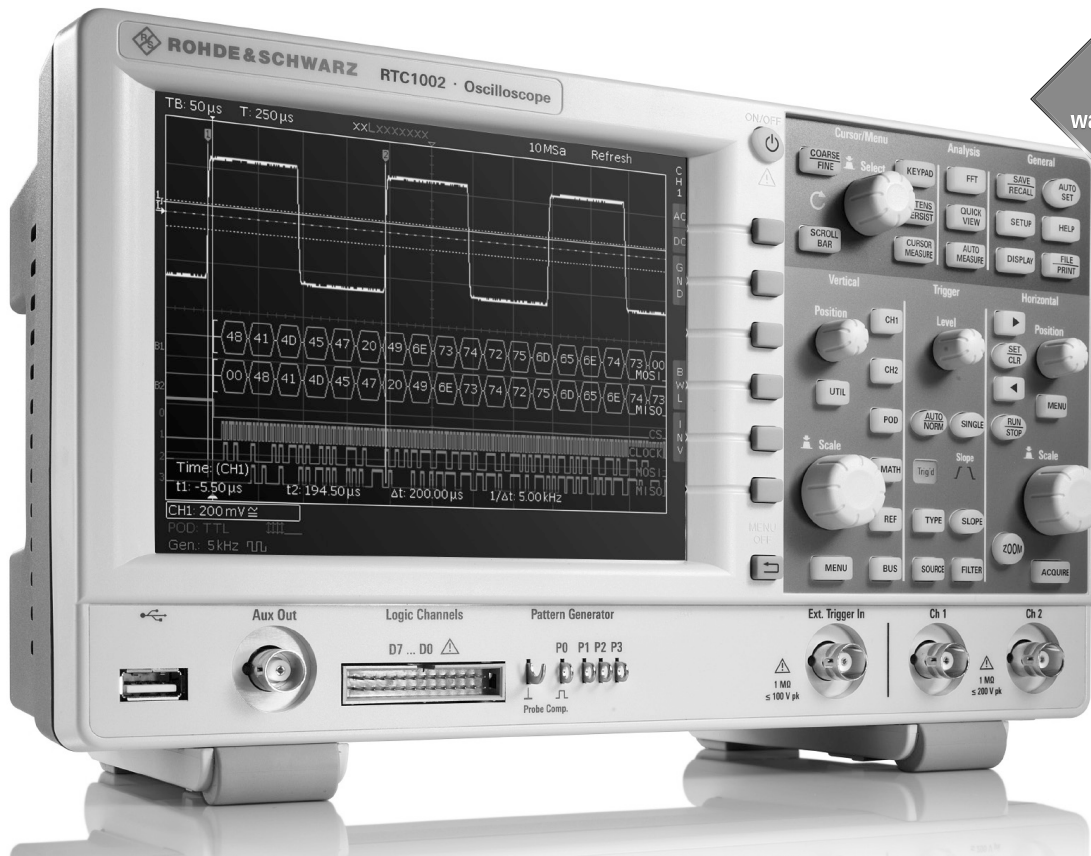


# R&S® RTC1000

## Digital Oscilloscope

## Specifications



3 year  
warranty

# CONTENTS

|                                      |           |
|--------------------------------------|-----------|
| <b>Definitions .....</b>             | <b>3</b>  |
| <b>Base unit.....</b>                | <b>4</b>  |
| Vertical system .....                | 4         |
| Horizontal system .....              | 4         |
| Acquisition system.....              | 4         |
| Trigger system.....                  | 5         |
| Waveform measurements.....           | 6         |
| Digital voltmeter.....               | 6         |
| Frequency counter.....               | 6         |
| Component tester .....               | 6         |
| Mask testing .....                   | 7         |
| Waveform maths .....                 | 7         |
| Frequency analysis (FFT) .....       | 7         |
| Reference signals.....               | 7         |
| Display characteristics .....        | 7         |
| Protocol and logic.....              | 8         |
| Miscellaneous.....                   | 8         |
| Input and outputs.....               | 9         |
| <b>General data .....</b>            | <b>10</b> |
| <b>Options .....</b>                 | <b>11</b> |
| R&S®RTC-B1 .....                     | 11        |
| R&S®RTC-B6 .....                     | 12        |
| R&S®RTC-Bxx bandwidth upgrades ..... | 12        |
| R&S®RTC-K1 .....                     | 13        |
| R&S®RTC-K2 .....                     | 13        |
| R&S®RTC-K3 .....                     | 14        |
| <b>Ordering information .....</b>    | <b>16</b> |

# Definitions

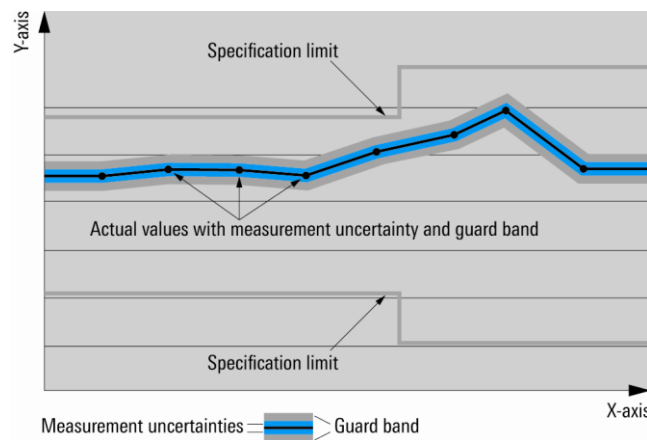
## General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 20 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®RTC1002  | 2 channels  |
| Input impedance  | R&S®RTC1002  | 1 MΩ ± 2 % with 14 pF ± 2 pF (meas.)  |
| Analog bandwidth (–3 dB)   | R&S®RTC1002  | > 50 MHz  |
|  | R&S®RTC1002 with -B220 option  | > 70 MHz  |
|  | R&S®RTC1002 with -B221 option  | > 100 MHz   |
|  | R&S®RTC1002 with -B222 option  | > 200 MHz (≥ 5 mV/div)  |
|  | R&S®RTC1002 with -B223 option  | > 300 MHz (≥ 5 mV/div)  |
| Lower frequency limit (–3 dB)  | at AC coupling   | < 2 Hz (meas.)  |
| Analog bandwidth limits<br>(max. –1.8 dB, min. –3.5 dB)                  |  | 20 MHz (meas.)  |
| Rise time (10 % to 90 %, calculated)                                     | R&S®RTC1002  | < 7 ns  |
|  | R&S®RTC1002 with -B220 option  | < 5 ns  |
|  | R&S®RTC1002 with -B221 option  | < 3.5 ns  |
|  | R&S®RTC1002 with -B222 option  | < 1.75 ns   |
|  | R&S®RTC1002 with -B223 option  | < 1.15 ns   |
| Vertical resolution  |  | 8 bit, up to 16 bit with high-resolution decimation mode                          |
| DC gain accuracy   | maximum operating temperature change of  | ±5 °C after self-alignment  |
|  | all input sensitivities  | ±3 % of full scale  |
| DC measurement accuracy  | after adequate suppression of measurement noise by using high-resolution sampling mode or waveform averaging | ±(DC gain accuracy ×  reading + sensitivity × position setting  + 0.1 div + 1 mV) |
| Input coupling   |  | DC, AC, GND   |
| Input sensitivity  |  | 1 mV/div to 10 V/div  |
| Maximum input voltage  |  | max. 200 V (V <sub>p</sub> ), derates at 20 dB/decade to 5 V (RMS) above 100 kHz  |
| Position range   |  | ±15 div   |
| Channel-to-channel isolation<br>(each channel at same input sensitivity) | input frequency < analog bandwidth   | > 35 dB (meas.)   |

### Horizontal system

|                      |                                       |   |
|----------------------|---------------------------------------|---|
| Timebase range       |                                       | selectable between 1 ns/div and 100 s/div |
| Channel deskew       |                                       | ±120 ns                                   |
| Trigger offset range | minimum                               | memory depth/actual sampling rate         |
|                      | maximum                               | 2 <sup>33</sup> /actual sampling rate     |
| Modes                |                                       | normal, roll ≥ 50 ms/div                  |
| Timebase accuracy    | after delivery/calibration, at +23 °C | ±50 ppm                                   |
|                      | during calibration interval           | ±60 ppm                                   |

### Acquisition system

|                                |   |   |
|--------------------------------|---|---|
| Maximum realtime sampling rate |   | 2 × 1 Gsample/s or 1 × 2 Gsample/s                                  |
| Memory depth per channel       |   | 2 × 1 Msample or 1 × 2 Msample                                      |
| Acquisition modes              | refresh   | first sample in decimation interval                                 |
|                                | peak detect                                     | largest and smallest sample in decimation interval (1 ns detection) |
|                                | high resolution                                 | average value of all samples in decimation interval (up to 16 bit)  |
|                                | envelope  | envelope of acquired waveforms                                      |
|                                | average   | average over a series of acquired waveforms                         |
|                                | filter  | low-pass, adjustable  |
|                                | smooth  |   |
| Number of averaged waveforms   |   | 2 to 1024   |
| Waveform acquisition rate      | dot display, single channel, max. waveform rate | up to 10 000 waveforms/s  |

## Trigger system

|                                    |  |   |
|------------------------------------|--|---|
| Trigger level                      | range (min)  | ±15 div from center of screen   |
| Trigger modes                      |  | auto, normal, single  |
| Hold-off range                     | time   | auto or 50 ns to 10 s   |
| Trigger types                      |  | edge, pulse, video, logic, serial bus   |
| Edge trigger                       | trigger events                                     | rising edge, falling edge, both edges   |
|                                    | sources  | channel 1, channel 2, logic channels from D7 to D0 (with R&S®RTC-B1 option), external trigger input, line                               |
|                                    | coupling (analog channels, external trigger input) | DC, AC, auto level, low pass (attenuates > 5 kHz (meas.)), HF (attenuates < 30 kHz (meas.)), noise reject (enlarges trigger hysteresis) |
| Pulse trigger                      | trigger events                                     | pulse width is smaller, greater, equal, unequal, inside interval, outside interval  |
|                                    | min. pulse width                                   | 8 ns  |
|                                    | max. pulse width                                   | 17.1 s  |
|                                    | polarity   | positive, negative  |
|                                    | sources  | channel 1, channel 2, logic channels from D7 to D0 (with R&S®RTC-B1 option)   |
| Video trigger                      | trigger events                                     | selectable line, all lines, even frame, odd frame, all frames   |
|                                    | supported standards                                | PAL, NTSC, SECAM, PAL-M, SDTV 576i, HDTV 720p, HDTV 1080i, HDTV 1080p   |
|                                    | sources  | channel 1, channel 2  |
|                                    | sync pulse polarity                                | positive, negative  |
| Logic trigger                      | trigger events                                     | logic condition between active channels   |
|                                    | sources  | channel 1, channel 2, logic channels from D7 to D0 (with R&S®RTC-B1 option)   |
|                                    | state of channels                                  | high, low, don't care   |
|                                    | logic between channels                             | and/or  |
|                                    | condition  | true, false   |
|                                    | duration condition                                 | smaller, greater, equal, unequal, inside interval, outside interval, timeout  |
|                                    | min. duration time                                 | 8 ns  |
|                                    | max. duration time                                 | 17.1 s  |
| Serial bus trigger                 | supported standards                                |   |
|                                    | R&S®RTC-K1 option                                  | I <sup>2</sup> C/SPI (two- and three-wire)  |
|                                    | R&S®RTC-K2 option                                  | UART/RS-232/RS-422/RS-485   |
|                                    | R&S®RTC-K3 option                                  | CAN/LIN   |
| Trigger sensitivity                | with DC, AC, LF reject                             |   |
|                                    | input sensitivity ≥ 5 mV/div                       | < 0.8 div (meas.)   |
|                                    | input sensitivity < 5 mV/div                       | < 1.5 div (meas.)   |
|                                    | with HF reject                                     |   |
|                                    | all input sensitivities                            | < 1 div (meas.)   |
|                                    | with noise rejection                               |   |
| External trigger input             | input sensitivity > 5 mV/div                       | < 1.5 div (meas.)   |
|                                    | input impedance                                    | 1 MΩ ± 1 % with 14 pF ± 2 pF (meas.)  |
|                                    | maximum input voltage at 1 MΩ                      | max. 100 V (V <sub>p</sub> ), derates at 20 dB/decade to 5 V (RMS) above 100 kHz  |
|                                    | trigger level                                      | ±5 V  |
|                                    | sensitivity  | 300 mV (V <sub>pp</sub> )   |
|                                    | input coupling                                     | DC, AC  |
| Trigger output (Aux Out connector) | functionality                                      | A pulse is generated for every acquisition trigger event.   |
|                                    | output voltage                                     |   |
|                                    | at high impedance                                  | 0 V to 3.0 V  |
|                                    | pulse polarity                                     | high active   |
|                                    | output delay                                       | depends on trigger settings   |
|                                    | pulse width  | > 150 ns (trigger event)<br>> 0.5 μs (mask violation)   |

## Waveform measurements

|                        |  |  |
|------------------------|--|--|
| Automatic measurements | measurements on channels,<br>math waveforms, reference waveforms | burst width, count positive pulses, count negative pulses, count falling edges, count rising edges, mean value, RMS, peak-to-peak, peak+, peak-, frequency, period, amplitude, crest factor, top level, base level, pos overshoot, neg overshoot, pulse width+, pulse width-, duty cycle+, duty cycle-, rise time (80 %, 90 %), fall time (80 %, 90 %), delay, phase, standard deviation |
|                        | measurements on trigger signal                                   | trigger period, trigger frequency implemented by means of six-digit hardware counter   |
|                        | number of active measurements                                    | 6  |
| Cursor measurements    | measurements on channels,<br>math waveforms, reference waveforms | voltage (V1, V2, $\Delta V$ ), time (t1, t2, $\Delta t$ , $1/\Delta t$ ), ratio X, ratio Y, pulse and edge count (pos./neg.), peak values ( $V_{pp}$ , $V_{p+}$ , $V_{p-}$ ), $V_{mean}$ , $V_{RMS}$ , standard deviation, duty cycle (pos./neg.), rise/fall time (80 %, 90 %), crest factor, voltage at the cursor position   |
|                        | functions  | x and y tracking, coupling of cursors, set to screen, set to trace, automatic source   |
| Quick measurements     | function   | fast overview of measurements from one channel, some measurements displayed with result lines in diagram   |
|                        | sources  | channel 1, channel 2   |
|                        | measurements displayed in diagram                                | mean value, max. peak, min. peak, rise time, fall time   |
|                        | numerically displayed measurements                               | RMS, peak-to-peak voltage, period, frequency, plus 6 automatic measurements selectable   |
| Marker                 |  | up to 8 freely positionable markers for easy navigation  |

## Digital voltmeter

|                        |  |   |
|------------------------|--|---|
| Accuracy               |  | related to channel settings of voltmeter source |
| Measurements           |  | DC, AC+DC <sub>RMS</sub> , AC <sub>RMS</sub>    |
| Sources                |  | channel 1, channel 2                            |
| Number of measurements |  | up to 4   |
| Resolution             |  | up to 3 digits                                  |

## Frequency counter

|                        |  |  |
|------------------------|--|--|
| Measurements           |  | frequency, period  |
| Sources                |  | trigger signal source (edge, video): line, channel 1, channel 2, external trigger in |
| Number of measurements |  | 2  |
| Resolution             |  | 5 digits   |
| Frequency range        |  | 0.03 Hz to bandwidth of scope (limited by bandwidth of trigger filter)               |

## Component tester

|  |                                     |                          |
|--|-------------------------------------|--------------------------|
| Parameters                                     |                                     | voltage (X), current (Y) |
| Selectable frequencies                         |                                     | 50 Hz, 200 Hz            |
| Component tester output<br>(Aux Out connector) | max. output voltage (open circuit)  | 10 V ( $V_p$ ) $\pm$ 5 % |
|  | max. output current (short circuit) | 10 mA $\pm$ 10 %         |
|  | reference potential                 | ground                   |

## Mask testing

|                           |  |   |
|---------------------------|--|---|
| Sources                   |  | channel 1, channel 2  |
| Mask definition           |  | acquired waveform with user-defined tolerance, can be stored and restored                       |
| Result statistics         |  | completed acquisitions, passed and failed acquisitions (absolute and in percent), test duration |
| Actions on mask violation |  | sound, acquisition stop, screenshot, save waveform, pulse out (Aux Out connector)               |

## Waveform maths

|             |  |  |
|-------------|--|--|
| Quick math  | number of math waveforms               | 1  |
|             | functions                              | addition, subtraction, multiplication, division  |
|             | sources                                | channel 1, channel 2   |
| Mathematics | number of formula sets                 | 5  |
|             | number of equations per set            | 5  |
|             | simultaneous display of math waveforms | 4  |
|             | functions                              | addition, subtraction, multiplication, division, min./max., square, square root, absolute value, pos./neg. wave, reciprocal, inverse, log10/ln, derivation, integration, filter (lowpass/highpass) |
|             | sources                                | channel 1, channel 2, math, user defined constants   |

## Frequency analysis (FFT)

|                     |  |   |
|---------------------|--|---|
| Setup parameters    |  | center frequency, frequency span, vertical scale, vertical position |
| Length              |  | 2 ksample to 128 ksample  |
| Window              |  | Hanning, Hamming, Blackman, rectangular, flat top                   |
| Waveform arithmetic |  | none, envelope, average (selectable 2 to 512)                       |
| Scale               |  | dBm, dBV, $V_{eff}$   |
| Cursor              |  | 2 horizontal cursors, previous/next peak search                     |
| Sources             |  | channel 1, channel 2  |

## Reference signals

|   |  |  |
|---|--|--|
| Simultaneous display of reference waveforms |  | 4  |
| Sources                                     |  | analog and digital channels, math, reference |

## Display characteristics

|                      |  |   |
|----------------------|--|---|
| Diagram types        |  | Yt, XY, zoom, FFT, component tester   |
| XY mode              |  | parallel display of XY diagram and Yt diagrams of input signals for X, Y                  |
| Zoom                 |  | horizontal zoom with fast navigation, split screen with overview signal and zoomed signal |
| FFT mode             |  | split screen with overview signal and dedicated frequency display                         |
| Interpolation        |  | $\sin(x)/x$ , linear, sample & hold   |
| Waveform display     |  | lines, dots only  |
| Persistence          |  | 50 ms to 9.6 s, infinite  |
| Special display mode |  | inverse brightness, false colors  |
| Diagram grid         |  | lines, reticle, none  |
| Virtual screen       |  | 20 divisions  |

## Protocol and logic

|            |                            |   |
|------------|----------------------------|---|
| Bus decode | number of bus signals      | 2 <sup>1</sup>  |
|            | bus types                  | parallel, parallel clocked  |
|            | R&S®RTC-K1 option          | SSPI, SPI, I <sup>2</sup> C                                       |
|            | R&S®RTC-K2 option          | UART/RS-232/RS-422/RS-485   |
|            | R&S®RTC-K3 option          | CAN, LIN  |
|            | display types              | decoded bus, logical signal, frame table (depends on decoded bus) |
|            | data format of decoded bus | hex, decimal, binary  |

## Miscellaneous

|                |                     |  |
|----------------|---------------------|--|
| Save/recall    | device settings     | save and recall on internal file system or USB flash drive or on a PC via web interface  |
|                | reference waveforms | save and recall on internal file system or USB flash drive or on a PC via web interface  |
|                | waveforms           | save on USB flash drive or download and save on a PC via web interface<br>available file formats: BIN, CSV, TXT float (MSB/LSB first)  |
|                | screenshots         | save on USB flash drive or download and save on a PC via web interface,<br>available file formats: BMP, PNG, GIF   |
| Print button   |                     | configurable button, actions on press: <ul style="list-style-type: none"> <li>• save device settings</li> <li>• save waveforms</li> <li>• save screenshot</li> <li>• save screenshot and setup</li> </ul>                    |
| Menu languages |                     | available menu languages: <ul style="list-style-type: none"> <li>• English</li> <li>• German</li> <li>• French</li> <li>• Russian</li> <li>• Simplified Chinese</li> <li>• Traditional Chinese</li> <li>• Spanish</li> </ul> |
| Help           |                     | online help, available languages: <ul style="list-style-type: none"> <li>• English</li> <li>• German</li> <li>• French</li> <li>• Simplified Chinese</li> <li>• Spanish</li> </ul>   |

<sup>1</sup> If a bidirectional bus is used (e.g. UART RX/TX or SPI MOSI/MISO), two bus decoders are occupied.



## Input and outputs

|  |  |  |
|--|--|--|
| <b>Front</b>                                 |  |  |
| Channel inputs                               |  | BNC,<br>for details see Vertical system                                    |
| External trigger input                       | trigger in                                       | BNC, for details see Trigger system  |
|  | additional digital channel                       | for level see Trigger system   |
| Aux Out                                      | trigger out                                      | for details see Trigger system   |
|  | mask violation                                   | pulse  |
|  | waveform generator (with R&S®RTC-B6 option only) | BNC, for details see Waveform generator                                    |
| Probe compensation output                    | signal shape rectangle                           | $V_{\text{low}} = 0 \text{ V}$ , $V_{\text{high}} = 2.4 \text{ V}$ (meas.) |
|  | frequency  | 1 kHz and 1 MHz with probe adjust wizard                                   |
| Pattern source (with R&S®RTC-B6 option only) | P3 to P0 (with R&S®RTC-B6 option only)           | 4 lugs, for details see 4-bit pattern generator                            |
| Digital channel inputs                       | D7 to D0   | with R&S®RTC-B1 option only  |
| Ground lug                                   |  | connected to ground  |
| USB host interface                           |  | 1 port, type A plug, version 2.0, USB drives only                          |
| <b>Rear</b>                                  |  |  |
| USB device interface                         |  | 1 port, type B plug, version 2.0   |
| Ethernet interface                           |  | 1 port, 1 Gbit   |
| Security slot                                |  | for standard Kensington style lock   |

## General data

|                                 |                             |   |
|---------------------------------|-----------------------------|---|
| <b>Display</b>                  |                             |   |
| Type                            |                             | 6.5" VGA color display  |
| Resolution                      |                             | 640 × 480 pixel (VGA)   |
| <b>Temperature</b>              |                             |   |
| Temperature loading             | operating temperature range | +5 °C to +40 °C   |
|                                 | storage temperature range   | −20 °C to +70 °C  |
| Climatic loading                |                             | +25° C/+40 °C at 85 % rel. humidity cyclic,<br>in line with IEC 60068-2-30  |
| <b>Altitude</b>                 |                             |   |
| Operating                       |                             | up to 3000 m above sea level  |
| Nonoperating                    |                             | up to 4600 m above sea level  |
| <b>Mechanical resistance</b>    |                             |   |
| Vibration                       | sinusoidal                  | 5 Hz to 150 Hz, max. 1.8 g at 55 Hz;<br>0.5 g from 55 Hz to 150 Hz,<br>in line with EN 60068-2-6,<br>MIL-PRF-28800F, 4.5.5.3.2 sinusoidal<br>vibration, class 3 and 4   |
|                                 | random                      | 10 Hz to 300 Hz,<br>acceleration 1.2 g (RMS),<br>in line with EN 60068-2-64,<br>MIL-PRF-28800F, 4.5.5.3.1 random<br>vibration, class 3 and 4  |
| Shock                           |                             | 40 g shock spectrum,<br>in line with MIL-STD-810E, method<br>no. 516.4, procedure I,<br>MIL-PRF-28800F, 4.5.5.4.1 functional<br>shock, 30 g, 11 ms, halfsine  |
| Maximum of sound pressure level |                             | 30.4 dB (A) at 0.3 m distance<br>(at +23.6 °C, 931 mbar (hPa), 39 % rel.<br>humidity), in line with EN ISO 3744   |
| <b>EMC</b>                      |                             |   |
| RF emission                     |                             | in line with CISPR 11/EN 55011 group 1<br>class A (for a shielded test setup);<br>the instrument complies with the emission<br>requirements stipulated by EN 55011,<br>EN 61326-1 and EN 61326-2-1 class A,<br>making the instrument suitable for use in<br>industrial environments |
| Immunity                        |                             | in line with IEC/EN 61326-1 table 2,<br>immunity test requirements for industrial<br>environments <sup>2</sup>  |
| Certifications                  |                             | VDE, cCSA <sub>US</sub>   |
| Calibration interval            |                             | 1 year  |
| <b>Power supply</b>             |                             |   |
| AC supply                       |                             | 100 V to 240 V at 50 Hz to 60 Hz,<br>100 V to 120 V at 400 Hz   |
| Power consumption               |                             | max. 25 W   |
| Safety                          |                             | in line with IEC 61010-1, EN 61010-1,<br>CAN/CSA-C22.2 No. 61010-1,<br>UL 61010-1   |
| <b>Mechanical data</b>          |                             |   |
| Dimensions                      | W × H × D                   | 285 × 175 × 140 mm<br>(11.22 in × 6.89 in × 5.51 in)  |
| Weight                          | without options (nom.)      | 1.7 kg (3.75 lb)  |

<sup>2</sup> Test criterion is displayed noise level within ±1 div for input sensitivity of 5 mV/div.

# Options

## R&S®RTC-B1

|  |  |   |
|--|--|---|
| <b>Mixed signal option</b> , additional 8 logic channels |  |   |
| Vertical system  |  |   |
| Input channels   |  | 8 logic channels (D7 to D0)   |
| Arrangement of input channels                            |  | assignment of the logic probes to the channels D7 to D0   |
| Input impedance  |  | 100 k $\Omega$ $\pm$ 2 %    ~4 pF (meas.) at probe tips   |
| Maximum input frequency                                  | signal with minimum input voltage swing and hysteresis setting: normal | 300 MHz (meas.)   |
| Maximum input voltage                                    |  | $\pm$ 40 V ( $V_p$ )  |
| Minimum input voltage swing                              | hysteresis small   | 300 mV ( $V_{pp}$ ) (meas.)   |
|  | hysteresis medium  | 800 mV ( $V_{pp}$ ) (meas.)   |
|  | hysteresis large   | 1500 mV ( $V_{pp}$ ) (meas.)  |
| Threshold groups   |  | D7 to D0  |
| Threshold level  | range  | -2 V to 8 V in 10 mV steps  |
|  | predefined   | CMOS, TTL, ECL  |
| Threshold accuracy                                       |  | $\pm$ (100 mV + 3 % of threshold setting) (meas.)   |
| Comparator hysteresis                                    |  | small, medium, large  |
| Horizontal system  |  |   |
| Channel-to-channel skew                                  |  | max. 1 ns (meas.)   |
| Acquisition system                                       |  |   |
| Sampling rate  |  | 1 Gsample/s for every channel   |
| Memory depth   |  | 1 Msample for every channel   |
| Trigger system   |  | see Trigger system  |
| Waveform measurements                                    |  |   |
| Measurement sources                                      |  | all channels from D7 to D0  |
| Automatic measurements                                   |  | positive pulse width, negative pulse width, period, frequency, burst width, delay, phase, positive duty cycle, negative duty cycle, positive pulse count, negative pulse count, rising edge count, falling edge count, value at the cursor position |
| Additional cursor function                               |  | display of decoded parallel bus value at the cursor position  |
| Display characteristics                                  |  |   |
| Channel activity display                                 |  | Independent of the scope acquisition, the state (stays low, stays high or toggles) of the channels from D7 to D0 is displayed.  |

**R&S®RTC-B6**

|                                |                   |   |
|--------------------------------|-------------------|---|
| <b>Waveform generator</b>      |                   |   |
| Resolution                     |                   | 8 bit   |
| Sample rate                    |                   | 978 ksample/s   |
| Amplitude                      | level             |   |
|                                | high-Z            | 60 mV to 6 V ( $V_{pp}$ )                                   |
|                                | accuracy          | 3 % at 1 kHz  |
| DC offset                      | level             |   |
|                                | high-Z            | $\pm 3$ V   |
|                                | accuracy          | 3 % or $\pm 25$ mV (meas.)                                  |
| Sine/rectangle                 | frequency         | 0.1 Hz to 50 kHz  |
| Pulse                          | frequency         | 0.1 Hz to 10 kHz  |
| Ramp/triangle                  | frequency         | 0.1 Hz to 10 kHz  |
| <b>4-bit pattern generator</b> |                   |   |
| Functions                      |                   | bus signal source 4-bit counter, programmable 4-bit pattern |
| Amplitude                      |                   | approx. 2.5 V ( $V_{pp}$ )                                  |
| Bus signal source              |                   | SPI, I <sup>2</sup> C, UART, CAN, LIN                       |
|                                | bit rate          |   |
|                                | UART              | 9600 bit/s, 115.2 kbit/s, 1 Mbit/s                          |
|                                | SPI               | 100 kbit/s, 250 kbit/s, 1Mbit/s                             |
|                                | I <sup>2</sup> C  | 100 kbit/s, 400 kbit/s, 1000 kbit/s, 3400 kbit/s            |
|                                | CAN               | 50 kbit/s, 100 kbit/s, 1 Mbit/s                             |
| 4-bit counter                  | LIN               | 9.6 kbit/s, 10.417 kbit/s, 19 kbit/s                        |
|                                | frequency         | 100 mHz to 50 MHz   |
|                                | duty cycle        | 1 % to 99 %   |
| Programmable pattern           | sample time       | 20 ns to 42 s, up/down                                      |
|                                | memory depth      | 2048 sample   |
|                                | pattern idle time | 20 ns to 42 s   |

**R&S®RTC-Bxx bandwidth upgrades**

| Option       | Model       | Analog bandwidth upgrade from 50 MHz to |
|--------------|-------------|---|
| R&S®RTC-B220 | R&S®RTC1002 | 70 MHz                                  |
| R&S®RTC-B221 | R&S®RTC1002 | 100 MHz                                 |
| R&S®RTC-B222 | R&S®RTC1002 | 200 MHz                                 |
| R&S®RTC-B222 | R&S®RTC1002 | 300 MHz                                 |

**R&S®RTC-K1**

| <b>I<sup>2</sup>C triggering and decoding</b> |                                    |  |
|---|------------------------------------|--|
| Bus configuration                             | sources for SCL and SDA            | channel 1, channel 2, logic channels from D7 to D0   |
|   | bit rate                           | up to 10 Mbps  |
|   | size of address                    | 7 bit or 10 bit  |
|   | size of data                       | 8 bit  |
|   | label list                         | associate frame identifier with symbolic ID  |
| Trigger                                       | trigger events                     | start, stop, restart, missing acknowledge, address (7 bit or 10 bit), data, address and data     |
|   | offset for trigger on data         | 0 data byte to 4095 data byte  |
|   | data pattern width                 | up to 3 sequential data byte   |
| Decode  | displayed signals                  | bus signal, logic signal or both   |
|   | color coding of bus signal         | address, data, start, stop, ACK, NACK; error and trigger event are displayed in different colors |
|   | displayed format of address        | hex  |
|   | displayed format of data           | ASCII, binary, decimal or hex  |
| <b>SPI triggering and decoding</b>            |                                    |  |
| Bus configuration                             | sources for CS, CLK, data          | channel 1, channel 2, logic channels from D7 to D0, extern input (only CS)                       |
|   | bit rate                           | up to 25 Mbps  |
|   | chip select (CS)                   | active low, active high or missing (two-wire SPI)  |
|   | clock (CLK) slope                  | rise or fall   |
|   | data symbol size                   | 1 bit to 32 bit  |
|   | idle time for two-wire SPI         | < 1 ms   |
| Trigger                                       | trigger events                     | start of frame, end of frame, bit number, data pattern   |
|   | selectable bit number              | 0 to 4095  |
|   | offset for trigger on data pattern | 0 to 4095 bit  |
|   | data pattern size                  | 1 bit to 32 bit  |
| Decode  | displayed signals                  | bus signal, logic signal or both   |
|   | color coding of bus signal         | data, start, stop; error and trigger event are displayed in different colors                     |
|   | displayed format of data           | ASCII, binary, decimal or hex  |
|   | data decoding                      | MSB or LSB first   |

**R&S®RTC-K2**

| <b>UART/RS-232/RS-422/RS-485 triggering and decoding</b> |                                   |  |
|--|-----------------------------------|--|
| Bus configuration  | source for data                   | channel 1, channel 2, logic channels from D7 to D0   |
|  | bit rate                          | 300/600/1200/2400/4800/9600/14400/19200/28800/38400/56000/57600/115200 bps<br>128 kbps/256 kbps/1 Mbps or user-selectable up to 3 Mbps |
|  | end of frame                      | timeout, none  |
|  | signal polarity                   | idle low, idle high  |
|  | data symbol size                  | 5 bit to 9 bit   |
|  | parity                            | none, even or odd  |
|  | stop bits                         | 1, 1.5 or 2  |
|  | trigger events                    | start bit, start of frame, symbol number, any symbol, pattern of symbols, parity error, frame error, break                             |
| Trigger  | offset for trigger on data symbol | 0 to 4095 symbols  |
|  | data symbol pattern width         | 1 to floor (32/symbol size) symbols  |
|  | displayed signals                 | bus signal, logic signal or both   |
| Decode   | color coding of bus signal        | data, start, stop; error and trigger event are displayed in different colors   |
|  | displayed format of data          | ASCII, binary, decimal or hex  |

**R&S®RTC-K3**

| <b>CAN triggering and decoding</b> |                            |  |
|------------------------------------|----------------------------|--|
| Bus configuration                  | signal type                | CAN_H, CAN_L   |
|                                    | sources                    | channel 1, channel 2, logic channels from D7 to D0   |
|                                    | bit rate                   | 10/20/33.3/50/83.3/100/125/250/500/1000 kbps or user-selectable in range from 100 bps to 2 Mbps  |
|                                    | sampling point             | 10 % to 90 % within bit period   |
|                                    | label list                 | associate frame identifier with symbolic ID  |
| Trigger                            | trigger events             | start 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                             | displayed signals          | bus signal, logic signal or both   |
|                                    | color coding of bus signal | start of frame, identifier, DLC, data payload, CRC, ACK, end of frame, error frame, overload frame, CRC error, bit stuffing error, ACK error                       |
|                                    | displayed format of data   | hex, decimal, binary, ASCII  |
|                                    | frame table                | decode results displayed as tabulated list, errors highlighted in red; three table positions (top, bottom, full screen); frame navigation; data export as CSV file |
| Search                             | search events              | frame, error, identifier, identifier + data, identifier + error  |
|                                    | frame event setup          | start of frame, end of frame, overload frame, error frame, data ID 11 bit, data ID 29 bit, remote ID 11 bit, remote ID 29 bit                                      |
|                                    | error event setup          | 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 =, ≠, >, <  |
|                                    | event table                | search results displayed as tabulated list; event navigation   |

| <b>LIN triggering and decoding</b> |                            |  |
|------------------------------------|----------------------------|--|
| Bus configuration                  | version                    | 1.3, 2.x or SAE J602; mixed traffic is supported   |
|                                    | bit rate                   | 1.2/2.4/4.8/9.6/10.417/19.2 kbps or user-selectable in range from 1 kbps to 5 Mbps   |
|                                    | polarity                   | active high or active low  |
|                                    | label list                 | associate frame identifier with symbolic ID  |
| Trigger                            | source                     | any input channel  |
|                                    | trigger events             | 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                             | displayed signals          | bus signal, logic signal or both   |
|                                    | color coding of bus signal | frame, frame identifier, parity, data payload, checksum, error condition   |
|                                    | displayed format of data   | hex, decimal, binary, ASCII  |
|                                    | frame table                | decode results displayed as tabulated list, errors highlighted in red; three table positions (top, bottom, full screen); frame navigation; data export as CSV file |
| Search                             | search events              | frame, error, identifier, identifier + data, identifier + error  |
|                                    | frame event setup          | start of frame, wake up  |
|                                    | error event setup          | 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 =, ≠, >, <  |
|                                    | event table                | search results displayed as tabulated list; event navigation   |

## Ordering information

| Designation   | Type          | Order No.    |
|---|---------------|--------------|
| <b>Choose your R&amp;S®RTC1000 base model</b>   |               |              |
| Digital Oscilloscope, 50 MHz, 2 channels  | R&S®RTC1002   | 1335.7500.02 |
| Base unit (including standard accessories: R&S®RT-ZP03 passive probe per channel, power cord, R&S®RT-ZA11 adapter BNC/banana, getting started manual and safety instructions) |               |              |
| <b>Choose your bandwidth upgrade</b>  |               |              |
| Upgrade of R&S®RTC1002 to 70 MHz bandwidth  | R&S®RTC-B220  | 1335.7300.02 |
| Upgrade of R&S®RTC1002 to 100 MHz bandwidth   | R&S®RTC-B221  | 1335.7317.02 |
| Upgrade of R&S®RTC1002 to 200 MHz bandwidth   | R&S®RTC-B222  | 1335.7275.02 |
| Upgrade of R&S®RTC1002 to 300 MHz bandwidth   | R&S®RTC-B223  | 1335.7323.02 |
| <b>Choose your options</b>  |               |              |
| Mixed Signal Upgrade for non-MSO models, 250 MHz  | R&S®RTC-B1    | 1335.7281.02 |
| Arbitrary Waveform Generator  | R&S®RTC-B6    | 1335.7298.02 |
| I²C/SPI Serial Triggering and Decoding  | R&S®RTC-K1    | 1335.7230.02 |
| UART/RS-232/RS-422/RS-485 Serial Triggering and Decoding  | R&S®RTC-K2    | 1335.7246.02 |
| CAN/LIN Serial Triggering and Decoding  | R&S®RTC-K3    | 1335.7252.02 |
| Application Bundle  | R&S®RTC-PK1   | 1335.7330.02 |
| <b>Choose your additional probes</b>  |               |              |
| Single-ended passive probes   |               |              |
| 300 MHz, 10 MHz, 10:1/1:1, 10 MΩ/1 MΩ, 400 V, 12 pF/82 pF   | R&S®RT-ZP03   | 3622.2817.02 |
| 500 MHz, 500 MHz, 10:1, 300 V (RMS), 10 pF  | R&S®RT-ZP05   | 3623.2927.02 |
| 500 MHz, 10 MΩ, 10:1, 400 V, 9.5 pF   | R&S®RTM-ZP10  | 1409.7708.02 |
| 38 MHz, 1 MΩ, 1:1, 55 V, 39 pF  | R&S®RT-ZP1X   | 1333.1370.02 |
| High-voltage single-ended passive probes  |               |              |
| 250 MHz, 100:1, 100 MΩ, 850 V, 6.5 pF   | R&S®RT-ZH03   | 1333.0873.02 |
| 400 MHz, 100:1, 50 MΩ, 1000 V, 7.5 pF   | R&S®RT-ZH10   | 1409.7720.02 |
| 400 MHz, 1000:1, 50 MΩ, 1000 V, 7.5 pF  | R&S®RT-ZH11   | 1409.7737.02 |
| Current probes  |               |              |
| 20 kHz, AC/DC, 10 A/1000 A  | R&S®RT-ZC02   | 1333.0850.02 |
| 100 kHz, AC/DC, 30 A  | R&S®RT-ZC03   | 1333.0844.02 |
| 10 MHz, AC/DC, 150 A  | R&S®RT-ZC10   | 1409.7750.02 |
| 100 MHz, AC/DC, 30 A  | R&S®RT-ZC20   | 1409.7766.02 |
| 120 MHz, AC/DC, 5 A   | R&S®RT-ZC30   | 1409.7772.02 |
| Power Supply for current probes   | R&S®RT-ZA13   | 1409.7789.02 |
| Active differential probes  |               |              |
| 100 MHz, 1000:1/100:1, 8 MΩ, 1000 V (RMS), 3.5 pF   | R&S®RT-ZD01   | 1422.0703.02 |
| 200 MHz, 10:1, 1 MΩ, 20 V diff., 3.5 pF   | R&S®RT-ZD02   | 1333.0821.02 |
| <b>Choose your accessories</b>  |               |              |
| Soft Case, for R&S®RTC1002 digital oscilloscope and accessories   | R&S®RTC-Z3    | 1333.0867.02 |
| Rackmount Kit   | R&S®ZZA-RTC1K | 1333.0967.02 |



| <b>Warranty</b>   |         |   |
|---|---------|---|
| Base unit   |         | 3 years   |
| All other items <sup>3</sup>                                      |         | 1 year  |
| Options   |         |   |
| Extended Warranty, one year                                       | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended Warranty, two years                                      | R&S®WE2 |   |
| Extended Warranty with Calibration Coverage, one year             | R&S®CW1 |   |
| Extended Warranty with Calibration Coverage, two years            | R&S®CW2 |   |
| Extended Warranty with Accredited Calibration Coverage, one year  | R&S®AW1 |   |
| Extended Warranty with Accredited Calibration Coverage, two years | R&S®AW2 |   |

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

Repairs carried out during the contract term are free of charge <sup>4</sup>. Necessary calibration and adjustments carried out during repairs are also covered.

#### **Extended warranty with calibration coverage (CW1 and CW2)**

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs <sup>4</sup> and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

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

Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs <sup>4</sup> and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

<sup>3</sup> For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

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





## Service that adds value

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

## Rohde & Schwarz

The Rohde & Schwarz 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](http://www.rohde-schwarz.com)

## Rohde & Schwarz training

[www.training.rohde-schwarz.com](http://www.training.rohde-schwarz.com)

## Regional contact

- ▮ Europe, Africa, Middle East | +49 89 4129 12345  
[customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)
- ▮ North America | 1 888 TEST RSA (1 888 837 87 72)  
[customer.support@rsa.rohde-schwarz.com](mailto:customer.support@rsa.rohde-schwarz.com)
- ▮ Latin America | +1 410 910 79 88  
[customersupport.la@rohde-schwarz.com](mailto:customersupport.la@rohde-schwarz.com)
- ▮ Asia Pacific | +65 65 13 04 88  
[customersupport.asia@rohde-schwarz.com](mailto:customersupport.asia@rohde-schwarz.com)
- ▮ China | +86 800 810 82 28 | +86 400 650 58 96  
[customersupport.china@rohde-schwarz.com](mailto:customersupport.china@rohde-schwarz.com)

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG

Trade names are trademarks of the owners

PD 3607.4287.22 | Version 03.00 | June 2017 (sk)

R&S®RTC1000 Digital Oscilloscope

Data without tolerance limits is not binding | Subject to change

© 2017 Rohde & Schwarz GmbH & Co. KG | 81671 Munich, Germany



3607428722