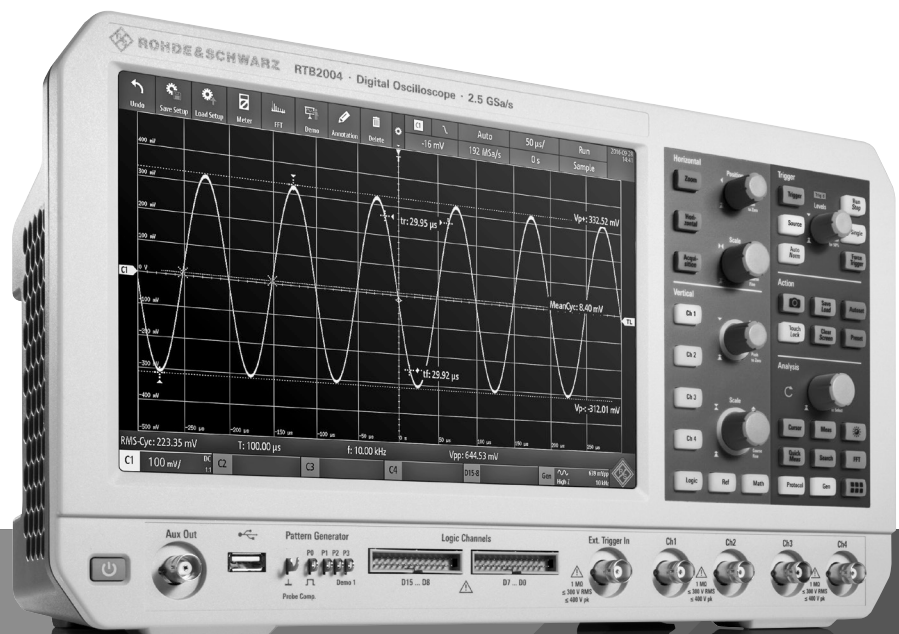


R&S® RTB2000 OSCILLOSCOPE

Specifications

3
year
warranty



Data Sheet
Version 13.00

ROHDE & SCHWARZ

Make ideas real



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Definitions

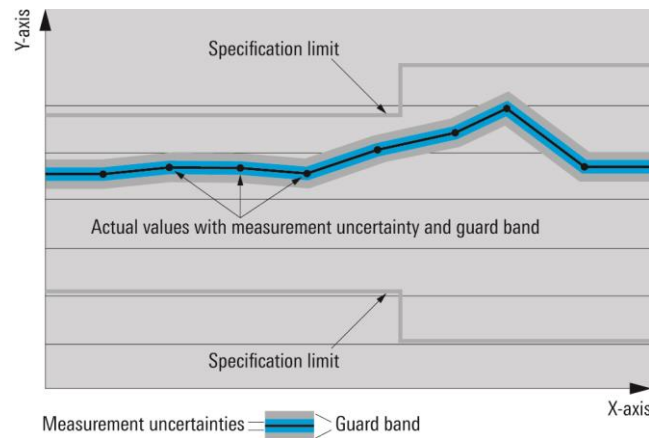
General

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®RTB2002 | 2 channels |
| | R&S®RTB2004 | 4 channels |
| Input impedance | R&S®RTB2002, R&S®RTB2004 | 1 MΩ ± 2 % with 9 pF ± 2 pF (meas.) |
| Analog bandwidth (–3 dB) | R&S®RTB2002 and R&S®RTB2004 | > 70 MHz |
| | R&S®RTB2002 with -B221 option and R&S®RTB2004 with -B241 option | > 100 MHz |
| | R&S®RTB2002 with -B222 option and R&S®RTB2004 with -B242 option | > 200 MHz |
| | R&S®RTB2002 with -B223 option and R&S®RTB2004 with -B243 option | > 300 MHz |
| Lower frequency limit (–3 dB) | at AC coupling | < 2 Hz (meas.) |
| Analog bandwidth limits (max. –1.8 dB, min. –3.5 dB) | R&S®RTB2002 and R&S®RTB2004 | 20 MHz |
| Rise time (10 % to 90 %, calculated) | R&S®RTB2002 and R&S®RTB2004 | < 5 ns |
| | R&S®RTB2002 with -B221 option and R&S®RTB2004 with -B241 option | < 3.5 ns |
| | R&S®RTB2002 with -B222 option and R&S®RTB2004 with -B242 option | < 1.75 ns |
| | R&S®RTB2002 with -B223 option and R&S®RTB2004 with -B243 option | < 1.15 ns |
| Vertical resolution | | 10-bit, up to 16-bit with high-resolution decimation mode |
| Invert signal | | yes |
| DC gain accuracy | offset and position = 0, maximum operating temperature change of ±5 °C after self-alignment | |
| | input sensitivity > 5 mV/div | ±1.5 % of full scale |
| Offset accuracy | input sensitivity ≤ 5 mV/div | ±2 % of full scale |
| | | ±(0.5 % × offset + 0.1 div × input sensitivity + 1 mV) |
| DC measurement accuracy | after adequate suppression of measurement noise by using high-resolution sampling mode or waveform averaging | ±(DC gain accuracy + offset accuracy) |
| Input coupling | | DC, AC, GND |
| Input sensitivity | | 1 mV/div to 5 V/div |
| Maximum input voltage | | 300 V (RMS), max. 400 V (V _p), derates at 20 dB/decade to 5 V (RMS) above 250 kHz |
| Position range | | ±5 div (depends on offset) |
| Offset range | input sensitivity | |
| | 200 mV/div to ≤ 5 V/div | ±(40 V – position × input sensitivity) |
| | 1 mV/div to < 200 mV/div | ±(1.2 V – position × input sensitivity) |
| Channel-to-channel isolation (each channel at same input sensitivity) | input frequency < analog bandwidth | > 50 dB |

Horizontal system

| | | |
|----------------------|---------------------------------------|---|
| Timebase range | | selectable between 1 ns/div and 500 s/div |
| Channel deskew | | ±500 ns |
| Trigger offset range | min. | memory depth/actual sampling rate |
| | max. | 2 ³³ /actual sampling rate |
| Modes | | normal, roll ≥ 50 ms/div |
| Timebase accuracy | after delivery/calibration, at +23 °C | ±2.5 ppm |
| | during calibration interval | ±3.5 ppm |

| | | |
|---------------------|---|---|
| Delta time accuracy | corresponds to time error between two edges on same acquisition and channel; waveform sample rate F_s can be obtained via SCPI command "ACQ:SRAT?"; signal amplitude greater than 5 divisions, measurement threshold set to 50 %, vertical gain 10 mV/div or greater; rise time lower than $4/F_s$; waveform acquired in sample mode | $\pm(1.19/F_s + \text{timebase accuracy} \times \text{reading})$ (peak) (meas.) |
|---------------------|---|---|

Acquisition system

| | | |
|--------------------------------|--|---|
| Maximum realtime sampling rate | normal mode | 1.25 Gsample/s |
| | interleaved mode, following channels are not used simultaneously: <ul style="list-style-type: none"> channel 1 and channel 2 channel 3 and channel 4 logic channels | 2.5 Gsample/s |
| Memory depth per channel | normal | 10 Msample per channel |
| | If following channels are not used simultaneously: <ul style="list-style-type: none"> channel 1 and channel 2 channel 3 and channel 4 logic channels | 20 Msample per channel |
| Acquisition modes | sample | first sample in decimation interval |
| | peak detect | largest and smallest sample in decimation interval (800 ps detection) |
| | high resolution | average value of all samples in decimation interval |
| | envelope | envelope of acquired waveforms |
| | average | average over a series of acquired waveforms |
| | envelope + peak detect | envelope of acquired waveforms with active peak detect |
| Number of averaged waveforms | | 2 to 100 000 |
| Waveform acquisition rate | dot display, single channel, auto record length | up to 50 000 waveforms/s |

Trigger system

| | | |
|----------------|--|--|
| Trigger level | range (min) | ± 5 div from center of screen |
| Trigger modes | | auto, normal, single, n single with R&S®RTB-K15 option |
| Hold-off range | time | inactive or 50 ns to 10 s |
| Trigger types | | edge, width, video, pattern, serial bus, timeout, line |
| Edge trigger | trigger events | rising edge, falling edge, both edges |
| | sources | |
| | R&S®RTB2002 | channel 1, channel 2, logic channels from D0 to D15 (with R&S®RTB-B1 option), external trigger input |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4, logic channels from D0 to D15 (with R&S®RTB-B1 option), external trigger input |
| | coupling (analog channels, external trigger input) | DC, AC, HF reject (attenuates > 50 kHz (meas.)), LF reject (attenuates < 50 kHz (meas.)), noise reject (enlarges trigger hysteresis) |

| | | |
|--|---|--|
| Width trigger | trigger events | pulse width is smaller, greater, equal, unequal, inside interval, outside interval |
| | min. pulse width | 6.4 ns |
| | max. pulse width | 13.5 s |
| | polarity | positive, negative |
| | sources | |
| Video trigger | R&S®RTB2002 | channel 1, channel 2, logic channels from D0 to D15 (with R&S®RTB-B1 option) |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4, logic channels from D0 to D15 (with R&S®RTB-B1 option) |
| | 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 | |
| Pattern trigger | R&S®RTB2002 | channel 1, channel 2, external trigger input |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4, external trigger input |
| | trigger events | logic condition between active channels |
| | sources | |
| | R&S®RTB2002 | channel 1, channel 2, logic channels from D0 to D15 (with R&S®RTB-B1 option) |
| Serial bus trigger | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4, logic channels from D0 to D15 (with R&S®RTB-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 | 6.4 ns |
| | max. duration time | 13.5 s |
| | supported standards | |
| | R&S®RTB-K1 option | I ² C/SPI (two- and three-wire) |
| | R&S®RTB-K2 option | UART/RS-232/RS-422/RS-485 |
| R&S®RTB-K3 option | CAN/LIN | |
| Trigger sensitivity R&S®RTB2002/R&S®RTB2004 | with DC, AC, LF reject | |
| | input sensitivity > 5 mV/div | < 0.8 div (meas.) |
| | 2 mV/div ≤ input sensitivity < 5 mV/div | < 1.5 div (meas.) |
| | input sensitivity < 2 mV/div | < 2 div (meas.) |
| External trigger input | with HF reject | |
| | all input sensitivities | < 1 div (meas.) |
| | input impedance | |
| | R&S®RTB2002/R&S®RTB2004 | 1 MΩ ± 2 % with 9 pF ± 2 pF (meas.) |
| Trigger output (AUX OUT connector) | maximum input voltage at 1 mΩ | 300 V (RMS), max. 400 V (V _p), derates at 20 dB/decade to 5 V (RMS) above 250 kHz |
| | trigger level | ±5 V |
| | sensitivity | 300 mV (V _{pp}) |
| | input coupling | DC, AC, LF reject, HF reject |
| | functionality | A pulse is generated for every acquisition trigger event. |
| Trigger output (AUX OUT connector) | output voltage | |
| | at high impedance | 0 V to 4.8 V |
| | at 50 Ω | 0 V to 2.4 V |
| | pulse polarity | high active |
| output delay | depends on trigger settings | |

Waveform measurements

| | | |
|------------------------------------|---|--|
| Automatic measurements | measurements on channels, math waveforms, reference waveforms | burst width, count positive pulses, count negative pulses, count falling edges, count rising edges, mean value, RMS cycle, RMS, mean cycle, peak peak, peak+, peak-, frequency, period, amplitude, top level, base level, positive overshoot, negative overshoot, pulse width+, pulse width-, duty cycle+, duty cycle-, rise time, fall time, delay, phase, crest factor, slew rate+, slew rate-, σ .std. deviation, σ .std. deviation cycle |
| | measurements on trigger signal | trigger period, trigger frequency implemented by means of six-digit hardware counter |
| | reference levels | lower, middle and upper level in percentage |
| | statistics | maximum, minimum, mean, standard deviation and measurement count for each automatic measurement |
| | number of active measurements | 4 |
| Cursor | type | vertical, horizontal, vertical and horizontal, V-marker |
| | functions | x and y tracking, coupling of cursors, set to trace, set to screen |
| Quick measurements | function | fast overview of measurements from one channel, some measurements displayed with result lines in diagram |
| | sources | |
| | R&S®RTB2002 | channel 1, channel 2 |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4 |
| | measurements displayed in diagram | mean, max. peak, min. peak, rise time, fall time |
| numerically displayed measurements | RMS cycle, peak-to-peak voltage, period, frequency | |

Digital voltmeter

| | | |
|------------------------|-------------|---|
| Accuracy | | related to channel settings of voltmeter source |
| Measurements | | DC, AC + DC (RMS), AC (RMS) |
| Sources | R&S®RTB2002 | channel 1, channel 2 |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4 |
| Number of measurements | | up to 4 |
| Resolution | | up to 3 digits |
| Bandwidth | | 1 MHz |

Frequency counter

| | | |
|------------------------|-------------|--|
| Measurements | | frequency, period |
| Sources | R&S®RTB2002 | trigger signal source (edge, video): line, channel 1, channel 2, external trigger in |
| | R&S®RTB2004 | trigger signal source (edge, video): line, channel 1, channel 2, channel 3, channel 4, external trigger in |
| Number of measurements | | 2 |
| Resolution | | 6 digits |
| Frequency range | | 0.05 Hz to bandwidth of scope (limited by bandwidth of trigger filter) |

Mask testing

| | | |
|---------------------------|-------------|---|
| Sources | R&S®RTB2002 | channel 1, channel 2 |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4 |
| 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

| | | |
|--------------------------|---------------------|--|
| Number of math waveforms | | up to 5 |
| Functions | | addition, subtraction, multiplication, division, square, square root, absolute value, reciprocal, inverse, log10, ln, derivation, integration |
| Sources | R&S®RTB2002 | channel 1, channel 2, math waveforms 1 to 4 |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4, math waveforms 1 to 4 |
| FFT | sources | |
| | R&S®RTB2002 | channel 1, channel 2, math waveforms, reference waveform |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4, math waveforms, reference waveform |
| | setup parameters | start frequency, stop frequency, center frequency, frequency span, vertical scale, vertical position, resolution bandwidth, gate (time range and position) |
| | windows | Hanning, Hamming, Blackman, rectangular, flat top |
| | waveform arithmetic | none, min. hold, max. hold, average (selectable from 2 to 1024) |
| | scaling | dBm, dBV, V (RMS) |

Search function

| | | |
|-----------|--------------------------|---|
| Functions | search types | edge, width, peak, rise/fall time, runt, data2clock, pattern, protocol (available with R&S®RTB-K3 option) |
| | configuration | manual level setting, adjustable hysteresis |
| | display of search events | in diagram (markers) and in result table |
| Sources | R&S®RTB2002 | channel 1, channel 2, math waveform, D0 to D15 (with R&S®RTB-B1 option) |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4, math waveform, D0 to D15 (with R&S®RTB-B1 option) |

Display characteristics

| | | |
|----------------------|--|---|
| Diagram types | manually changeable vertical window size | Yt, XY, zoom, FFT |
| 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 Yt diagrams and dedicated frequency diagram |
| Interpolation | | sin(x)/x, linear, sample & hold |
| Waveform display | | lines, dots only |
| Persistence | | 50 ms to 12.8 s, infinite |
| Special display mode | | inverse brightness, waveform color modes for analog channels (temperature, fire, rainbow) |
| Diagram grid | | lines, reticle, none, with annotation, track grid |
| Reference signals | | up to 4 reference signals |
| Sources | | analog and digital channels, math, reference, spectrum |

Protocol and logic

| | | |
|------------|----------------------------|---|
| Bus decode | number of bus signals | 2 ¹ |
| | bus types | parallel, parallel clocked |
| | R&S®RTB-K1 option | SPI (2-wire, 3-wire, 4-wire ¹), I ² C |
| | R&S®RTB-K2 option | UART/RS-232/RS-422/RS-485 |
| | R&S®RTB-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 or USB-MTP (media transfer protocol) |
| | reference waveforms | save and recall on internal file system or USB flash drive or on a PC via web interface or USB-MTP |
| | waveforms | save on USB flash drive or download and save on a PC via web interface or USB-MTP; 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 or USB-MTP; available file formats: BMP, PNG |
| Camera button (one touch) | | configurable button, actions on press: <ul style="list-style-type: none"> • save device settings (setup) • save waveforms • save screenshot • search/bus/statistic results |
| Instrument security | | secure erasure of internal file system and all settings |

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

| | | |
|----------------|--|--|
| Menu languages | | available menu languages: <ul style="list-style-type: none"> • English • German • French • Spanish • Italian • Portuguese • Czech • Polish • Russian • Simplified Chinese • Traditional Chinese • Korean • Japanese |
| Help | | online help, available languages: <ul style="list-style-type: none"> • English |
| Undo/redo | | undo/redo function |

Input and outputs

| | | |
|--|--|--|
| Front | | |
| Channel inputs | | BNC, for details see Vertical system |
| External trigger input | | BNC, for details see Trigger system |
| AUX OUT (BNC) | trigger out | for details see Trigger system |
| | reference frequency | 10 MHz ± 3.5 ppm (meas.) |
| | mask violation | pulse |
| Probe compensation output | waveform generator (with R&S®RTB-B6 option only) | for details see Waveform generator |
| | signal shape rectangle | $V_{low} = 0\text{ V}$, $V_{high} = 2.5\text{ V}$ (meas.) |
| | frequency | 1 kHz during probe adjust setup or manual configurable |
| Pattern source (with R&S®RTB-B6 option only) | P3 to P0 (with R&S®RTB-B6 option only) | 4 lugs, for details see 4-bit pattern generator |
| Digital channel inputs | D15 to D8, D7 to D0 | with R&S®RTB-B1 option only |
| Ground lug | | connected to ground |
| USB host interface | | 1 port, type A plug, version 2.0, memory sticks only |
| Rear | | |
| USB device interface | | 1 port, type B plug, version 2.0 |
| Ethernet interface | | 1 port, 1 Gbit |
| Security slot | | for standard Kensington style lock |
| Fixation loop | | for securing the instrument with a cable |

General data

| | | |
|---------------------------------|-----------------------------|---|
| Display | | |
| Type | | 10.1" WXGA display with capacitive touch |
| Resolution | | 1280 × 800 pixel (WXGA) |
| Temperature | | |
| Temperature loading | operating temperature range | 0 °C to +50 °C |
| | storage temperature range | -40 °C to +70 °C |
| Climatic loading | | +25 °C/+40 °C at 85 % rel. humidity cyclic, in line with IEC 60068-2-30 |
| Altitude | | |
| Operating | | up to 3000 m above sea level |
| Nonoperating | | up to 4600 m above sea level |
| Mechanical resistance | | |
| 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 sinusoidal vibration, class 3 and 4 |
| | random | 10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64, MIL-PRF-28800F, 4.5.5.3.1 random vibration, class 3 and 4 |
| 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 |
| Maximum of sound pressure level | | 28.3/30.2 dB (A) at 1.0/0.8 m distance (at +23 °C, 947 mbar (hPa), 20 % rel. humidity), in line with ISO EN 3744 |
| 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 ² |
| Certifications | | VDE, cCSA _{US} |
| Calibration interval | | 1 year |
| Power supply | | |
| AC supply | | 100 V to 240 V at 50 Hz to 400 Hz, 0.95 A to 0.5 A |
| Power consumption | | max. 60 W |
| Safety | | in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1-04, UL 61010-1 |
| Power consumption in stand-by | | 0.5 W (meas.) |
| Mechanical data | | |
| Dimensions | W × H × D | 390 mm × 220 mm × 152 mm (15.4 in × 8.66 in × 5.98 in) |
| Weight | (nom.) | 2.5 kg (5.5 lb) |

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

Options

R&S®RTB-B1

| | | |
|---|--|---|
| Mixed signal option , additional 16 logic channels | | |
| Vertical system | | |
| Input channels | | 16 logic channels (D15 to D0) |
| Arrangement of input channels | | arranged in two logic probes with 8 channels each, assignment of the logic probes to the channels D15 to D8 and D7 to D0 |
| Input impedance | | 100 k Ω \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 | | D15 to D8 and D7 to D0 |
| Threshold level | range | -2 V to 8 V in 10 mV steps |
| | predefined | CMOS 5.0 V, CMOS 3.3 V, CMOS 2.5 V, TTL, ECL |
| Threshold accuracy | | \pm (100 mV + 3 % of threshold setting) (meas.) |
| Comparator hysteresis | | small, medium, large |
| Horizontal system | | |
| Channel-to-channel skew | | max. 800 ps (meas.) |
| Acquisition system | | |
| Sampling rate | | 1.25 Gsample/s for every channel |
| Memory depth | | 10 Msample for every channel |
| Trigger system | | see Trigger system |
| Waveform measurements | | |
| Measurement sources | | all channels from D15 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 D15 to D0 is displayed |

R&S®RTB-B6

| Waveform generator and 4-bit pattern generator | | |
|--|-------------------------------|---|
| Waveform generator | | |
| Resolution | | 14-bit |
| Sample rate | | 250 Msample/s |
| Amplitude | level | |
| | high Z | 20 mV to 5 V (V_{pp}) |
| | 50 Ω | 10 mV to 2.5 V (V_{pp}) |
| | accuracy | 3 % |
| DC offset | level | |
| | high Z | ± 2.5 V |
| | 50 Ω | ± 1.25 V |
| | accuracy | 3 % or ± 5 mV whatever is greater |
| Sine | frequency | 0.1 Hz to 25 MHz |
| | SFDR | > 40 dBc (meas.) |
| | THD | > 40 dBc (meas.) |
| Rectangle | frequency | 0.1 Hz to 10 MHz |
| Pulse | frequency | 0.1 Hz to 10 MHz |
| | edge time | adjustable |
| | duty cycle | 1 % to 99 % |
| Ramp, triangle, sinc, exponential | frequency | 0.1 Hz to 1 MHz |
| Arbitrary | sample rate | max. 10 Msample/s |
| | memory depth | 16k points |
| Noise | bandwidth | max. 25 MHz |
| | level | 0 % to 100 % of signal amplitude |
| Modulation | AM | |
| | function | sine, rectangle, triangle, ramp |
| | frequency | 0.1 Hz to 1 MHz |
| | depth | 0 % to 100 % |
| | FM | |
| | function | sine, rectangle, triangle, ramp |
| | frequency | 0.1 Hz to 1 MHz |
| | deviation | depends on modulation frequency |
| | ASK | |
| | function | sine, rectangle, triangle, ramp |
| | frequency | 0.1 Hz to 1 MHz |
| | ASK depth | 0 % to 100 % |
| | FSK | |
| | function | sine, rectangle, triangle, ramp |
| | frequency | 0.1 Hz to 1 MHz |
| FSK rate | 0.1 Hz to carrier frequency/2 | |
| Sweep | start frequency | 1 Hz to 25 MHz |
| | stop frequency | 1 Hz to 25 MHz |
| | sweep time | 1 ms to 10 s |
| | sweep type | linear, logarithmic, triangle |
| Burst | number of cycle | 1 to 1024 |
| | idle time | 28 ns to 17 s |
| | start phase | 0° to 360° |
| | trigger | continuous, manually |
| 4-bit pattern generator | | |
| Functions | | probe adjust/square wave, bus signal source 4-bit counter, programmable 4-bit pattern |
| Probe adjust | | 1 kHz/1 MHz square wave signal approx. 2.5 V (V_{pp}) (tr < 4 ns) |
| Bus signal source | | SPI, I ² C, UART, CAN, LIN |
| | bandwidth | 9600 bit/s to 1 Mbit/s |
| 4-bit counter | frequency | 1 mHz to 25 MHz |
| Programmable pattern | sample rate | 20 ns to 1 s, up/down |
| | memory depth | 2048 bit |
| | pattern idle time | 50 ns to 1 s |

R&S®RTB-Bxx bandwidth upgrades

| Option | Model | Analog bandwidth upgrade from 70 MHz to |
|--------------|-------------|---|
| R&S®RTB-B221 | R&S®RTB2002 | 100 MHz |
| R&S®RTB-B222 | R&S®RTB2002 | 200 MHz |
| R&S®RTB-B223 | R&S®RTB2002 | 300 MHz |
| R&S®RTB-B241 | R&S®RTB2004 | 100 MHz |
| R&S®RTB-B242 | R&S®RTB2004 | 200 MHz |
| R&S®RTB-B243 | R&S®RTB2004 | 300 MHz |

R&S®RTB-K1

| I²C triggering and decoding | | |
|---|------------------------------------|--|
| Bus configuration | sources for SCL and SDA | channel 1, channel 2, channel 3, channel 4, logic channels from D0 to D15 |
| | 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 |
| SPI triggering and decoding | | |
| Bus configuration | sources for CS, CLK, MOSI and MISO | channel 1, channel 2, channel 3, channel 4, logic channels from D0 to D15 |
| | 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®RTB-K2

| UART/RS-232/RS-422/RS-485 triggering and decoding | | |
|--|-----------------------------------|--|
| Bus configuration | source for RX and TX | channel 1, channel 2, channel 3, channel 4, logic channels from D0 to D15 |
| | bit rate | 300/600/1200/2400/4800/9600/19200/38400/57600/115200 bps 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 | trigger events | start bit, start of frame, symbol number, any symbol, pattern of symbols, parity error, frame error, break |
| | offset for trigger on data symbol | 0 to 4095 symbols |
| | data symbol pattern width | 1 to floor (32/symbol size) symbols |
| 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 |

R&S®RTB-K3

| CAN triggering and decoding | | |
|------------------------------------|---|---|
| Bus configuration | signal type | CAN_H, CAN_L |
| | sources | channel 1, channel 2, channel 3, channel 4, logic channels from D0 to D15 |
| | 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 frame table | hex, decimal, binary, ASCII 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 |

| LIN triggering and decoding | | |
|------------------------------------|---|---|
| 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 2.5 Mbps |
| | polarity label list | active high or active low 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 |
| Decode | data setup | data pattern up to 8 byte (hex or binary); condition =, ≠, >, < |
| | 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 frame table | hex, decimal, binary, ASCII 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 |

R&S®RTB-K15

| History and segmented memory | | | | |
|------------------------------|---|---|------------------|----------------------------|
| Memory segmentation | function | additional memory segments for the acquisition | | |
| | number of segments ³ | record length | segments (up to) | total memory (per channel) |
| | | 10 ksample | 13 107 | 131 Msample |
| | | 20 ksample | 13 107 | 262 Msample |
| | | 50 ksample | 4 369 | 218 Msample |
| | | 100 ksample | 2 621 | 262 Msample |
| | | 200 ksample | 1 456 | 291 Msample |
| | | 500 ksample | 624 | 312 Msample |
| | | 1 Msample | 319 | 319 Msample |
| | | 2 Msample | 159 | 318 Msample |
| | | 5 Msample | 64 | 320 Msample |
| | | 10 Msample | 32 | 320 Msample |
| | | 20 Msample | 16 | 320 Msample |
| | | Segmentation is active on all analog and logic channels, protocol decoding and spectrum analysis. | | |
| Fast-segmented mode | continuous recording of waveforms in acquisition memory without interruption due to visualization; blind time between consecutive acquisitions less than 2.5 µs (up to 300 000 waveforms/s) | | | |
| History mode | function | The history mode always provides access to past acquisitions in the segmented memory. | | |
| | timestamp resolution | 6.4 ns | | |
| | history player | replays the recorded waveforms; start and stop waveform could be set; repetition possible | | |

R&S®RTB-K36

| Frequency response analysis – Bode plot (does not require R&S®RTB-B6 option) | | |
|--|--|--|
| Stimulus | frequency mode | single sweep or repeated sweep |
| | frequency range | 10 Hz to 25 MHz |
| | amplitude mode | fixed or amplitude profile |
| | amplitude level | 20 mV to 5 V into high Z 10 mV to 2.5 V into 50 Ω |
| Input and output sources | R&S®RTB2002 | channel 1, channel 2 |
| | R&S®RTB2004 | channel 1, channel 2, channel 3, channel 4 |
| Number of test points | | 10 points to 500 points per decade |
| Dynamic range | | typ. > 70 dB based on 0 dBm (630 mV (V _{pp}) into 50 Ω, gain noise < 1 dB, phase noise < 5°) |
| Measurement | | dual pair of tracking gain and phase cursors |
| Diagram types | manually changeable vertical window size | parallel display of result window and input and output signal view |
| Result table | | navigation and export functions |
| Scaling | during and after test | auto-scale and manual scaling and positioning |

³ In interleaved mode.

Ordering information

| Designation | Type | Order No. |
|---|---------------|--------------|
| Choose your R&S®RTB2000 base model | | |
| Oscilloscope, 70 MHz, 2 channels | R&S®RTB2002 | 1333.1005.02 |
| Oscilloscope, 70 MHz, 4 channels | R&S®RTB2004 | 1333.1005.04 |
| Base unit (including standard accessories: R&S®RT-ZP03 passive probe per channel, power cord, getting started manual and safety instructions) | | |
| Choose your bandwidth upgrade | | |
| Upgrade of R&S®RTB2002 oscilloscopes to 100 MHz bandwidth | R&S®RTB-B221 | 1333.1163.02 |
| Upgrade of R&S®RTB2002 oscilloscopes to 200 MHz bandwidth | R&S®RTB-B222 | 1333.1170.02 |
| Upgrade of R&S®RTB2002 oscilloscopes to 300 MHz bandwidth | R&S®RTB-B223 | 1333.1186.02 |
| Upgrade of R&S®RTB2004 oscilloscopes to 100 MHz bandwidth | R&S®RTB-B241 | 1333.1257.02 |
| Upgrade of R&S®RTB2004 oscilloscopes to 200 MHz bandwidth | R&S®RTB-B242 | 1333.1263.02 |
| Upgrade of R&S®RTB2004 oscilloscopes to 300 MHz bandwidth | R&S®RTB-B243 | 1333.1270.02 |
| Choose your options | | |
| Mixed signal option for non-MSO models, 300 MHz | R&S®RTB-B1 | 1333.1105.02 |
| Arbitrary waveform generator | R&S®RTB-B6 | 1333.1111.02 |
| I ² C/SPI serial triggering and decoding | R&S®RTB-K1 | 1333.1011.02 |
| UART/RS-232/RS-422/RS-485 serial triggering and decoding | R&S®RTB-K2 | 1333.1028.02 |
| CAN/LIN serial triggering and decoding | R&S®RTB-K3 | 1333.1034.02 |
| History and segmented memory | R&S®RTB-K15 | 1333.1040.02 |
| Frequency response analysis (Bode plot) | R&S®RTB-K36 | 1335.8007.02 |
| Application bundle, consists of the following options: R&S®RTB-K1, R&S®RTB-K2, R&S®RTB-K3, R&S®RTB-K15, R&S®RTB-K36, R&S®RTB-B6 | R&S®RTB-PK1 | 1333.1092.02 |
| Choose your additional probes | | |
| 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 |
| High voltage probes: passive | | |
| 25 MHz, 8 MΩ, 2.75 pF, 10:1/100:1, ±700 V, 1000 V (RMS) CAT III | R&S®RT-ZD002 | 1337.9700.02 |
| 25 MHz, 8 MΩ, 2.75 pF, 20:1/200:1, ±1400 V, 1000 V (RMS) CAT III | R&S®RT-ZD003 | 1337.9800.02 |
| 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 |
| Logic probes | | |
| Active 8 channel logic probe | R&S®RT-ZL03 | 1333.0715.02 |
| Probe accessories | | |
| Feedthrough termination 50 Ω | R&S®HZ22 | 3594.4015.02 |
| Probe pouch | R&S®RT-ZA19 | 1335.7875.02 |
| Choose your accessories | | |
| Front cover | R&S®RTB-Z1 | 1333.1728.02 |
| Soft case | R&S®RTB-Z3 | 1333.1734.02 |
| Transit case | R&S®RTB-Z4 | 1335.9290.02 |
| Rackmount kit | R&S®ZZA-RTB2K | 1333.1711.02 |

| Warranty | | |
|--|---------|---|
| Base unit and passive probes that are included as standard accessories | | 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.

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.

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.

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