--|
| Bus trigger and decode | number of bus signals | 1 |
| | bus types | |
| | R&S®RTH-K1 option | SPI, I ² C |
| | R&S®RTH-K2 option | UART |
| | display types | decoded bus, logical signal, event table |
| | position and size | size and position on screen selectable |
| | data format of decoded bus | hex, decimal, binary |

Data logger

| | | |
|---|------------------------|--|
| Number of simultaneous logging channels | | 4 |
| Sources | R&S®RTH1004 | |
| | oscilloscope mode | up to 4 waveform measurements |
| | digital voltmeter mode | up to 4 digital voltmeter measurements |
| | R&S®RTH1002 | |
| | oscilloscope mode | up to 4 waveform measurements |
| | multimeter mode | multimeter measurement |
| Timebase range | | selectable between 5 s/div and 4 days/div |
| Measurement speed | | 1/2/5 measurements/s |
| Memory depth | | 2 Msample per logging channel |
| Slot memory | | internal memory for up to 10 sets of data logger results; slots results can be reset, loaded and exported. |

Digital voltmeter (DVM)

| | | |
|-------------------------------|-------------|--|
| Sources | R&S®RTH1004 | CH1, CH2, CH3, CH4 |
| Measurements | voltage | DC, AC, AC+DC with indication of max., min. and average |
| Number of active measurements | | 4 |
| Maximum resolution | | 999 counts, 3 digits |

Digital multimeter (DMM)

| | | |
|---|----------------------------|---|
| Sources | R&S®RTH1002 | multimeter, 4 mm banana inputs, fully isolated from scope inputs, interfaces and ground |
| Measurements | voltage | DC, AC, AC+DC |
| | current | with current clamp or shunt |
| | resistance | |
| | continuity test | |
| | diode test | |
| | temperature | resistance measurement with PT100, PT500 or PT1000 platinum sensors (recommended accessory R&S®HZ812 PT100 temperature probe) |
| | frequency | |
| | capacitance | |
| Number of active measurements | | 1 |
| Maximum resolution | | 10000 counts, 4 digits |
| Input impedance (voltage DC, AC, AC+DC) | 1 V, 10 V | 11.11 MΩ (nom.) |
| | 100 V | 10.10 MΩ (nom.) |
| | 1000 V | 10.01 MΩ (nom.) |
| Input capacitance | | < 100 pF |
| Common mode rejection ratio (CMRR) | DC and 50 Hz/60 Hz ± 0.1 % | > 100 dB (meas.) |

| | | |
|--------------------------------------|---|---|
| Normal mode rejection ratio (NMRR) | 50 Hz/60 Hz \pm 0.1 % | > 60 dB (meas.) |
| Maximum input voltage | | CAT III 1000 V (RMS), 1414 V (peak), CAT IV 600 V (RMS), 849 V (peak), derates at 20 dB/decade above 50 kHz (see figure "Input rating: Maximum signal voltage at meter input" on page 13) |
| Specified accuracy temperature range | rated accuracy applies after 1 h stabilization | +23 °C \pm 5 °C |
| Temperature coefficient | from 0 °C to +18 °C or +28 °C to +50 °C | 0.1 \times specified accuracy/°C |
| Voltage ranges | 10 % overrange except of 1000 V range | 1.0000 V, 10.000 V, 100.00 V, 1000.0 V |
| DC accuracy | 1 V | \pm (0.05 % + 0.05 % of range) |
| | 10 V, 100 V | \pm (0.05 % + 0.03 % of range) |
| | 1000 V | \pm (0.08 % + 0.03 % of range) |
| AC accuracy (AC coupling) | 1 V, 10 V, 100 V | |
| | 10 Hz to 20 kHz | \pm (0.2 % + 0.05 % of range) |
| | 20 kHz to 100 kHz | \pm (0.5 % + 0.05 % of range) |
| | 1000 V | |
| | 10 Hz to 10 kHz | \pm (0.2 % + 0.05 % of range) |
| Resistance ranges | 10 % overrange | 1.0000 k Ω , 10.000 k Ω , 100.00 k Ω , 1.0000 M Ω , 10.000 M Ω , 100.00 M Ω |
| Resistance accuracy | 1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω | \pm (0.08 % + 0.03 % of range) |
| | 10 M Ω | \pm (0.2 % + 0.05 % of range) |
| | 100 M Ω | \pm (1.5 % + 0.1 % of range) |
| Resistance test currents | 1 k Ω | 1.004 mA (nom.) |
| | 10 k Ω | 101.3 μ A (nom.) |
| | 100 k Ω | 10.13 μ A (nom.) |
| | 1 M Ω | 1.003 μ A (nom.) |
| | 10 M Ω | 100.3 nA (nom.) |
| | 100 M Ω | 100.3 nA 11.11 M Ω (nom.) |
| Continuity range | test current 1.004 mA (nom.), continuous beep when resistance < 10 Ω | 1.0000 k Ω |
| Continuity accuracy | | \pm (0.1 % + 0.5 Ω) |
| Diode test ranges | test current 1.004 mA | 3.000 V |
| Diode test accuracy | | \pm (0.1 % + 3 mV) |
| Capacity ranges | 10 % overrange | 10.000 nF, 100.00 nF, 1.0000 μ F, 10.000 μ F, 100.00 μ F, 1.0000 mF, 10.000 mF |
| Capacity accuracy | | \pm (1 % + 0.05 % of range) |
| Temperature (calculated) | with linearization for platinum sensors, in line with EN 60751, range from -200 °C to +850 °C | \pm (0.13 % + sensor tolerance +1 °C) |
| Frequency ranges | | 1000.0 Hz, 10.000 kHz, 100.00 kHz, 1000.0 kHz |
| Frequency accuracy | | \pm 0.005 % |

Miscellaneous

| | | |
|---------------------|---------------------------------|--|
| Save/recall | device settings | save and recall on micro SD card or USB memory stick |
| | reference waveforms | save and recall on micro SD card or USB memory stick |
| | screenshots | save on micro SD card or USB memory stick |
| | logger records | export to USB memory stick |
| | configurable fast setting slots | 8 slots, F1 to F8 to easily activate preconfigured settings with a single keystroke |
| Screenshot | selectable file formats | png, jpg, bmp, tif |
| | screenshot modes | standard, inverse, black and white |
| Instrument security | | User data and settings are stored on removable micro SD card only. |
| Menu languages | | available menu languages: <ul style="list-style-type: none"> • English • German • French • Russian • Simplified Chinese • Traditional Chinese • Japanese • Spanish • Italian • Portuguese • Korean • Czech • Polish |
| Help | online help on the instrument | available language: <ul style="list-style-type: none"> • English |

Inputs and outputs

| | | |
|---------------------------|--------------|---|
| Channel inputs | R&S®RTH1004 | 4 BNC oscilloscope inputs |
| | R&S®RTH1002 | 2 BNC oscilloscope inputs, 2 banana meter inputs (4-mm type) |
| Probe compensation output | signal shape | rectangle $V_{low} = 0\text{ V}$, $V_{high} = 1\text{ V}$ amplitude 1 V (peak-to-peak) $\pm 5\%$ |
| | frequency | 1 kHz $\pm 5\%$ |
| USB host interface | | 1 port, type A plug, USB 2.0, memory sticks only |
| USB device port | | 1 port, mini USB-B, remote control only |
| LAN interface | | RJ-45 connector, supports 10/100BASE-T |
| Logic probe input | | 8 logic channels, see R&S®RTH-B1 option |
| External trigger input | R&S®RTH1002 | Meter input can also be used as external trigger input. |
| Security slot | | for standard Kensington style lock |
| SD card slot | type | micro SD card slot, memory cards only |
| | capacity | SDHC, min. 4 Gbyte, max. 32 Gbyte |

General data

| Display | | |
|----------------|--|---------------------------|
| Type | | 7.0" LC TFT color display |
| Resolution | | 800 × 480 pixel (WVGA) |

| Temperature | | |
|---------------------|-----------------------|---|
| Temperature loading | operating temperature | |
| | battery only | 0 °C to +50 °C |
| | power adapter | 0 °C to +40 °C |
| | storage temperature | -20 °C to +50 °C |
| Climatic loading | | +25° C/+55 °C at 95 % rel. humidity cyclic, in line with IEC 60068-2-30 |

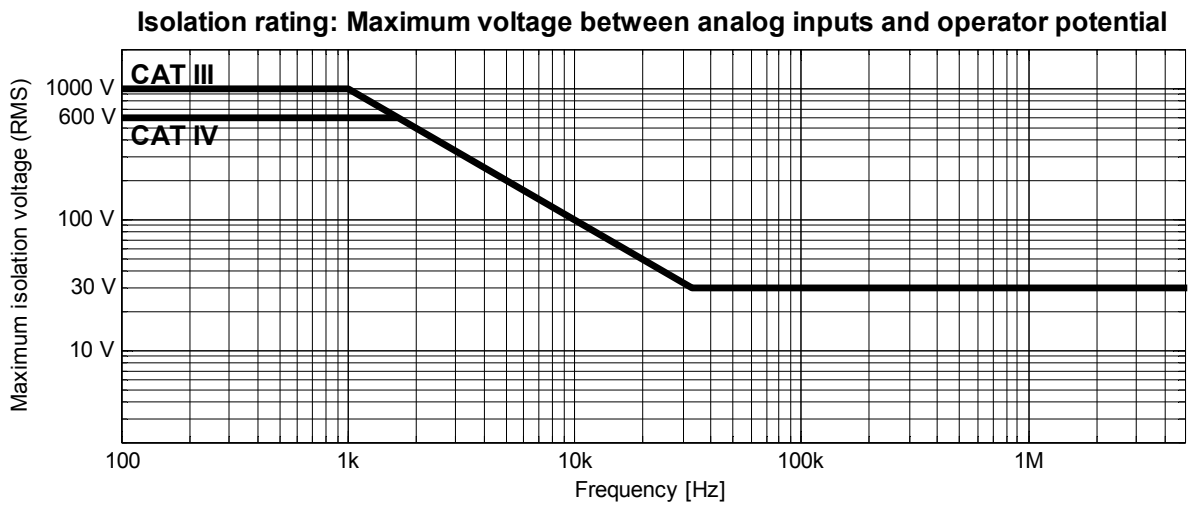
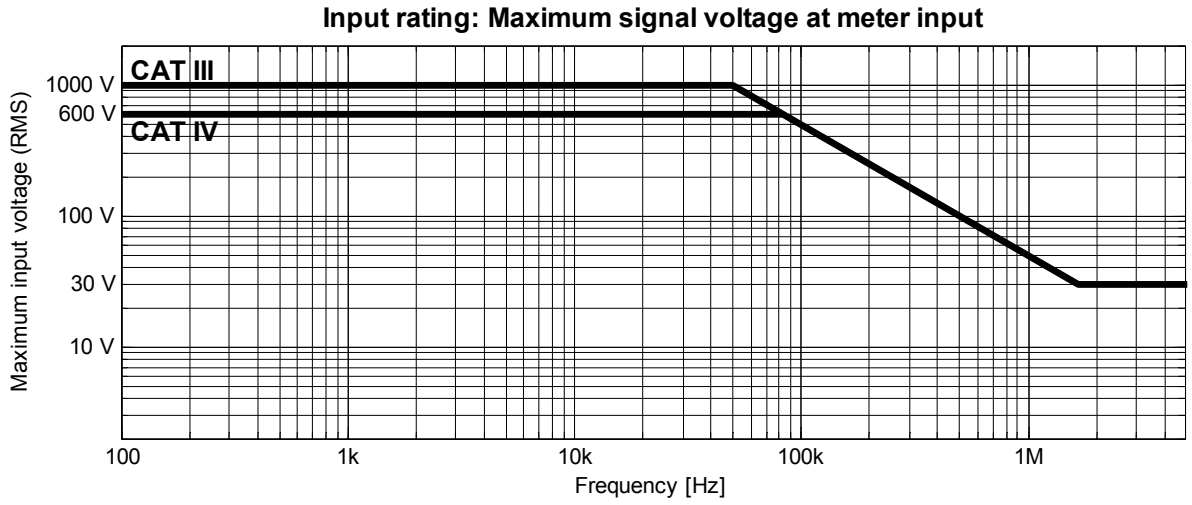
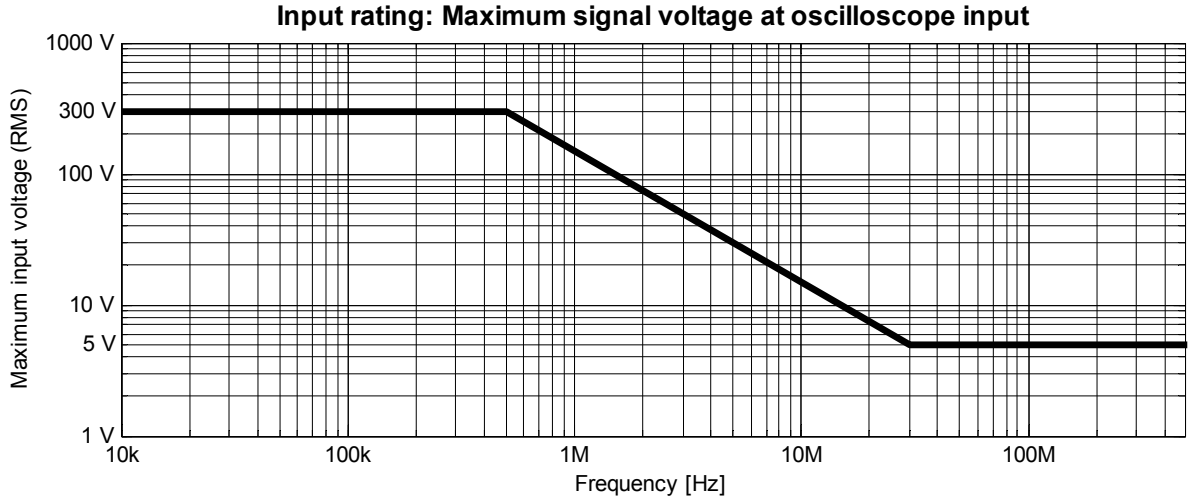
| Altitude | | |
|-----------------|------------------------------|------------------------------|
| Operating | CAT IV 600 V, CAT III 1000 V | up to 2000 m above sea level |
| | CAT III 600 V, CAT II 1000 V | up to 3000 m above sea level |
| Nonoperating | | up to 4600 m above sea level |

| Mechanical resistance | | |
|------------------------------|------------|---|
| IP rating | | IP51, in line with IEC 60529 |
| Vibration | sinusoidal | 5 Hz to 150 Hz, max. 1.8 g at 55 Hz, 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6; MIL-PRF-28800F, 4.5.5.3.2, class 3 |
| | random | 8 Hz to 650 Hz, acceleration 1.9 g (RMS), in line with EN 60068-2-64; MIL-PRF-28800F, 4.5.5.3.1 random vibration, class 3 |
| Shock | | 40 g shock spectrum, in line with MIL-STD-810E, method no. 516.4, procedure I; MIL-PRF-28800F, 4.5.5.4.1, functional shock, 30 g, 11 ms, halfsine |

| EMC | | |
|-------------|---|--|
| RF emission | in line with EN 55011 class A, operation in residential, commercial and business areas or in small-size companies is not covered; therefore the instrument may not be operated in residential, commercial and business areas or in small-size companies unless additional measures are taken to ensure that EN 55011 class B is complied with | in line with CISPR 11/EN 55011 group 1 class A (for a shielded test setup); the instrument complies with the emission requirements stipulated by EN 55011, EN 61326-1 and EN 61326-2-1 class A, making the instrument suitable for use in industrial environments. |
| Immunity | | in line with IEC/EN 61326-1 table 2, immunity test requirements for industrial environments ³ |

³ Test criterion is displayed noise level within ±1 div for input sensitivity of 100 mV/div.

| | | |
|-----------------------------|--|---|
| Certifications | VDE, cCSA _{US} , KC | |
| Calibration interval | 1 year | |
| Safety | in line with IEC/EN/DIN EN 61010-1, IEC/EN/DIN EN 61010-2-030, UL/CSA 61010-1, UL/CSA 61010-2-030, IEC/EN/DIN EN 61010-2-033 (R&S®RTH1002), UL/CSA 61010-2-033 (R&S®RTH1002) | |
| Battery/power supply | | |
| Battery data | | Lithium-ion rechargeable smart battery |
| | operating time | approx. 4 h |
| | charging time | approx. 4 h while instrument is switched off |
| | capacity | 72 Wh |
| | voltage | 11.25 V |
| Power adapter | input | 100 V to 240 V at 50 Hz to 60 Hz, 1.5 A |
| | output | +15 V DC, 4.0 A |
| Mechanical data | | |
| Dimensions | W × H × D | 201 mm × 293 mm × 74 mm (7.91 in × 11.54 in × 2.91 in) |
| Weight | with battery | 2.4 kg (5.3 lb) (nom.) |



Options

R&S®RTH-B1

| |
|--|
| Mixed signal option, additional 8 logic channels |
|--|

Vertical system

| | | |
|-----------------------------|--|--|
| Input channels | | 8 logic channels (from D0 to D7) |
| Input impedance | | 100 kΩ ± 2 % ~4 pF (meas.) at probe tips |
| Maximum input frequency | signal with minimum input voltage swing and hysteresis setting: normal | 250 MHz (meas.) |
| Maximum input voltage | | ±40 V (peak) |
| Minimum input voltage swing | | 500 mV (peak-to-peak) (meas.) |
| Threshold groups | | from D0 to D3, D4 to D7 |
| Threshold level | range | ±8 V in 25 mV steps |
| | predefined | CMOS 5.0 V, CMOS 3.3 V, CMOS 2.5 V, TTL, ECL, PECL, LVPECL |
| Threshold accuracy | | ±(100 mV + 3 % of threshold setting) |
| Comparator hysteresis | | normal, robust, maximum |

Horizontal system

| | | |
|-------------------------|------------------------|----------------|
| Channel deskew | range for each channel | ±100 ns |
| Channel-to-channel skew | | < 2 ns (meas.) |

Acquisition system

| | | |
|---------------|--|--------------------------------|
| Sampling rate | | 1.25 Gsample/s on each channel |
| Memory depth | | 125 ksample for each channel |

Trigger system

| | | |
|-----------------|-------------|--|
| Trigger level | range | ±4 div from center of screen |
| Trigger modes | | auto, normal, single |
| Trigger sources | R&S®RTH1004 | logic channels from D0 to D7 CH1, CH2, CH3, CH4 |
| | R&S®RTH1002 | logic channels from D0 to D7 CH1, CH2 |
| Hold off range | time | 8 ns to 10 s, fixed and random |
| | events | 1 to 1 000 000 000 events |

Trigger types

| | | |
|------------|---|--|
| Edge | triggers on specified slope (positive, negative or either) and level | |
| Glitch | triggers on glitches of positive, negative or either polarity that are shorter or longer than specified width | |
| | glitch width | 200 ps to 5000 s (CH1, CH2, CH3, CH4) 800 ps to 5000 s (D0 to D7) |
| Width | triggers on positive or negative pulse of specified width; width can be shorter, longer, inside or outside the interval | |
| | pulse width | 200 ps to 5000 s (CH1, CH2, CH3, CH4) 800 ps to 5000 s (D0 to D7) |
| Pattern | triggers when a logical combination (and, nand, or, nor) of the input channels stays true for a period of time shorter, longer, inside or outside a specified range (requires R&S®RTH-K19 option) | |
| | pattern time | 200 ps to 5000 s (CH1, CH2, CH3, CH4) 800 ps to 5000 s (D0 to D7) |
| State | triggers when a logical combination (and, nand, or, nor) of the input channels stays true at a slope (positive, negative or either) in one selected channel; state values may be high (H), low (L) or don't care (X) (requires R&S®RTH-K19 option) | |
| Data2clock | triggers on setup time and hold time violations between clock and data present on any two input channels; monitored time interval may be specified by the user with a step size of 800 ps in the range from -124 ns to 124 ns around a clock edge (requires R&S®RTH-K19 option) | |

| | | |
|----------------|--|--|
| Serial pattern | triggers on serial data pattern up to 32 bit clocked by one input channel; pattern bits may be high (H), low (L) or don't care (X); clock edge slope may be positive, negative or either (requires R&S®RTH-K19 option) | |
| | max. data rate | < 250 Mbps |
| Timeout | triggers when signal stays high, low or unchanged for a specified period of time (requires R&S®RTH-K19 option) | |
| | timeout | 200 ps to 5000 s (CH1, CH2, CH3, CH4) 800 ps to 5000 s (D0 to D7) |
| Interval | triggers when time between two consecutive edges of same slope (positive or negative) is shorter, longer inside or outside a specified range (requires R&S®RTH-K19 option) | |
| | interval time | 200 ps to 5000 s (CH1, CH2, CH3, CH4) 800 ps to 5000 s (D0 to D7) |
| Protocol | see R&S®RTH-K1 and R&S®RTH-K2 options | |

Waveform measurements

| | | |
|---------------------------|-------------------------------------|---|
| Automatic measurements on | total number of active measurements | 4 |
| | sources | logic channels from D0 to D7 |
| | time based measurements | period, frequency, positive pulse width, negative pulse width, positive duty cycle, negative duty cycle, delay, phase |
| | amplitude based measurements | mean value |
| | count based measurements | count positive pulses, count negative pulses, count rising edges, count falling edges |
| Cursor measurements | sources | logic channels from D0 to D7 |
| | vertical | 2 cursors showing time, time difference and inverse time difference (frequency) |
| | tracking | vertical cursor additionally showing logic level and logic level difference of selected channel |
| | measure | defines gate for automatic measurements |

R&S®RTH-K1

| I²C serial triggering and decoding | | |
|--|-------------------------|--|
| Protocol configuration | bit rate | up to 3.4 Mbps (auto-detected) |
| | auto threshold setup | assisted threshold configuration for I ² C triggering and decoding (software) |
| | device list | associate frame address with symbolic ID (software) |
| Trigger | source (clock and data) | any input channel or logical channel |
| | trigger event setup | start, stop, restart, missing ACK, address, data, address + data |
| | address setup | 7 bit or 10 bit address (value in hex or binary); read, write or either; condition =, ≠ |
| | data setup | data pattern up to 8 byte (hex or binary); condition =, ≠, >, <; offset within frame in range from 0 byte to 4095 byte |
| Decode | source (clock and data) | any input channel, logical channel |
| | display type | decoded bus, tabulated list |
| | color coding | frame, start/restart, address (r/w), data, ACK/NACK, stop, error |
| | address and data format | hex, decimal, octal, binary, ASCII; symbolic names for user-defined subset of addresses (software) |

| SPI serial triggering and decoding | | |
|---|------------------------------|--|
| Protocol configuration | type | 2-wire, 3-wire and 4-wire SPI |
| | bit rate | up to 50 Mbps (auto-detected) |
| | bit order | LSB first, MSB first |
| | word size | 4/8/12/16/20/24/28/32 bit |
| | frame condition | SS, timeout |
| | polarity (MOSI, MISO, SS) | active high, active low |
| | slope (CLK) | rising edge, falling edge |
| | auto threshold setup | assisted threshold configuration for SPI triggering and decoding (software) |
| Trigger | source (MOSI, MISO, SS, CLK) | any input channel or logical channel |
| | trigger event setup | start of frame, end of frame, MOSI, MISO |
| | data setup | data pattern up to 32 bit (hex or binary); condition =, ≠; offset within frame in range from 0 to 4095 bit |
| Decode | source (MOSI, MISO, SS, CLK) | any input channel, logical channel |
| | display type | decoded bus, tabulated list |
| | color coding | Frame start, frame stop, word, error |
| | data format | hex, decimal, octal, binary, ASCII (software) |

R&S®RTH-K2

| UART/RS-232/RS-422/RS-485 serial triggering and decoding | | |
|--|----------------------|--|
| Protocol configuration | bit rate | 300 bps to 20 Mbps |
| | signal polarity | idle low, idle high |
| | number of bits | 5 bit to 9 bit |
| | bit order | LSB first, MSB first |
| | parity | odd, even, none |
| | stop bits | 1, 1.5 or 2 |
| | end of packet | timeout, none |
| | auto threshold setup | assisted threshold configuration for UART triggering and decoding (software) |
| Trigger | source | any input channel or logical channel |
| | trigger event setup | start bit, packet start, data, parity error, stop error, break condition |
| | data setup | data pattern (hex, decimal, octal, binary or ASCII); condition =, ≠, >, <; offset within packet in range 0 to 4095 words |
| Decode | source | any input channel, logical channel |
| | display type | decoded bus, tabulated list |
| | color coding | start, data payload, parity, stop, start error, parity error, stop error |
| | data format | hex, decimal, octal, binary, ASCII |

R&S®RTH-K19

Advanced triggering

Additional trigger types:

TV/video: SDTV and HDTV broadcast standards; pattern, state, runt, slew rate, window, data2clock, serial pattern, timeout, interval and protocol. For more details see Trigger system.

R&S®RTH-K200

Wireless LAN

Interface wireless LAN 802.11 b/g/n 2x2, 2.4 GHz

Operating modes: access point and client mode

Certifications: CE0682

Certification valid for the following countries:

Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom

For operation in countries that are not listed, it is the sole responsibility of the user to ensure that the above certification is accepted and in line with the applicable laws of those countries.

Rohde & Schwarz does not expressly warrant wireless LAN compliance for countries that are not listed above.

R&S®RTH-K200US

Wireless LAN

Interface wireless LAN 802.11 b/g/n 2x2, 2.4 GHz

Operating modes: access point and client mode

Certifications: FCC and IC

Certification valid for Canada and the United States

For operation outside Canada and the US, it is the sole responsibility of the user to ensure that the above certifications are accepted and in line with the applicable laws of that particular country.

Rohde & Schwarz does not expressly warrant wireless LAN compliance for countries that are not listed above.

R&S®RTH-K201

Web interface remote control

Remote operation via Ethernet port or wireless LAN (requires R&S®RTH-K200 or R&S®RTH-K200US option in addition).

Control of the instrument from the web browser on a PC, laptop or handheld device. Full operation of the instrument's touch interface, keys and multifunction wheel via web browser.

Ordering information

| Designation | Type | Order No. |
|---|----------------|--------------|
| Base unit (including standard accessories: one 500 MHz, 10:1, 600 V CAT IV voltage probe for each oscilloscope input channel; one 600 V CAT IV test lead per meter input; compact manual; Lithium-Ion battery pack; power supply with plugs for EU, CH, UK, US, CAN, China, Australia) | | |
| Handheld Digital Oscilloscope, 60 MHz, 2 channels, DMM | R&S®RTH1002 | 1317.5000K02 |
| Handheld Digital Oscilloscope, 60 MHz, 4 channels | R&S®RTH1004 | 1317.5000K04 |
| Hardware options | | |
| Mixed Signal Option, 250 MHz | R&S®RTH-B1 | 5710.0901.02 |
| Bandwidth upgrades | | |
| Upgrade of R&S®RTH1002 oscilloscopes to 100 MHz bandwidth | R&S®RTH-B221 | 1325.9717.02 |
| Upgrade of R&S®RTH1004 oscilloscopes to 100 MHz bandwidth | R&S®RTH-B241 | 1326.0588.02 |
| Upgrade of R&S®RTH1002 oscilloscopes to 200 MHz bandwidth | R&S®RTH-B222 | 1325.9723.02 |
| Upgrade of R&S®RTH1004 oscilloscopes to 200 MHz bandwidth | R&S®RTH-B242 | 1326.0594.02 |
| Upgrade of R&S®RTH1002 oscilloscopes to 350 MHz bandwidth | R&S®RTH-B223 | 1325.9730.02 |
| Upgrade of R&S®RTH1004 oscilloscopes to 350 MHz bandwidth | R&S®RTH-B243 | 1326.0607.02 |
| Upgrade of R&S®RTH1002 oscilloscopes to 500 MHz bandwidth | R&S®RTH-B224 | 1326.0571.02 |
| Upgrade of R&S®RTH1004 oscilloscopes to 500 MHz bandwidth | R&S®RTH-B244 | 1326.0613.02 |
| Hardware bundles | | |
| Combination of instruments and hardware options into a single order number. This is a more convenient alternative to ordering basic models and hardware options separately. | | |
| R&S®RTH1002 basic instrument, no hardware options | R&S®RTH1002 | 1317.5000P02 |
| Combination of R&S®RTH1002, R&S®RTH-B221 | R&S®RTH1012 | 1317.5000P12 |
| Combination of R&S®RTH1002, R&S®RTH-B222 | R&S®RTH1022 | 1317.5000P22 |
| Combination of R&S®RTH1002, R&S®RTH-B223 | R&S®RTH1032 | 1317.5000P32 |
| Combination of R&S®RTH1002, R&S®RTH-B224 | R&S®RTH1052 | 1317.5000P52 |
| R&S®RTH1004 basic instrument, no hardware options | R&S®RTH1004 | 1317.5000P04 |
| Combination of R&S®RTH1004, R&S®RTH-B241 | R&S®RTH1014 | 1317.5000P14 |
| Combination of R&S®RTH1004, R&S®RTH-B242 | R&S®RTH1024 | 1317.5000P24 |
| Combination of R&S®RTH1004, R&S®RTH-B243 | R&S®RTH1034 | 1317.5000P34 |
| Combination of R&S®RTH1004, R&S®RTH-B244 | R&S®RTH1054 | 1317.5000P54 |
| Combination of R&S®RTH1002, R&S®RTH-B1 | R&S®RTH1002MSO | 1317.5000P03 |
| Combination of R&S®RTH1002, R&S®RTH-B221, R&S®RTH-B1 | R&S®RTH1012MSO | 1317.5000P13 |
| Combination of R&S®RTH1002, R&S®RTH-B222, R&S®RTH-B1 | R&S®RTH1022MSO | 1317.5000P23 |
| Combination of R&S®RTH1002, R&S®RTH-B223, R&S®RTH-B1 | R&S®RTH1032MSO | 1317.5000P33 |
| Combination of R&S®RTH1002, R&S®RTH-B224, R&S®RTH-B1 | R&S®RTH1052MSO | 1317.5000P53 |
| Combination of R&S®RTH1004, R&S®RTH-B1 | R&S®RTH1004MSO | 1317.5000P05 |
| Combination of R&S®RTH1004, R&S®RTH-B241, R&S®RTH-B1 | R&S®RTH1014MSO | 1317.5000P15 |
| Combination of R&S®RTH1004, R&S®RTH-B242, R&S®RTH-B1 | R&S®RTH1024MSO | 1317.5000P25 |
| Combination of R&S®RTH1004, R&S®RTH-B243, R&S®RTH-B1 | R&S®RTH1034MSO | 1317.5000P35 |
| Combination of R&S®RTH1004, R&S®RTH-B244, R&S®RTH-B1 | R&S®RTH1054MSO | 1317.5000P55 |
| Software options | | |
| I ² C/SPI Serial Triggering and Decoding | R&S®RTH-K1 | 1325.9969.02 |
| UART/RS-232/RS-422/RS-485 Serial Triggering and Decoding | R&S®RTH-K2 | 1325.9975.02 |
| Advanced Triggering | R&S®RTH-K19 | 1326.0642.02 |
| Wireless LAN, all countries except US and Canada | R&S®RTH-K200 | 1326.0620.02 |
| Wireless LAN, for US and Canada only | R&S®RTH-K200US | 1332.9890.02 |
| Web Interface Remote Control | R&S®RTH-K201 | 1326.0636.02 |
| Probes | | |
| Passive Probe, 500 MHz, isolated, 10:1, 10 MΩ, 12 pF, 600 V CAT IV, 1000 V CAT III | R&S®RT-ZI10 | 1326.1761.02 |
| Passive Probe, 500 MHz, isolated, 100:1, 100 MΩ, 4.6 pF, 600 V CAT IV, 1000 V CAT III | R&S®RT-ZI11 | 1326.1810.02 |
| AC/DC Current Probe, battery-operated, 30 A, 100 kHz | R&S®HZO50 | 3594.6476.02 |
| AC/DC Current Probe, battery-operated, 1000 A, 20 kHz | R&S®HZO501 | 3594.6482.02 |
| PT100 Temperature Probe | R&S®HZ812 | 3594.4321.02 |
| Probe accessories | | |
| Accessory Replacement Set for R&S®RT-ZI10 and R&S®RT-ZI11 | R&S®RT-ZA20 | 1326.1978.02 |
| Extended Accessory Set for R&S®RT-ZI10 | R&S®RT-ZA21 | 1326.1984.02 |
| Safety Test Leads, red and black, silicone, 600 V CAT IV | R&S®RT-ZA22 | 1326.0988.02 |

| Designation | Type | Order No. |
|---|-------------|--------------|
| Accessories | | |
| Soft Carrying Bag | R&S®HA-Z220 | 1309.6175.00 |
| Ethernet Cable, length: 2 m, crossover | R&S®HA-Z210 | 1309.6152.00 |
| USB Cable, length: 1.8 m, standard/mini USB connector | R&S®HA-Z211 | 1309.6169.00 |
| Hard Shell Protective Carrying Case | R&S®RTH-Z4 | 1326.2774.02 |
| Car Adapter | R&S®HA-Z302 | 1321.1340.02 |
| Battery Charger for Lithium-Ion Battery | R&S®HA-Z303 | 1321.1328.02 |
| Replacement Battery | R&S®HA-Z306 | 1321.1334.02 |
| Spare Power Supply, for R&S®RTH incl. power plugs for EU, CH, UK, US, CAN, China, Australia | R&S®RT-ZA14 | 1326.2874.02 |

| | | |
|--|---------|---|
| Service options | | |
| Extended Warranty, one year | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended Warranty, two years | R&S®WE2 | |
| Extended Warranty with Calibration Coverage, one year | R&S®CW1 | |
| Extended Warranty with Calibration Coverage, two years | R&S®CW2 | |

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

Repairs carried out during the contract term are free of charge ⁴. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

Extended warranty with calibration (CW1 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 ⁴ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

⁴ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

Service that adds value

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

About Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, this independent company has an extensive sales and service network and is present in more than 70 countries. The electronics group is among the world market leaders in its established business fields. The company is headquartered in Munich, Germany. It also has regional headquarters in Singapore and Columbia, Maryland, USA, to manage its operations in these regions.

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

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