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

**3** year warranty

ROHDE & SCHWARZ

# CONTENTS

# 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 <, ≤, >, ≥, ±, 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.
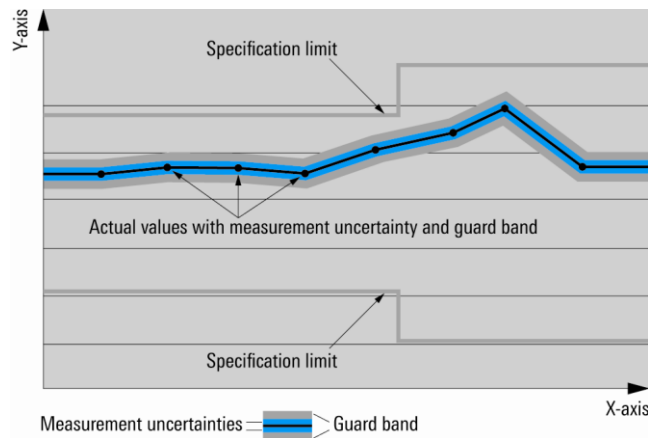


**Specifications without limits**

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 % ǁ 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 | | < 8 Hz (meas.) |
| 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] |
| ADC resolution | | 10 bit |
| 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-ZI10 or R&S®RT-ZI11 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 % × ǀnet offsetǀ + 0.1 div × input sensitivity + 1.5 mV ) (net offset = offset – (position × input sensitivity)) |

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[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 | ±( DC gain accuracy × \|reading – net offset\| + 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 |
| Timebase accuracy | | ±10 ppm |

## Acquisition system

| Maximum realtime sampling rate | R&S®RTH1004 | 1 active channel with 5 Gsample/s |
|---|---|---|
| | | 2 active channels with 2.5 Gsample/s |
| | | 4 active channels with 1.25 Gsample/s |
| | R&S®RTH1002 | 1 active channel with 5 Gsample/s |
| | | 2 active channels with 2.5 Gsample/s |
| | definition: active channel | A channel is active if it is either acquired or used as a trigger source. |
| Maximum acquisition length for fast time bases (less than or equal to 20 ms/div) | 1 active analog channel | 500 ksample (sample acquisition mode) |
| | | 250 ksample (high resolution, peak detect, envelope and average acquisition modes) |
| | 2 active analog channels | 250 ksample for each channel (sample acquisition mode) |
| | | 125 ksample for each channel (high resolution, peak detect, envelope and average acquisition modes) |
| | 3 or 4 active analog channels | 125 ksample for each channel (sample acquisition mode) |
| | | 62.5 ksample for each channel (high resolution, peak detect, envelope and average acquisition modes) |
| Maximum acquisition length for slow time bases (greater than or equal to 50 ms/div) | 1, 2, 3 or 4 active analog channels | 125 ksample for each channel (sample acquisition modes) |
| | | 62.5 ksample for each channel (high resolution, peak detect, envelope and average acquisition modes) |
| 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 polaritiy 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, R&S®RTH-K2, R&S®RTH-K3, R&S®RTH-K9 and R&S®RTH-K10 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 |
| History behavior | requires R&S®RTH-K15 option | store all |

# 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 |

# FFT

| Number of simultaneous spectra | | 1 (always on selected channel) |
|---|---|---|
| Sources | R&S®RTH1004 | CH1, CH2, CH3, CH4 |
| | R&S®RTH1002 | CH1, CH2 |
| FFT sizes | | 64 ksample or 8 ksample |
| Sampling frequency | | equal to sampling rate of current horizontal scale for FFT size of 64 ksample; equal to 1/8th of sampling rate of current horizontal scale for FFT size of 8 ksample |
| Window types | | rectangular, flat-top, Hamming, Hann, Blackman |
| Channel bandwidth | | same as bandwidth limits in vertical system; additionally accessible over FFT menu |
| X-axis scaling | | linear or logarithmic |

## Display characteristics

| Diagram types | Yt, XY, zoom, FFT |
|---|---|
| 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, I²C |
| | R&S®RTH-K2 option | UART |
| | R&S®RTH-K3 option | CAN, LIN |
| | R&S®RTH-K9 option | CAN-FD |
| | R&S®RTH-K10 option | SENT |
| | 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 |
| | counter mode (R&S®RTH-K33 option) | up to 2 counter measurements |
| | R&S®RTH1002 | |
| | oscilloscope mode | up to 4 waveform measurements |
| | multimeter mode | multimeter measurement |
| | counter mode (R&S®RTH-K33 option) | up to 2 counter measurements |
| 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<br>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 or PT500 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 ± 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 ± 5 °C |
| Temperature coefficient | from 0 °C to +18 °C or +28 °C to +50 °C | 0.1 × 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 | ±(0.05 % + 0.05 % of range) |
| | 10 V, 100 V | ±(0.05 % + 0.03 % of range) |
| | 1000 V | ±(0.08 % + 0.03 % of range) |
| AC accuracy (AC coupling) | 1 V, 10 V, 100 V | |
| | 20 Hz to 20 kHz | ±(0.2 % + 0.05 % of range) |
| | 20 kHz to 100 kHz | ±(0.5 % + 0.05 % of range) |
| | 1000 V | |
| | 20 Hz to 10 kHz | ±(0.2 % + 0.05 % of range) |
| Resistance ranges | 10 % overrange | 1.0000 kΩ, 10.000 kΩ, 100.00 kΩ, 1.0000 MΩ, 10.000 MΩ, 100.00 MΩ |
| Resistance accuracy | 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ | ±(0.08 % + 0.03 % of range) |
| | 10 MΩ | ±(0.2 % + 0.05 % of range) |
| | 100 MΩ | ±(1.5 % + 0.1 % of range) |
| Resistance test currents | 1 kΩ | 1.004 mA (nom.) |
| | 10 kΩ | 101.3 µA (nom.) |
| | 100 kΩ | 10.13 µA (nom.) |
| | 1 MΩ | 1.003 µA (nom.) |
| | 10 MΩ | 100.3 nA (nom.) |
| | 100 MΩ | 100.3 nA ‖ 11.11 MΩ (nom.) |
| Continuity range | test current 1.004 mA (nom.), continuous beep when resistance < 10 Ω | 1.0000 kΩ |
| Continuity accuracy | | ±(0.1 % + 0.5 Ω) |
| Diode test ranges | test current 1.004 mA (nom.) | 3.000 V |
| Diode test accuracy | | ±(0.1 % + 3 mV) |
| Capacity ranges | 10 % overrange | 10.000 nF, 100.00 nF, 1.0000 µF, 10.000 µF, 100.00 µF, 1.0000 mF, 10.000 mF |
| Capacity accuracy | | ±(1 % + 0.05 % of range) |
| Temperature (calculated) | with linearization for platinum sensors, in line with EN 60751, range from −200 °C to +850 °C | ±(0.13 % + sensor tolerance + 1 °C) |
| Frequency ranges | | 1000.0 Hz, 10.000 kHz, 100.00 kHz, 1000.0 kHz |
| Frequency accuracy | | ±0.005 % |

## Miscellaneous

| Save/recall | device settings | save and recall on micro SD card or USB drive |
|---|---|---|
| | reference waveforms | save and recall on micro SD card or USB drive |
| | screenshots | save on micro SD card or USB drive |
| | logger records | export to USB drive |
| | 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: <br> • English <br> • German <br> • French <br> • Russian <br> • Simplified Chinese <br> • Traditional Chinese <br> • Japanese <br> • Spanish <br> • Italian <br> • Portuguese <br> • Korean <br> • Czech <br> • Polish |
| Help | online help on the instrument | available language: <br> • English |

## Inputs and outputs

| Channel inputs | R&S®RTH1004 | 4 BNC oscilloscope inputs |
|---|---|---|
| | R&S®RTH1002 | 2 BNC oscilloscope inputs, <br> 2 banana jack meter inputs (4-mm type) |
| Probe compensation output | signal shape | rectangle <br> $V_{low}$ = 0 V, $V_{high}$ = 1 V <br> amplitude 1 V (peak-to-peak) ± 5 % |
| | frequency | 1 kHz ± 5 % |
| USB host interface | | 1 port, type A plug, USB 2.0, <br> 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 |

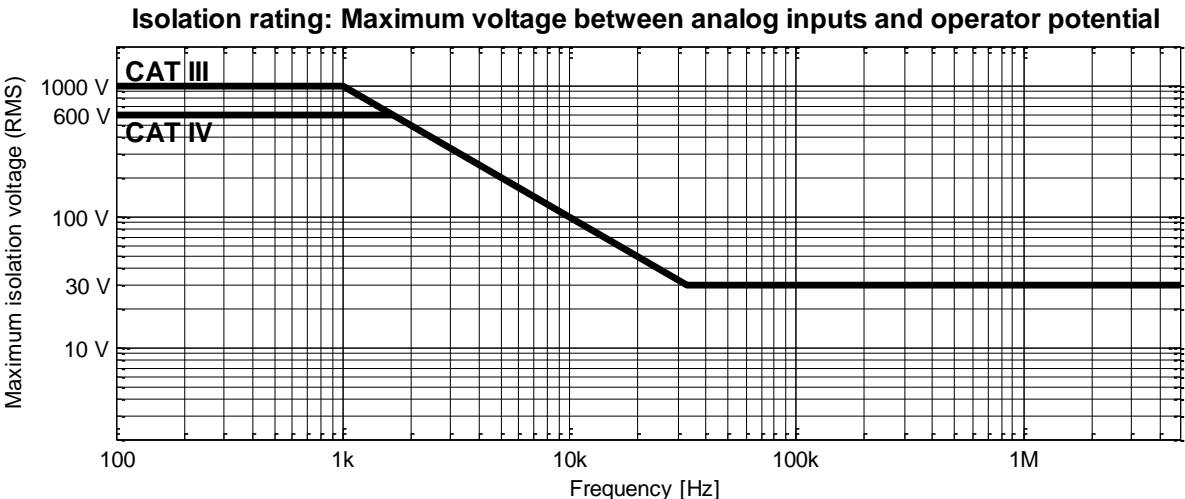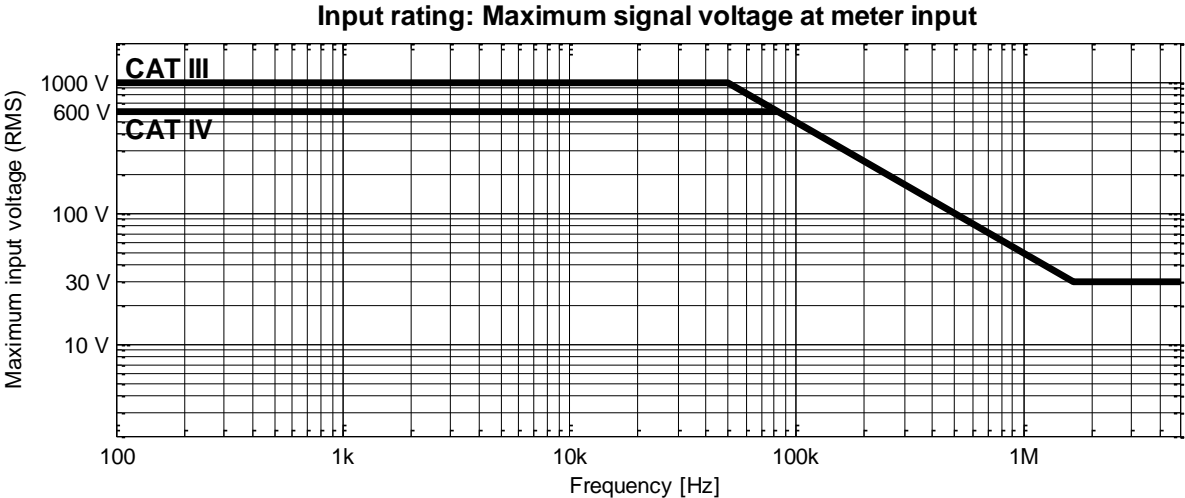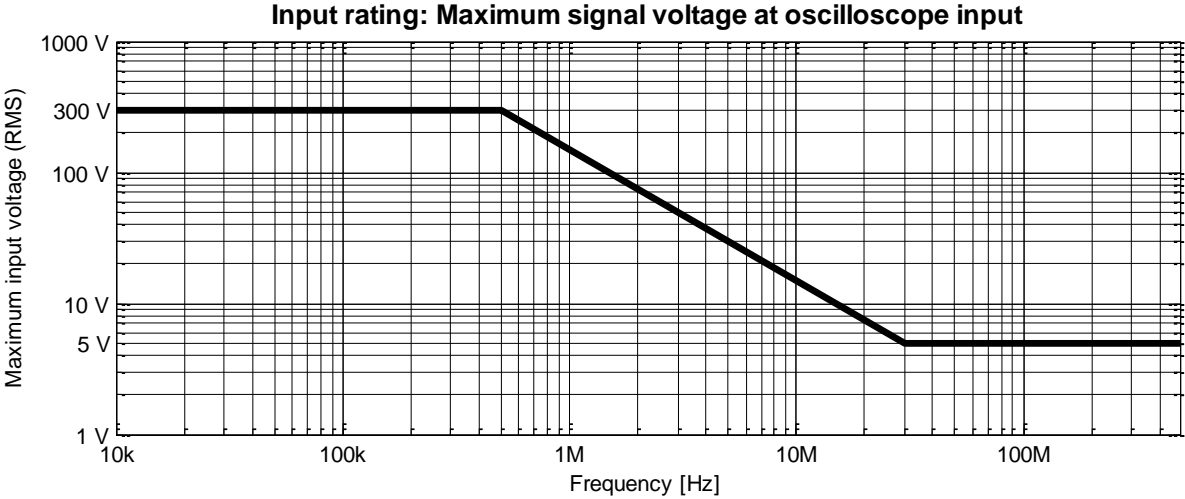| Mechanical resistance | | |
|---|---|---|
| IP rating | | IP51, in line with IEC 60529 |
| Vibration | sinusoidal | 5 Hz to 150 Hz, max. 1.8 g at 55 Hz, 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6; MIL-PRF-28800F, 4.5.5.3.2, class 3 |
| | random | 8 Hz to 650 Hz, acceleration 1.9 g (RMS), 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 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] |

| Certifications | VDE, $_c$CSA$_{US,}$ KC |
|---|---|

| Calibration interval | 1 year |
|---|---|

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

| Safety | in line with<br>• IEC/EN/DIN EN 61010-1,<br>• IEC/EN/DIN EN 61010-2-030,<br>• UL/CSA 61010-1,<br>• UL/CSA 61010-2-030,<br>• IEC/EN/DIN EN 61010-2-033 (R&S®RTH1002),<br>• 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<br>(7.91 in × 11.54 in × 2.91 in) |
| Weight | with battery | 2.4 kg (5.3 lb) (nom.) |

**Input rating: Maximum signal voltage at oscilloscope input**



**Input rating: Maximum signal voltage at meter input**



**Isolation rating: Maximum voltage between analog inputs and operator potential**

# 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

| Maximum realtime sampling rate | | 1.25 Gsample/s on each channel |
|---|---|---|
| Maximum acquisition length for fast time bases (less than or equal to 20 ms/div) | | 125 ksample for each channel |
| Maximum acquisition length for slow time bases (greater than or equal to 50 ms/div) | | 125 ksample for each channel (sample acquisition mode of analog channels even if no analog channel is active) |
| | | 62.5 ksample for each channel (high resolution, peak detect, envelope and average acquisition modes of analog channels even if no analog channel is active) |

### 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 polaritiy 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, R&S®RTH-K2, R&S®RTH-K3, R&S®RTH-K9 and R&S®RTH-K10 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 I²C 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-K3

| CAN triggering and decoding | | |
|---|---|---|
| Protocol configuration | signal type | CAN_H, CAN_L |
| | bit rate | standard bit rate (10/20/33.3/50/83.3/ 100/125/250/500/1000 kbps) or user-defined bit rate in range from 10 kbps to 1 Mbps |
| | sampling point | 10 % to 95 % within bit period |
| | device list | associate frame identifier with symbolic ID, load DBC file content |
| | auto threshold setup | assisted threshold configuration for CAN triggering and decoding (software) |
| Trigger | source | any input channel or logical channel |
| | trigger event setup | start of frame, end of frame, frame type, identifier, identifier + data, error condition (any combination of CRC error, bit stuffing error, form error and ACK error) |
| | identifier setup | frame type (data, remote or both), identifier type (11 bit or 29 bit); condition =, ≠; identifier selectable from label list |
| | data setup | data pattern up to 8 byte (hex or binary); condition =, ≠ |
| Decode | source | any input channel, logical channel |
| | display type | decoded bus, tabulated list |
| | color coding | start of frame, identifier, DLC, data payload, CRC, end of frame, error frame, overload frame, CRC error |
| | data format | hex, decimal, octal, binary, ASCII, symbolic |

| LIN triggering and decoding | | |
|---|---|---|
| Protocol configuration | version | 1.3, 2.x or SAE J602; mixed traffic is supported |
| | bit rate | standard bit rate (1.2/2.4/4.8/9.6/10.417/ 19.2 kbps) or user-defined bit rate in range from 1 kbps to 20 kbps |
| | signal polarity | idle low, idle high |
| | device list | associate frame address with symbolic ID (software) |
| | auto threshold setup | assisted threshold configuration for LIN triggering and decoding (software) |
| Trigger | source | any input channel or logical channel |
| | trigger event setup | start of frame (sync break), identifier, identifier + data, wakeup frame, error condition (any combination of checksum error, parity error and sync field error) |
| | identifier setup | range from 0d to 63d; condition =, ≠; identifier selectable from label list |
| | data setup | data pattern up to 8 byte (hex or binary); condition =, ≠ |
| Decode | source | any input channel, logical channel |
| | display type | decoded bus, tabulated list |
| | color coding | frame, frame identifier, parity, data payload, checksum, error condition |
| | data format | hex, decimal, octal, binary, ASCII |

# R&S®RTH-K9

| CAN-FD triggering and decoding (requires option R&S®RTH-K3 as basis) | | | |
|---|---|---|---|
| Protocol configuration | signal polarity | CAN_H, CAN_L | |
| | standard | ISO, non-ISO (Bosch) | |
| | bit rate | | |
| |     arbitration rate | standard bit rate (10/20/33.3/50/83.3/ 100/125/250/500/1000 kbps) or user-defined bit rate in range from 10 kbps to 1 Mbps | |
| |     data rate | standard bit rate (10/20/33.3/50/83.3/ 100/125/250/500 kbps; 1/1.5/2/4/6/8/10/12/14/15 Mbps) or user-defined bit rate in range from 10 kbps to 15 Mbps | |
| | sampling point | 10 % to 95 % within bit period; independent settings for arbitration phase and data phase | |
| | device list | associate frame identifier with symbolic ID, load DBC file content | |
| | auto threshold setup | assisted threshold configuration for CAN triggering and decoding (software) | |
| Trigger | source | any input channel or logical channel | |
| | trigger event setup | start of frame, end of frame, frame type, identifier, identifier + data, error condition (any combination of CRC error, bit stuffing error, form error, stuff count error and ACK error) | |
| | identifier setup | frame type (data, remote or both), identifier type (11 bit or 29 bit); condition =, ≠; identifier selectable from label list | |
| | FD bits | FDF, BRS and ESI (0, 1, X) | |
| | data setup | data pattern up to 8 byte (hex or binary); condition =, ≠ | |
| Decode | source | any input channel, logical channel | |
| | display type | decoded bus, tabulated list | |
| | color coding | start of frame, identifier, FD bits, DLC, data payload, stuff count, CRC, end of frame, error frame, overload frame, CRC error | |
| | data format | hex, decimal, octal, binary, ASCII, symbolic | |

# R&S®RTH-K10

| SENT triggering and decoding | | |
|---|---|---|
| Protocol configuration | signal polarity | idle low, idle high |
| | clock period (clock tick) | 1 µs to 100 µs |
| | clock tolerance | 0 % to 25 % |
| | data nibbles | 1 to 6 |
| | serial message type | none, short serial message and enhanced serial message |
| | CRC version | legacy (Feb 2008) and v2010, v2016 (latest) |
| | CRC calculation | SAE J2716 standard and TLE 4998X |
| | pause pulse | no, yes, for constant frame length |
| | frame length in clock ticks (applicable only when pause pulse = constant frame length) | 104 to 922 |
| | auto threshold setup | assisted threshold configuration for SENT triggering and decoding (software) |
| Trigger | source | any input channel or logical channel |
| | trigger event setup | calibration or sync, transmission sequence status, transmission sequence status + data, serial message identifier, serial message identifier + data, error condition (any combination of calibration pulse error, pulse period error, transmission sequence CRC error, serial message CRC error and irregular frame length error) |
| | transmission sequence status nibble setup | from 0 to F, condition =, ≠ |
| | transmission sequence data nibbles setup | each nibble value from 0 to F, condition =, ≠ |
| | serial message identifier setup | from 00 to FF, condition =, ≠; identifier selectable from label list |
| | serial message identifier type setup (applicable only when the serial protocol = enhanced serial message in protocol configuration) | 4 bit and 8 bit |
| | serial message data setup | 00 to FF (short serial message) |
| | | 000 to FFF (enhanced serial message with 8 bit ID) |
| | | 0000 to FFFF (enhanced serial message with 4 bit ID) |
| Decode | source | any input channel, logical channel |
| | display type | decoded bus, tabulated list |
| | color coding | transmission sequence: sync/calibration, status, data bits, CRC, pause pulse, calibration pulse error, pulse period error, irregular frame length error and CRC error; serial message: identifier, data, CRC, CRC error |
| | data format | hex, decimal, octal, binary, ASCII, symbolic |

# R&S®RTH-K15

| History and segmented memory | | | | | | | |
|---|---|---|---|---|---|---|---|
| Memory segmentation | function | Provides an adjustable number of memory segments for the acquisition. Segmentation is active on all analog and logic channels and protocol decoding. Combinations with zoom and math functions are supported, but reduce the effectively used number of segments. | | | | | |
| | maximum record length per channel (analog channels in sample acquisition mode) | segments | 1 active analog channel (sample) | 2 active analog channels (sample) | 3 or 4 active analog channels (sample) | digital channels (sample) | serial channel (protocol memory in byte) |
| | | 5000 | 10k | 5k | 2.5k | 2.5k | 5.12k |
| | | 1000 | 50k | 25k | 12.5k | 12.5k | 25.6k |
| | | 100 | 500k | 250k | 125k | 125k | 256k |
| | total memory per channel | | 50M | 25M | 12.5M | 12.5M | 25.6M |
| | maximum record length per channel (analog channels in high resolution, peak detect, envelope and average acquisition modes) | segments | 1 active analog channel (sample) | 2 active analog channels (sample) | 3 or 4 active analog channels (sample) | digital channels (sample) | serial channel (protocol memory in byte) |
| | | 5000 | 5k | 2.5k | 1.25k | 1.25k | 5.12k |
| | | 1000 | 25k | 12.5k | 6.25k | 6.25k | 25.6k |
| | | 100 | 250k | 125k | 62.5k | 62.5k | 256k |
| | total memory per channel | | 25M | 12.5M | 6.25M | 6.25M | 25.6M |
| History mode | function | If active, the history mode provides access to past acquisitions in the segmented memory. | | | | | |
| | timestamp resolution | 1.6 ps | | | | | |
| | time format | relative, absolute | | | | | |
| | history player | replays the recorded waveforms; start and stop waveform can be set; repetition possible | | | | | |

# R&S®RTH-K18

| Spectrum analysis | | |
|---|---|---|
| Spectrum | R&S®RTH1004 | CH1, CH2, CH3, CH4 |
| | R&S®RTH1002 | CH1, CH2 |
| | scaling x-axis | linear or logarithmic frequency axis |
| | scaling y-axis | dBm, dBV, dBA |
| | setup parameters | center frequency and span (linear frequency axis), start and stop frequency (logarithmic frequency axis), resolution bandwidth, vertical scale |
| | span | 1 kHz up to instrument bandwidth |
| | resolution bandwidth | span/10 ≥ RBW ≥ span/1000 |
| | window types | flat-top, Hann, Hamming, Blackman, rectangular |
| | trace types | normal, max. hold, min. hold, average |
| Marker | peak marker search | parameters: threshold, excursion, distance |
| | markers on peak | up to 15 |
| | sources | any spectrum trace |
| | marker values | absolute frequency and amplitude level or frequency and amplitude level relative to reference marker |
| Cursor | sources | any spectrum trace |
| | cursor values | absolute frequency and amplitude level of cursor 1 and absolute frequency and amplitude level of cursor 2 or frequency and amplitude level of cursor 2 relative to cursor 1 |
| | cursor functions | track scaling, coupling, set to screen |

# 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 and interval. For more details see Trigger system. |

# R&S®RTH-K33

| **Frequency counter** | | |
|---|---|---|
| Sources | R&S®RTH1004 | CH1, CH2, CH3, CH4 |
| | R&S®RTH1002 | CH1, CH2 |
| Number of counters | | 2 |
| Number of measurements | | up to 2 using internal clock as reference; 1 using external signal to second counter as reference |
| Frequency range | R&S®RTH1002 and R&S®RTH1004 | 10 Hz up to 66 MHz |
| | R&S®RTH1002 with -B221 option and R&S®RTH1004 with -B241 option | 10 Hz up to 110 MHz |
| | R&S®RTH1002 with -B222 option and R&S®RTH1004 with -B242 option | 10 Hz up to 220 MHz |
| | R&S®RTH1002 with -B223 option and R&S®RTH1004 with -B243 option | 10 Hz up to 385 MHz |
| | R&S®RTH1002 with -B224 option and R&S®RTH1004 with -B244 option | 10 Hz up to 550 MHz |
| Long term statistics | | max., min. and average since (re-)start; max. and min. are time stamped with a resolution of 1 s. |
| Precision (measurement accuracy must also take reference clock accuracy into account) | $f \geq 10$ kHz | 7 digits (meas.) |
| | 1 kHz $\leq f <$ 10 kHz | 6 digits (meas.) |
| | 100 Hz $\leq f <$ 1 kHz | 4 digits (meas.) |
| | 10 Hz $\leq f <$ 100 Hz | 3 digits (meas.) |
| | | (greater precision can be achieved by observing the long term average) |
| Coupling | | Measured channels are automatically switched to AC coupling. |

# R&S®RTH-K34

| Harmonic analysis | | |
|---|---|---|
| Harmonics | R&S®RTH1004 | CH1, CH2, CH3, CH4 |
| | R&S®RTH1002 | CH1, CH2 |
| | setup parameters | fundamental frequency, scale |
| | scaling | linear (percent) or logarithmic (dB) |
| | fundamental frequency | 10 Hz to 1 kHz |
| | harmonics | up to 64 harmonics |
| | statistic | current, max., min. |
| | limits | predefined limits or user defined |
| Display | bar graph | up to 64 harmonics on one screen |
| | displayed harmonics | all harmonics, even harmonics, odd harmonics, odd and multiple of 3, odd and not multiple of 3 or user defined |
| Measurements | signal measurements | fundamental frequency, total harmonic distortion relative to fundamental ($THD_F$) or relative to RMS amplitude ($THD_R$) |
| | harmonic measurements | RMS amplitude and amplitude relative to amplitude of the fundamental, phase angle relative to the fundamental and frequency |
| Fundamental amplitude accuracy | absolute | ±(DC gain accuracy + 1.0 % of the fundamental amplitude) (meas.) |
| | relative (percent) | – |
| Harmonics amplitude accuracy | absolute | ±(DC gain accuracy + 0.2 % of the fundamental amplitude + 1.0 % of the harmonic amplitude) (meas.) |
| | relative (percent) | ±(2.0 % of the relative harmonic amplitude + 0.2 %) (meas.) |
| THD accuracy | $THD_F$ | ±0.8 % absolute (meas.) |
| | $THD_R$ | ±0.8 % absolute (meas.) |
| Frequency accuracy | | ±0.5 % of fundamental frequency (meas.) |

# R&S®RTH-K200

| Wireless LAN |
|---|
| Interface wireless LAN 802.11 b/g/n 2x2, 2.4 GHz<br>Operating modes: access point and client mode<br><br>Certification: CE0682, valid for the following countries:<br>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<br><br>Certification: SRCC, valid for China<br><br>Certification, valid for Japan    R 003-160047<br><br>Complies with IDA Standards DB102020, valid for Singapore<br><br>Certification: WPC, valid for India<br><br>Other countries where operation of R&S®RTH-K200 is permitted: Armenia, Australia, Belarus, Kazakhstan, Kyrgyz Republic, New Zealand, Russian Federation, Taiwan<br><br>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.<br>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<br>Operating modes: access point and client mode<br><br>Certifications: FCC and IC, valid for Canada and the United States<br><br>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.<br>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).<br>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; 4 Gbyte microSD card (installed in the instrument), 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** | | |
| I²C/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 |
| CAN/LIN Serial Triggering and Decoding | R&S®RTH-K3 | 1333.0550.02 |
| CAN-FD Serial Triggering and Decoding (requires active R&S®RTH-K3 option as basis) | R&S®RTH-K9 | 1326.3829.02 |
| SENT Serial Triggering and Decoding | R&S®RTH-K10 | 1326.3835.02 |
| History and Segmented Memory | R&S®RTH-K15 | 1326.1803.02 |
| Spectrum Analysis | R&S®RTH-K18 | 1333.0680.02 |
| Advanced Triggering | R&S®RTH-K19 | 1326.0642.02 |
| Frequency Counter | R&S®RTH-K33 | 1333.0696.02 |
| Harmonic Analysis | R&S®RTH-K34 | 1333.0673.02 |
| 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 |
| 20 kHz, AC/DC, 0.01 V/A and 0.001 V/A, ±200 A and ±2000 A | R&S®RT-ZC02 | 1333.0850.02 |
| 100 kHz, AC/DC, 0.1 V/A, 30 A | R&S®RT-ZC03 | 1333.0844.02 |
| PT100 Temperature Probe | R&S®RT-ZA12 | 1333.0809.02 |

| Designation | Type | Order No. |
|---|---|---|
| **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 |
| **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 |

| Warranty | | |
|---|---|---|
| Base unit | | 3 years |
| All other items [4] | | 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 [5]. 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 [5] 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 [5] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

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[4]  For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

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

## Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

## 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

## Rohde & Schwarz GmbH & Co. KG

www.rohde-schwarz.com

## Rohde & Schwarz training

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