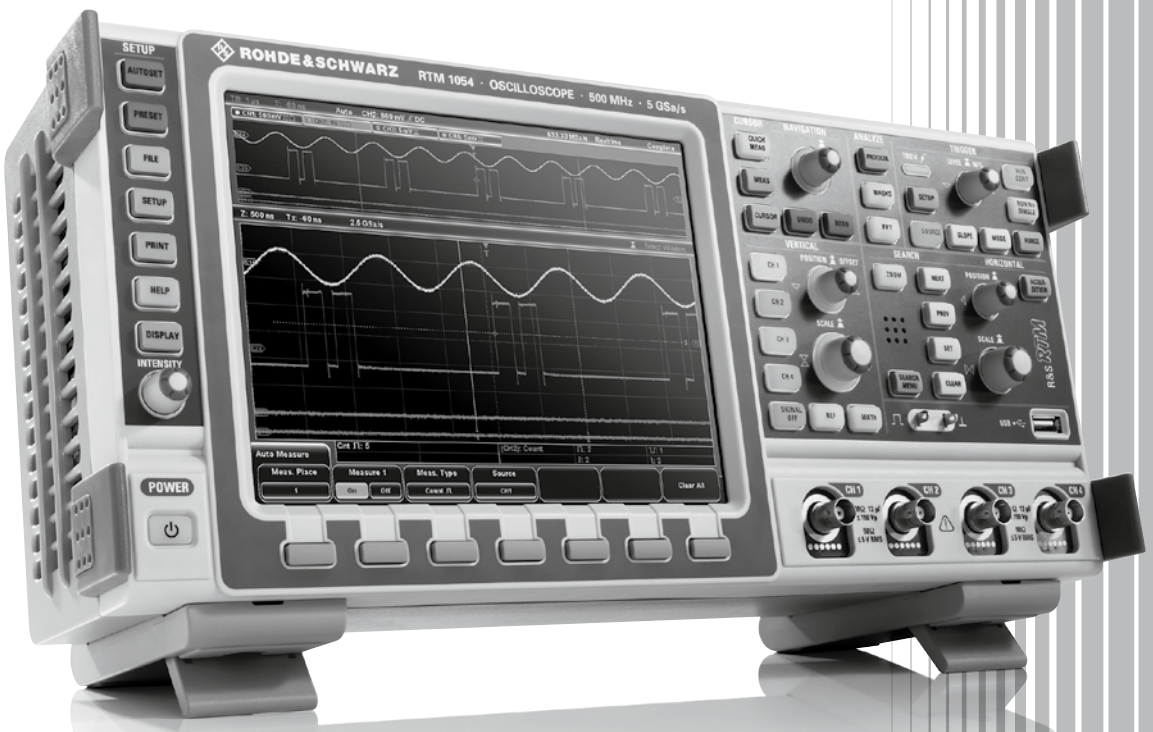
R&S®RTM
Digital Oscilloscopes
Specifications



ROHDE&SCHWARZ

Test & Measurement

Data Sheet | 02.00

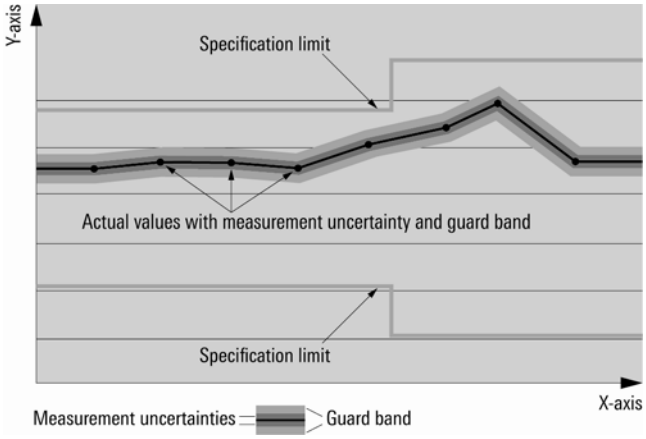
CONTENTS

Definitions

General
Product data applies under the following conditions:

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

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



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

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

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

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

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

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

Base unit

Vertical system

Input channels	R&S®RTM1052	2 channels
	R&S®RTM1054	4 channels
Input impedance		50 Ω ± 1.5 % or 1 MΩ ± 1 % with 13 pF ± 1 pF (meas.)
Bandwidth (–3 dB) at 50 Ω input impedance		> 500 MHz
Bandwidth (–3 dB) at 1 MΩ input impedance		500 MHz (meas.)
Lower frequency limit (–3 dB) at AC coupling		< 5 Hz (meas.)
Analog bandwidth limits (max. –2 dB, min. –3.5 dB)		400 MHz, 200 MHz, 20 MHz
Rise time (calculated)		700 ps
Vertical resolution		8 bit
DC gain accuracy	offset and position = 0 maximum operating temperature change of ±5 °C after self-alignment	
	input sensitivity > 5 mV/div	±1.5 %
	input sensitivity ≤ 5 mV/div	±2 %
Input coupling		DC, AC
Input sensitivity	at 50 Ω	1 mV/div to 1 V/div
	at 1 MΩ	1 mV/div to 10 V/div
Maximum input voltage	at 50 Ω	5 V (RMS), max. 30 V (V_p)
	at 1 MΩ	150 V (RMS), 200 V (V_p), derates at 20 dB/decade to 5 V (RMS) above 250 kHz
Position range		±5 div
Offset range	input sensitivity	
	500 mV/div to ≤ 10 V/div	±(100 V – input sensitivity × 5 div) max. ±5 V at 50 Ω
	50 mV/div to < 498 mV/div	±(10 V – input sensitivity × 5 div) max. ±5 V at 50 Ω
	1 mV/div to < 49.8 mV/div	±(1 V – input sensitivity × 5 div)
Offset accuracy		±(0.5% × |net offset| + + 0.15 div × input sensitivity) (net offset = offset – (position × input sensitivity))
DC measurement accuracy	after adequate suppression of measurement noise by means of either high-resolution sampling mode, waveform averaging, or a combination of both	±(DC gain accuracy x |reading – net offset| + offset accuracy)
Channel-to-channel isolation (each channel at same input sensitivity)	input frequency < 500 MHz	> 50 dB

Horizontal system

Time base range		selectable between 1 ns/div and 50 s/div
Channel deskew		±12 ns
Trigger offset range	min.	memory depth/actual sampling rate
	max.	4 × memory depth/actual sampling rate
Modes		normal, roll
Channel-to-channel skew		< 200 ps (meas.)
Time base accuracy		10 ppm

Acquisition system

Maximum realtime sampling rate	R&S®RTM1052	2 channels with 2.5 Gsample/s
		1 channel with 5 Gsample/s
	R&S®RTM1054	4 channels with 2.5 Gsample/s
		2 channels with 5 Gsample/s
Maximum equivalent time sampling rate		100 Gsample/s
Memory depth per channel	at sampling rate of 2.5 Gsample/s	4 Msample for each channel
	at sampling rate of 5 Gsample/s	8 Msample for each channel
Decimation modes	sample	first sample in decimation interval
	peak detect	largest and smallest sample in decimation interval
	high resolution [1]	average value of samples in decimation interval
Waveform arithmetic	OFF	no arithmetic
	envelope	envelope of acquired waveforms
	smooth	graphical smoothing of acquired waveform
	average	average over a series of acquired waveforms
Number of averaged waveforms		2, 4, 8, 16, 32, 64, 128, 256
Waveform acquisition rate		up to 10000 waveforms/s

Trigger system

Trigger level	range	±10 div from center of screen
Trigger modes		auto, normal, single, n single
Trigger types		edge, width, video, pattern, serial bus
Edge trigger	trigger events	rising edge, falling edge, both edges
	sources for A trigger	
	R&S®RTM1052	channel 1, channel 2, ext. trigger input, line
	R&S®RTM1054	channel 1, channel 2, channel 3, channel 4, ext. trigger input, line
	trigger coupling of A trigger	DC, AC, HF reject (attenuates > 5 kHz), LF reject (attenuates < 2 kHz), lowpass (attenuates > 100 MHz)
	sources for B trigger	
	R&S®RTM1052	channel 1, channel 2
	R&S®RTM1054	channel 1, channel 2, channel 3, channel 4
	trigger coupling of B trigger	DC
	selectable trigger hysteresis for A and B trigger	automatic, small, medium, large
Width trigger	trigger events	pulse width is smaller, greater, equal, unequal, inside interval, outside interval
	minimum pulse width	20 ns
	maximum pulse width	100 ms
	polarity	positive, negative
	sources	
	R&S®RTM1052	channel 1, channel 2, ext. trigger input
	R&S®RTM1054	channel 1, channel 2, channel 3, channel 4, ext. trigger input
	selectable trigger hysteresis	automatic, small, medium, large
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	
	R&S®RTM1052	channel 1, channel 2, ext. trigger input
	R&S®RTM1054	channel 1, channel 2, channel 3, channel 4, ext. trigger input
	sync pulse polarity	positive, negative

[1] Available in a future software release.

Pattern trigger	trigger events	logic condition between active channels
	sources	
	R&S®RTM1052	channel 1, channel 2
	R&S®RTM1054	channel 1, channel 2, channel 3, channel 4
	state of channels	high, low, don't care
	logic between channels	and/or
	condition	true, false
Serial bus trigger	supported standards	
	R&S®RTM-K1 option (only available for the R&S®RTM1054)	I^2C/SPI (two- and three-wire)
	R&S®RTM-K2 option (only available for the R&S®RTM1054)	UART/RS-232
Trigger sensitivity	with DC, AC, LF reject, lowpass	
	input sensitivity > 5 mV/div	< 0.8 div
	2 mV/div ≤ input sensitivity < 5 mV/div	< 1.5 div
	input sensitivity < 2 mV/div	< 2 div
	with HF reject	
	all input sensitivities	< 1 div

External trigger input	input impedance	1 MΩ ± 1 % with 12 pF ± 2 pF (meas.)
	maximum input voltage	150 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

Waveform measurements

Automatic measurements	measurements on channels, math waveforms, reference waveforms	mean, mean cycle, RMS, RMS cycle, amplitude, top level, base level, peak-to-peak, max. peak, min. peak, period, frequency, positive pulse count, negative pulse count, rising edge count, falling edge count, positive pulse width, negative pulse width, positive duty cycle, negative duty cycle, rise time, fall time, standard deviation
	measurements on trigger signal	trigger period, trigger frequency implemented by means of six-digit hardware counter
		DC voltmeter (requires Rohde & Schwarz active probe with R&S®ProbeMeter functionality)
	number of active measurements	4
Cursor measurements	measurements on channels, math waveforms, reference waveforms	voltage, time, ratio x, ratio y, pulse count, peak values, RMS, mean, rise time, vertical marker
Quick measurements	function	fast overview of measurements from one channel some measurements displayed with result lines in diagram
	sources	
	R&S®RTM1052	channel 1, channel 2
	R&S®RTM1054	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, peak-to-peak, period, frequency

Mask testing

Sources	R&S®RTM1052	channel 1, channel 2
	R&S®RTM1054	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		beep, acquisition stop, print, screenshot

Waveform maths

Number of math waveforms		up to 5
Functions		addition, subtraction, multiplication, division, maximum, minimum, square, square root, absolute value, positive wave, negative wave, reciprocal, inverse, log10, ln, derivation, integration, lowpass filter, highpass filter
Sources	R&S®RTM1052	channel 1, channel 2, math waveforms 1 to 4
	R&S®RTM1054	channel 1, channel 2, channel 3, channel 4, math waveforms 1 to 4

Search function

The search function will be available in a future software release.

Display characteristics

Diagram types		Yt, XY, XYZ, zoom, FFT
XY/XYZ mode		parallel display of XY/XYZ diagram and Yt diagrams of input signals for X, Y_1, Y_2 and Z
Zoom		horizontal zoom with fast navigation, split screen with overview signal and zoomed signal
Interpolation		sin(x)/x
FFT mode		split screen with overview signal and dedicated frequency display
Waveform display		lines, dots
Persistence		50 ms to 9.6 s; infinite
Special display mode		inverse brightness, temperature colors
Diagram grid		lines, reticle, none
Marker		up to 16 time markers, fast navigation with dedicated keys
Reference signals		up to 4 reference signals

Miscellaneous

Save/recall	device settings	save and recall on internal file system or USB memory stick
	reference waveforms	save and recall on internal file system or USB memory stick
	math equation sets	save and recall on internal file system or USB memory stick
	waveforms	save on USB memory stick, available file formats: BIN, CSV, TXT, TRF
	screenshots	save on USB memory stick, available file formats: BMP, PNG
Print		configurable print button, actions on press: • save device settings • save traces • save screenshot • save screenshot and device settings • print screenshot on USB printer
Menu languages		available menu languages: • English
Help		online help, available languages: • English
Undo/Redo		deep Undo/Redo function

Input and outputs

Front		
Channel inputs		BNC, for details see "Vertical system"
	probe interface	auto detection of passive probes, Rohde & Schwarz active probe interface
Probe compensation output	signal shape	rectangle V_{low} = 0 V, V_{high} = 1 V (meas.)
	frequency	1 kHz/1 MHz depending on time base setting
Ground jack		connected to ground
USB host interface		1 port, type A plug, version 2.0, memory sticks only
Rear		
Ext. trigger input		BNC, for details see "Trigger system"
USB host interface		1 port, type A plug, version 2.0, printer
Interface slot	slot for interface boards	LAN/USB interface (standard) GPIB interface
	LAN/USB interface	
	LAN	RJ-45 connector, supports 10/100BaseT
	USB	USB device port
	GPIB interface	see R&S®RTM-B10 option
External monitor interface		DVI-D connector, output of scope display
Security slot		for standard Kensington style lock

General data

Display		
Type		8.4" LC TFT color display
Resolution		1024 × 768 pixel (XGA)

Temperature		
Temperature loading	operating temperature range	0 °C to +50 °C
	storage temperature range	–40 °C to +70 °C
Climatic loading		+40 °C at 85 % rel. humidity, in line with IEC 60068-2-30

Altitude		
Operating		up to 3000 m above sea level
Non-operating		up to 4600 m above sea level

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E method no. 516.4 procedure I

EMC		
RF emission	In line with EN 55011 class A, operation in residential, commercial and business areas or in small-size companies is not covered. Thus, the instrument may not be operated in residential, commercial and business areas or in small-size companies, unless additional measures are taken to ensure that EN 55011 class B is complied with.	in line with CISPR 11/EN 55011 group 1 class A (for a shielded test setup) The instrument complies with the emission requirements stipulated by EN 55011, EN 61326-1 and EN 61326-2-1 class A. This means that the instrument is 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-GS, $_{C}$CSA$_{US}$

Calibration interval		1 year

Power supply		
AC supply		100 V to 240 V at 50 Hz to 60 Hz max. 120 VA, in line with MIL-PRF-28800F
Power consumption		max. 100 W
Safety		in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1-04, UL 61010-1

Mechanical data		
Dimensions	W × H × D	403 mm × 189 mm × 142 mm (15.87 in × 7.44 in × 5.59 in)
Weight	without options (nom.)	4.9 kg (10.8 lb)

[2] Test criterion is displayed noise level within ±1 div for input sensitivity of 49.8 mV/div.

Options

R&S®RTM-B10

GPIB additional interface		
Function		interface in line with IEC 625-2 (IEEE 488.2)
Command set		SCPI 1999.0
Connector		24-pin Amphenol female
Interface functions		SH1, AH1, T6, L4, SR1, RL0, PP1, DC1, DT0, C0

R&S®RTM-K1 (only available for the R&S®RTM1054)

I^2C/SPI trigger and decoding		
I^2C		
Bus configuration	sources for SCL and SDA	channel 1, channel 2, channel 3, channel 4
	baud rate	up to 10 Mbit/s
	size of address	7 bit or 10 bit
	size of data	8 bit
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 bytes
	data pattern width	up to 3 sequential data bytes
Decoding	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		
Bus configuration	sources for CS, CLK and data	channel 1, channel 2, channel 3, channel 4
	baud rate	up to 25 Mbit/s
	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	frame start, frame end, bit number, data pattern
	selectable bit number	0 to 4095
	offset for trigger on data pattern	0 bit to 4095 bit
	data pattern size	1 bit to 32 bit
Decoding	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®RTM-K2 (only available for the R&S®RTM1054)

UART/RS-232 trigger and decoding		
Bus configuration	source	channel 1, channel 2, channel 3, channel 4
	baud rate	300/600/1200/2400/4800/9600/19200/ 38400/57600/115200 bit/s or user-selectable up to 12 Mbit/s
	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, frame start, 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
Decoding	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

Ordering information

Designation	Type	Order No.
Base unit (including standard accessories: per channel: 500 MHz passive probe (10:1), compact manual, CD-ROM (with operating and service manual), power cord)		
Digital Oscilloscope		
500 MHz, 2.5/5 Gsample/s, 4/8 Msample, 2 channels	R&S®RTM1052	1305.0008.52
500 MHz, 2.5/5 Gsample/s, 4/8 Msample, 4 channels	R&S®RTM1054	1305.0008.54
Hardware options		
GPIB Interface	R&S®RTM-B10	1305.0014.02
Software options		
I^2C/SPI Serial Triggering and Decoding (only for R&S®RTM1054)	R&S®RTM-K1	1305.0295.02
UART/RS-232 Serial Triggering and Decoding (only for R&S®RTM1054)	R&S®RTM-K2	1305.0308.02
Probes		
500 MHz, passive, 10:1, 10 MΩ, 9.5 pF, max. 400 V	R&S®RTM-ZP10	1409.7708.02
1.0 GHz, active, 1 MΩ, 0.8 pF, R&S®ProbeMeter, micro button	R&S®RT-ZS10	1410.4080.02
1.0 GHz, active, 1 MΩ, 0.8 pF	R&S®RT-ZS10E	1418.7007.02
Probe accessories		
Accessory Set for R&S®RTM-ZP10 Passive Probe	R&S®RT-ZA1	1409.7566.02
Spare Accessory Set for R&S®RT-ZS10/R&S®RT-ZS10E	R&S®RT-ZA2	1416.0405.02
Pin Set for R&S®RT-ZS10/R&S®RT-ZS10E	R&S®RT-ZA3	1416.0411.02
Mini Clips	R&S®RT-ZA4	1416.0428.02
Micro Clips	R&S®RT-ZA5	1416.0434.02
Lead Set	R&S®RT-ZA6	1416.0440.02
Accessories		
Front Cover	R&S®RTM-Z1	1305.0272.02
Soft Case for R&S®RTM oscilloscopes and accessories	R&S®RTM-Z3	1305.0289.02
Rackmount Kit	R&S®ZZA-RTM	1304.8292.02
Service options		
Two-Year Calibration Service	R&S®CO2RTM	please contact your local Rohde & Schwarz office
Three-Year Calibration Service	R&S®CO3RTM	
Five-Year Calibration Service	R&S®CO5RTM	
One-Year Repair Service following the warranty period	R&S®RO2RTM	
Two-Year Repair Service following the warranty period	R&S®RO3RTM	
Four-Year Repair Service following the warranty period	R&S®RO5RTM	

For product brochure, see PD 5214.0276.12 and www.rohde-schwarz.com

Service you can rely on

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

About Rohde&Schwarz

Rohde&Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde&Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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