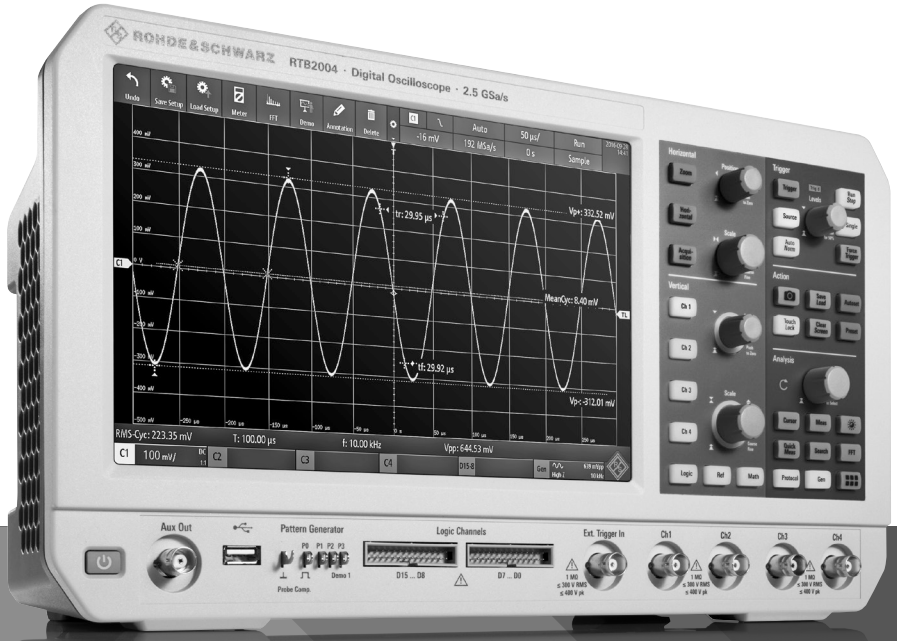
R&S®RTB2000
OSCILLOSCOPE



Data Sheet
Version 17.00

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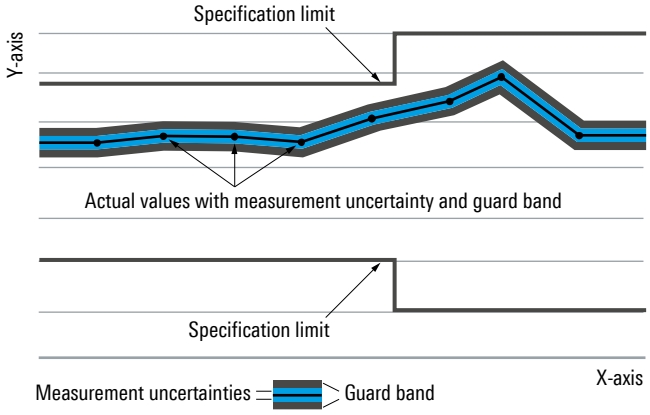
Definitions

General
Product data applies under the following conditions:

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

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



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

Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

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

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

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

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

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

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

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

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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
	input sensitivity ≤ 5 mV/div	±2 % of full scale
Offset accuracy		±(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 [1]	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

[1] Signals with non-destructive DC components that overdrive the ADC continually for long periods of time are not recommended, and may result in instrument damage.

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Delta time accuracy	corresponds to time error between two edges on same acquisition and channel; waveform sample rate Fs 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/Fs; waveform acquired in sample mode	±(1.19/Fs + timebase accuracy × |reading|) (peak) (meas.)

Acquisition system

Maximum realtime sampling rate	normal mode	1.25 Gsample/s
	interleaved mode, if following channels are not used simultaneously: • channel 1 and channel 2 • channel 3 and channel 4 • logic probe	2.5 Gsample/s
Memory depth per channel	normal mode	10 Msample per channel
	interleave mode, if following channels are not used simultaneously: • channel 1 and channel 2 • channel 3 and channel 4 • D7 to D0 and D15 to D8 (logic probes)	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
	actions on trigger	pulse, sound, screenshot, save waveform, save reference waveform
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)

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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	
	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)
Video trigger	trigger events	selectable line, all lines, even frame, odd frame, all frames
	supported standards	PAL, NTSC, SECAM, PAL-M, SDTV 576i
	sources	
	R&S®RTB2002	channel 1, channel 2, external trigger input
	R&S®RTB2004	channel 1, channel 2, channel 3, channel 4, external trigger input
	sync pulse polarity	positive, negative
Pattern trigger	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)
	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
Timeout trigger	trigger events	greater than timeout
	minimum timeout	6.4 ns
	maximum timeout	13.5 s
	polarity	stays high, stays low
	sources	
	R&S®RTB2002	channel 1, channel 2, logic channels from D15 to D0 (with R&S®RTB-B1 option)
	R&S®RTB2004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTB-B1 option)
	selectable trigger hysteresis	small, medium, large
Serial bus trigger	supported standards	
	R&S®RTB-K1 option	I^2C/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	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.)
	with HF reject	
	all input sensitivities	< 1 div (meas.)
External trigger input	input impedance	
	R&S®RTB2002/R&S®RTB2004	1 MΩ ± 2 % with 9 pF ± 2 pF (meas.)
	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

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Trigger output (AUX OUT connector)	functionality	A pulse is generated for every acquisition trigger event.
	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, delay to trigger
	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	6
Cursor	type	vertical, horizontal, vertical and horizontal, V-marker
	functions	x and y tracking, coupling of cursors, set to trace, two sources selectable
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

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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, low pass, high pass, track period, track frequency, track pulse width, track duty cycle
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, dBµV, 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)

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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 [2]
	bus types	parallel, parallel clocked
	R&S®RTB-K1 option	SPI (2-wire, 3-wire, 4-wire [2]), I^2C
	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: • save device settings (setup) • save waveforms • save screenshot • search/bus/statistic results
Instrument security		secure erasure of internal file system and all settings

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

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Menu languages		available menu languages: • English • German • French • Spanish • Italian • Portuguese • Czech • Polish • Russian • Simplified Chinese • Traditional Chinese • Korean • Japanese
Help		online help, available languages: • 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
	waveform generator (with R&S®RTB-B6 option only)	for details see Waveform generator
Probe compensation output	signal shape rectangle	V_{low} = 0 V, V_{high} = 2.5 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

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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 [3]
Certifications		VDE, $_{C}$CSA$_{US}$
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)

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

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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 kΩ ± 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		±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		±(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	two logic probes (normal mode)	10 Msample for every channel
	one logic probe (interleave mode)	20 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

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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 (frequency ≤100 kHz)	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	frequency	0.1 Hz to 10 MHz
	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^2C, 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

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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

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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	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

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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 J2602; 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	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

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R&S®RTB-K15

History and segmented memory				
Memory segmentation	function	additional memory segments for the acquisition		
	number of segments [4]	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

[4] In interleaved mode.

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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: 300 MHz 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^2C/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, 10:1, 10 MΩ, 400 V (RMS), 12 pF	R&S®RT-ZP03S	1803.1001.02
500 MHz, 10:1, 10 MΩ, 300 V (RMS), 10 pF	R&S®RT-ZP05S	1333.2401.02
500 MHz, 10 MΩ, 10:1, 400 V, 9.5 pF	R&S®RT-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

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Warranty		
Base unit and passive probes that are included as standard accessories		3 years
All other items [5]		1 year
Service options		
Extended warranty, one year	R&S®WE1	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 [6]. 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 [6] 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 [6] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

[5] For options installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.
[6] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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