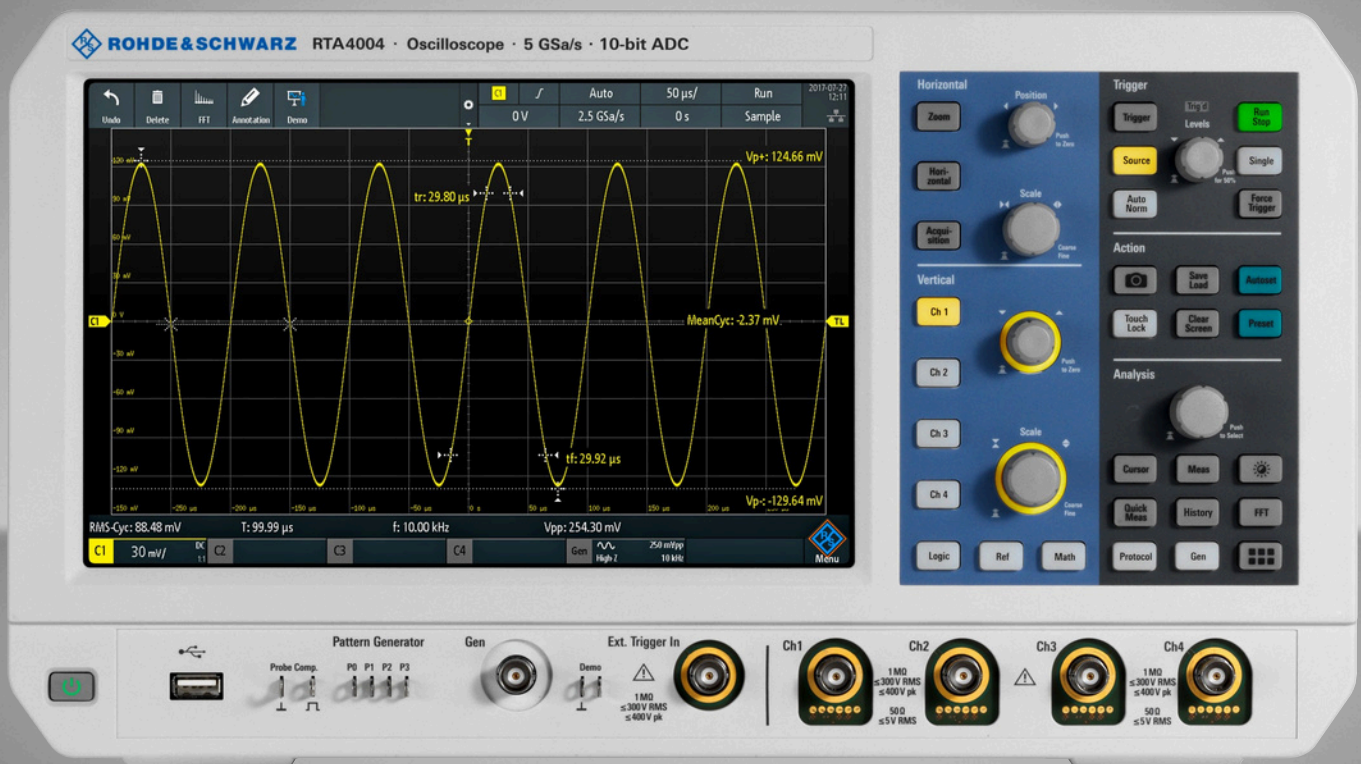# R&S®RTA4000 OSCILLOSCOPE

Power of ten

- ► 200 MHz to 1 GHz
- ► 10-bit ADC
- ► 1 Gsample standard memory

Product Brochure
Version 07.00

ROHDE & SCHWARZ

Make ideas real

AT A GLANCE

Designed with class-leading signal integrity and responsive ultra-deep memory, the R&S®RTA4000 brings the power of 10 to a new level. A Rohde & Schwarz designed 10-bit ADC combined with class-leading low noise, memory depth and timebase accuracy gives you sharp waveforms, more accurate measurements and confidence when facing unexpected measurement challenges.

Traditionally, excellent signal integrity has been overlooked in the benchtop class of instruments because it is hard to accomplish and also expensive for instrument manufacturers. Users have had to compromise on measurement accuracy to get an affordable instrument that they could use for everyday debugging and troubleshooting tasks. With the R&S®RTA4000, signal integrity was at the forefront when we designed it.

The 10-bit A/D converter yields up to a fourfold improvement over conventional 8-bit A/D converters. The class-leading low noise allows users to take advantage of this extra vertical resolution. You get sharper waveforms with signal details that would have been hidden on other oscilloscopes in this class.

Oscilloscopes in the R&S®RTA4000 class have traditionally made users choose between deep memory and fast update rates. Each of these has its place, and having to choose one or the other means you may have the wrong tool for the problem you are addressing. The R&S®RTA4000 doesn't make you choose; it provides a fast update rate and ultra-deep memory to tackle any challenge that may come up.

The R&S®RTA4000 provides users with more than just an oscilloscope. It includes a logic analyzer, protocol analyzer, spectrum analyzer, waveform and pattern generator and digital voltmeter. A large, high-resolution capacitive touchscreen with a widely acclaimed user interface makes it easy to take advantage of all these tools.

Rohde & Schwarz stands for quality, precision and innovation in all fields of wireless communications. As an independent, family-owned company, Rohde & Schwarz finances its growth from its own funds. The company plans for the long term to the benefit of its customers. Purchasing Rohde & Schwarz products is an investment for the future.
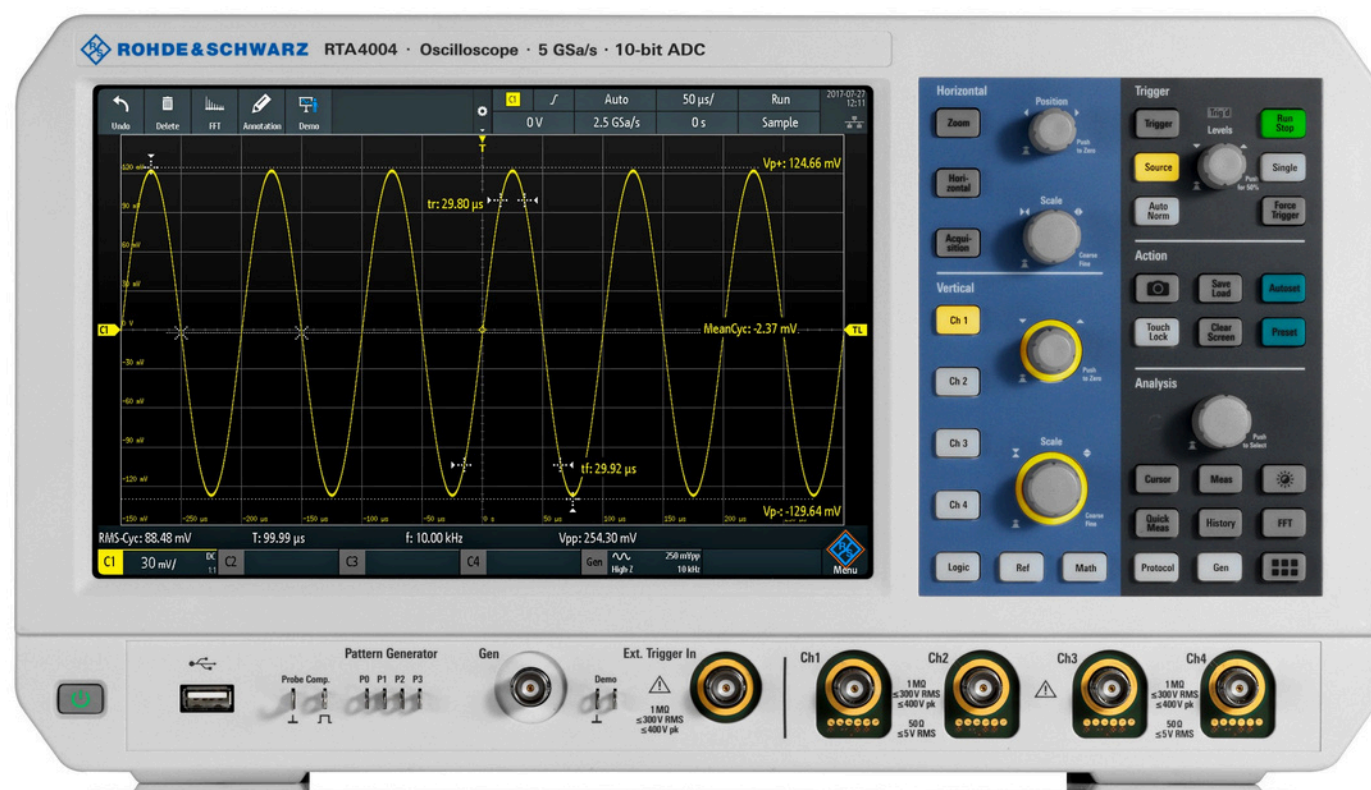
BENEFITS

Unrivaled signal integrity
► page 4

Capture more time at full bandwidth
► page 5

Large high-resolution display in a compact form factor
► page 6

Frequency response analysis (Bode plot)
► page 8

Spectrum analysis: identify interactions between time and frequency
► page 10

Protocol analysis: efficiently debug serial buses
► page 11

The right probe for the best measurement
► page 12

Capabilities to meet your needs today with insurance for the future
► page 14

Choose your Rohde & Schwarz oscilloscope

	R&S®RTC1000	R&S®RTB2000	R&S®RTM3000	R&S®RTA4000
Number of oscilloscope channels	2	2/4 70, 100, 200, 300	2/4 100, 200, 350, 500, 1000	4 200, 350, 500, 1000
Bandwidth in MHz	50, 70, 100, 200, 300	1.25/channel, 2.5 interleaved	2.5/channel, 5 interleaved	2.5/channel, 5 interleaved
Max. sampling rate in Gsample/s	1/channel, 2 interleaved	10/channel, 20 interleaved; 160 Msample (optional) segmented memory	40/channel, 80 interleaved; 400 Msample (optional) segmented memory	100/channel, 200 interleaved; 1 Gsample (standard) segmented memory
Max. memory depth in Msample	1/channel, 2 interleaved	2.5	2.5	0.5
Timebase accuracy in ppm	50	10	10	10
Vertical bits (ADC)	8			
Min. input sensitivity	1 mV/div	1 mV/div	500 µV/div	500 µV/div
Display	6.5", 640 × 480 pixel	10" capacitive touch, 1280 × 800 pixel	10" capacitive touch, 1280 × 800 pixel	10" capacitive touch, 1280 × 800 pixel
Update rate	10 000 waveforms/s	300 000 waveforms/s in fast segmentated memory mode	2 000 000 waveforms/s in fast segmentated memory mode	2 000 000 waveforms/s in fast segmentated memory mode
MSO	8 channels, 1 Gsample/s	16 channels, 2.5 Gsample/s	16 channels, 5 Gsample/s	16 channels, 5 Gsample/s
Protocol (optional)	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, audio (I²S/LJ/RJ/TDM), ARINC, MIL	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, audio (I²S), ARINC, MIL
Generator(s)	1 generator, 4-bit pattern generator	1 ARB, 4-bit pattern generator	1 ARB, 4-bit pattern generator	1 ARB, 4-bit pattern generator
Math	+, −, *, /, FFT (128k points)	+, −, *, /, FFT (128k points)	+, −, *, /, FFT (128k points), 21 advanced functions	+, −, *, /, FFT (128k points), 21 advanced functions
Rohde & Schwarz probe interface	–	–	standard	standard
RF capability	FFT	FFT	spectrum analysis	spectrum analysis

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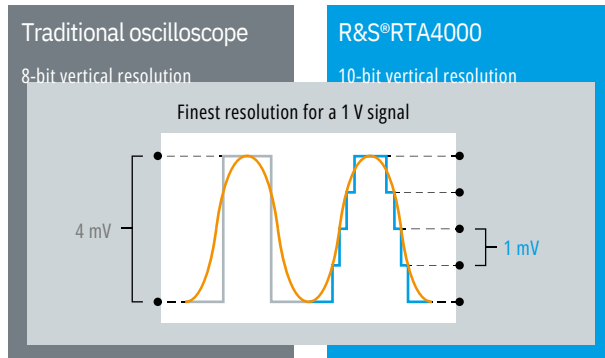
UNRIVALED SIGNAL INTEGRITY

▶ **10-bit ADC:** 1024 levels, 4 times more than 8-bit ADC

▶ **0.6 % noise:** at 1 mV/div, 200 MHz, 50 Ω; % of full scale

▶ **500 µV/div:** full bandwidth, no software magnification

10-bit ADC with up to 16-bit resolution

Rohde & Schwarz engineered a proprietary 10-bit A/D converter that delivers a fourfold improvement over conventional 8-bit A/D converters.

The increased resolution results in sharper waveforms with more signal details that would otherwise be missed. One example is the characterization of switched-mode power supplies. The voltages across the switching device must
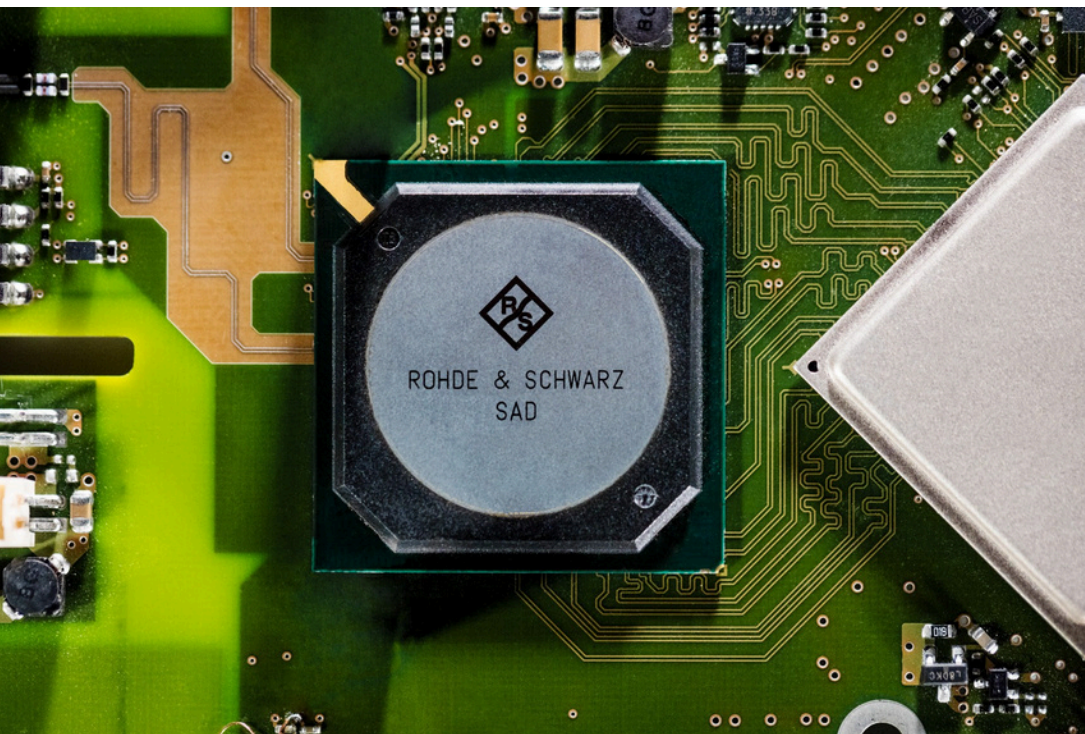
be determined during the on/off times within the same acquisition. For precise measurements of small voltage components, a high resolution of more than 8 bit is essential. With high resolution decimation, the R&S®RTA4000 even provides up to 16-bit vertical resolution, a resolution previously unseen in this class of instrument.

500 µV/div: full measurement bandwidth

The R&S®RTA4000 oscilloscope offers outstanding sensitivity down to 500 µV/div. Traditional oscilloscopes can only reach this level of input sensitivity by employing software-based magnification of larger settings or by limiting the bandwidth. The R&S®RTA4000 oscilloscope shows the signal's real sampling points over the full measurement bandwidth – even at 500 µV/div.

Class-leading low noise

Higher resolution is only beneficial if the extra bits are not consumed by the noise of the oscilloscope. The R&S®RTA4000 has class-leading low noise that allows you to take advantage of the extra bits of resolution and see signals that are hidden in the noise of other oscilloscopes.

10-bit A/D converter: uncovers even small signal details

Traditional oscilloscope — 8-bit vertical resolution

R&S®RTA4000 — 10-bit vertical resolution

Finest resolution for a 1 V signal

4 mV

1 mV

The Rohde & Schwarz designed 10-bit A/D converter ensures highest signal fidelity at highest resolution

CAPTURE MORE TIME AT FULL BANDWIDTH

▶ 200 Msample: standard acquisition memory

▶ 1 Gsample: standard history and segmented mode

▶ ±0.5 ppm: timebase accuracy

Deep memory: standard 100 Msample per channel and 200 Msample interleaved

The R&S®RTA4000 offers class-leading memory depth: 100 Msample per channel, 200 Msample in interleaved mode. This is up to 10 times more than similar oscilloscopes in the same instrument class. Maintaining a fast sample rate is directly tied to acquisition memory. With its deep memory, the R&S®RTA4000 captures longer periods of time at high sample rates, giving you extra insurance for unexpected project requirements.

Class-leading timebase accuracy

With a timebase accuracy of ±0.5 ppm, the R&S®RTA4000 is 5 to 20 times better than other instruments in its class. An excellent timebase is important to ensure accurate measurements over long time captures.
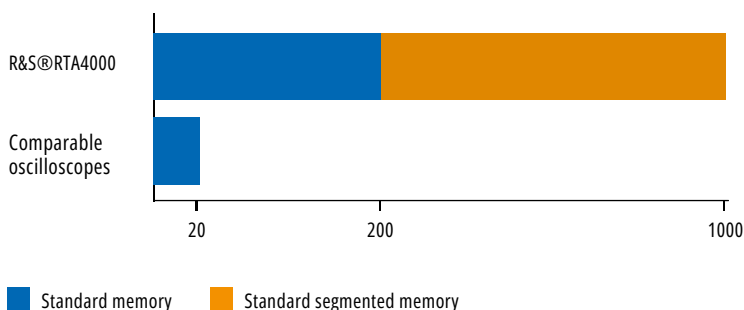
Standard segmented memory: 1 Gsample

The standard segmented memory analyzes signal sequences over a long observation period. For example, protocol-based signals with communications gaps, such as I2C or SPI, can be captured over extended periods of time without wasting storage on idle time. Thanks to the variable segment size from 10 ksample to 200 Msample, the deep memory is optimally utilized; more than 87 000 cohesive individual segments are possible.

Standard history function

History mode is an always-on capability to view previous acquisitions up to the maximum segmented memory depth of 1 Gsample. For further analysis, the complete toolset can be applied to recorded segments. This includes, for example, mask tests, QuickMeas function and FFT.

10 to 50 times more memory depth than traditional oscilloscopes in the same instrument class

Capture the longest time periods with class-leading 1000 Msample memory

	20	200	1000

■ Standard memory ■ Standard segmented memory

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LARGE HIGH-RESOLUTION DISPLAY IN A

Quick access to important tools
▶ Drag & drop to use analysis tools
▶ Toolbar to access functions
▶ User-defined shortcuts allow fast adjustment of functions

Vertical zoom
▶ Zoom both horizontally and vertically on waveforms without overdriving the frontend

Easily customizable waveform display with R&S®SmartGrid technology
▶ Configurable display
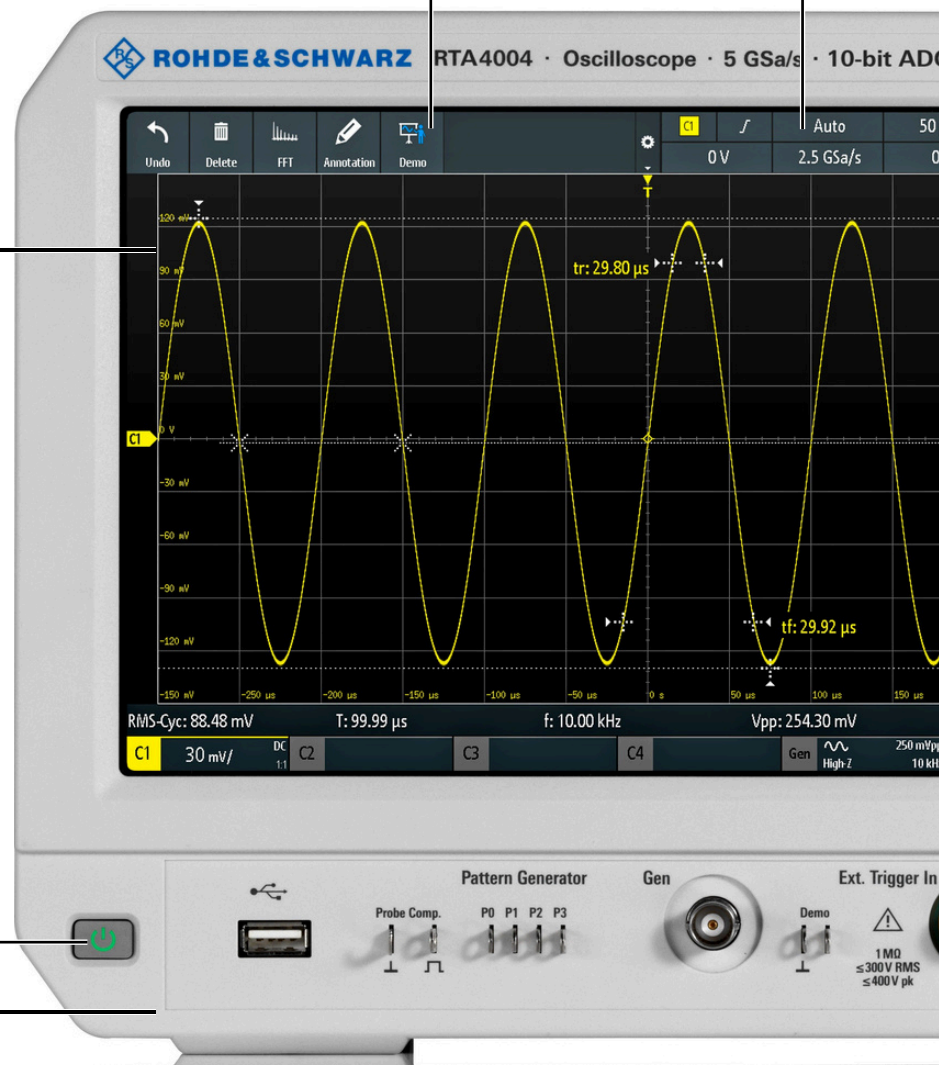▶ Resizable waveform areas
▶ Scales labeled on all axes

10 second boot time

Compact form factor
▶ Small footprint
▶ Less than 3.3 kg
▶ Only 28.3 dB(A) audible noise

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COMPACT FORM FACTOR

10.1" high-resolution capacitive touchscreen with gesture support
- ► Gesture support for scaling and zooming
- ► High resolution: 1280 × 800 pixel
- ► 12 horizontal grid lines for more signal details

Documentation of results at the push of a button
- ► Documentation as a screenshot or of instrument settings

Integrated logic analyzer (MSO)
- ► 16 additional digital channels
- ► Synchronous and time-correlated analysis of analog and digital components of embedded designs
- ► User upgradeable

Color-coded controls indicate the selected channel

Standard history function
- ► Always-on capability to view previous acquisitions
- ► Over 1 Gsample
- ► More than 87 000 segments

Active probe interface
- ► Automatically detects and powers probes
- ► Rohde & Schwarz probes with probe interface
- ► More than 30 available probes

Rohde & Schwarz R&S®RTA4000 Oscilloscope 7

FREQUENCY RESPONSE ANALYSIS (BODE PLOT)

▶ Analyze the frequency response of passive filters and amplifier circuits

▶ Perform control loop response measurements

▶ Perform power supply rejection ratio measurements

▶ Simple and fast documentation

Perform low-frequency response analysis with an oscilloscope

The R&S®RTA-K36 frequency response analysis (Bode plot) option lets you perform low-frequency response analysis on your oscilloscope easily and quickly. It characterizes the frequency response of a variety of electronic devices, including passive filters and amplifier circuits. For switch mode power supplies, it measures the control loop response and power supply rejection ratio.

The frequency response analysis option uses the oscilloscope's built-in waveform generator to create stimulus signals ranging from 10 Hz to 25 MHz. Measuring the ratio of the stimulus signal and the output signal of the DUT at each test frequency, the oscilloscope plots gain and phase logarithmically.

The R&S®RTA-K36 frequency response analysis (Bode plot) option characterizes the frequency response of a variety of electronic devices, including passive filters and amplifier circuits
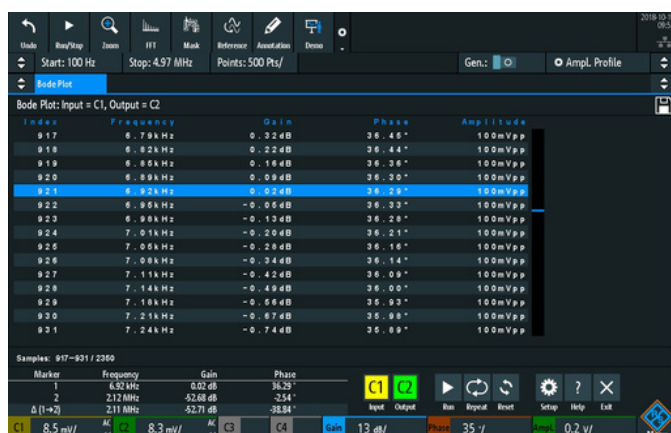
The amplitude output level of the generator signal can be varied during the measurement to suppress the noise behavior of the DUT

The measurement resolution can be varied by changing the points per decade

A table of measurement results provides detailed information about each measurement point, consisting of frequency, gain and phase shift

R&S®RT-ZP1X 38 MHz bandwidth 1:1 passive probe

Features and functionalities

Amplitude profile
The R&S®RTA-K36 frequency response analysis (Bode plot) option allows users to profile the amplitude output level of the generator. This helps to suppress the noise behavior of the DUT when performing a control loop response or power supply rejection ratio and to improve signal-to-noise ratio (SNR). It is possible to define up to 16 steps.

Improve resolution and markers support
You can choose the points per decade to set up and modify the resolution of your plot. The oscilloscope supports up to 500 points per decade. Markers can be dragged to the desired position, directly on the plotted trace. A legend displays the corresponding coordinates of the markers. To determine the crossover frequency, set one marker to 0 dB and the second marker to −180° phase shift. Now you can easily determine the phase and gain margin.

Measurement table
Furthermore, you can view the results in a table. The table of measurement results details information about each measured point, consisting of frequency, gain and phase shift. In case you use cursors, for ease of use, the associated row of the result table is highlighted. For reporting, screenshots, table results or both can be quickly saved to a USB device.

Broad probe portfolio
Accurate control loop response or power supply rejection ratio characterization highly depends on choosing the right probes, since peak-to-peak amplitudes of both V_{in} and V_{out} can be very low at some test frequencies. These values would be buried in the oscilloscope's noise floor and/or in the switching noise of the DUT itself. We recommend the low-noise R&S®RT-ZP1X 38 MHz bandwidth 1:1 passive probes. These reduce measurement noise and provide the best SNR.

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a simac group company

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SPECTRUM ANALYSIS: IDENTIFY INTERACTIONS BETWEEN TIME AND FREQUENCY

▶ Spectrogram: evolution over time

▶ Peak markers: automatic positioning

Fast and precise analysis

Difficult-to-find faults often result from the interaction between time and frequency signals. The R&S®RTA-K37 spectrum analysis and spectrogram option quickly finds such errors. Like on a spectrum analyzer, parameters such as center frequency and resolution bandwidth can be adapted to the specific measurement task. The oscilloscope automatically selects the relevant time domain settings. Optimum performance ensures the fastest multi-domain analysis in this oscilloscope class.

## Parallel operation: correlation between frequency and time

Advanced electronics is based on the seamless interac- tion between protocol-based interfaces, digital, analog and frequency components. Simultaneous analysis of all com-ponents is a must. Time, frequency and protocol informa-tion is correlated, and time references can be quickly rec-ognized. Measurement windows help you select specific areas of the recording, which can simplify, for example, the acquisition of frequency switching operations.

Spectrogram: display of frequency over time

A spectrogram displays the spectrum of frequencies as they vary over time. For easy interpretation, the magni-tude can be color-coded. Thanks to the high FFT rate, even fast frequency changes can be displayed. When used in combination with the history and segmented memory, the spectrogram marker shows the time of the acquisition and makes it possible to load the corresponding time and frequency waveforms onto the screen. All R&S®RTA4000 tools can be used to analyze the loaded waveforms.

Markers: find peaks automatically

Markers can be automatically positioned on the frequency peaks for fast analysis. An adaptable threshold defines the peaks. Parameters such as excursion and maximum peak width can be adjusted for in-depth analysis. Results can be compiled in a table (absolute or relative to a specific refer-ence marker). Selectable delta measurements make it easy to adjust the distances between signal peaks.
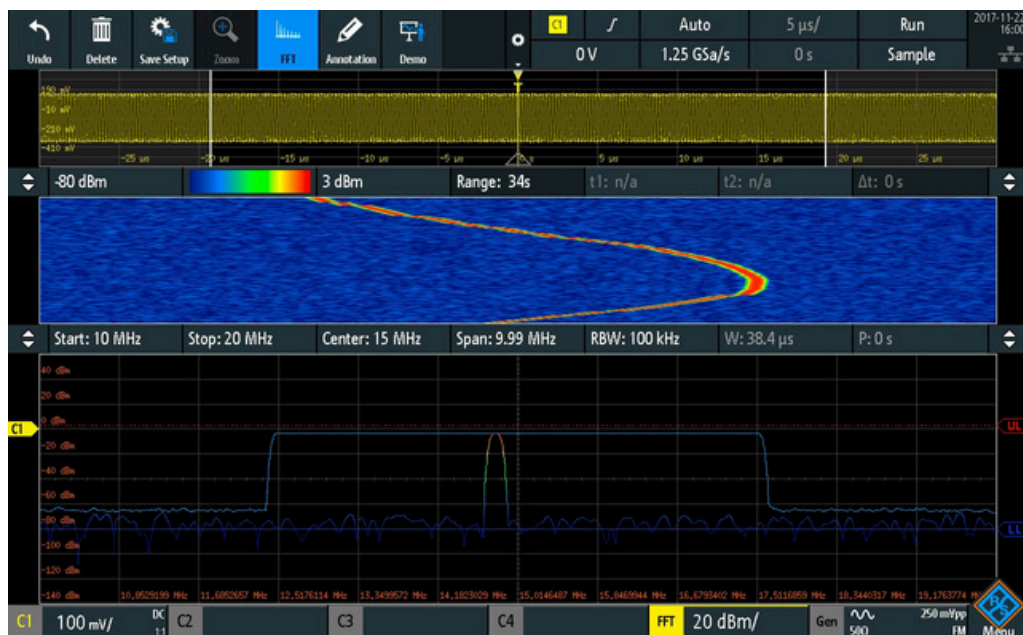
Test signal from three different perspectives: time domain (top), spectrogram (center) and frequency domain (bottom)

PROTOCOL ANALYSIS: EFFICIENTLY DEBUG SERIAL BUSES

Protocol aware triggering and decoding for serial buses

Counting 1s and 0s to decode a serial bus is tedious and error-prone. The R&S®RTA4000 automates this process by decoding the waveforms into a specific protocol. In addition, protocol aware triggering directly triggers on specific parts of a packet or frame.

Segmented memory for long time captures

Standard segmented memory is ideal for serial protocols. It allows you to capture only relevant packets/frames and ignore the long idle time in between packets. With 1 Gsample of segmented memory available, you can capture more than 87 000 timestamped packets/frames.

Table view of packets/frames

A table view allows you to see a high-level representation of all captured packets. You can also export the table.

Supported buses	
Embedded	▸ I2C
	▸ UART/RS-232/RS-422/RS-485
	▸ SPI (2/3/4-wire)
Aerospace	▸ MIL-STD-1553
	▸ ARINC 429
Automotive, industrial	▸ CAN
	▸ LIN
Audio	▸ I2S/LJ/RJ/TDM

Decoded hexadecimal I²C message shown in honeycomb format and in table

Rohde & Schwarz R&S®RTA4000 Oscilloscope

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THE RIGHT PROBE FOR THE BEST MEASUREMENT

▶ More than 30 dedicated probes

▶ Micro button for convenient instrument control

▶ 0.01 % accuracy: with R&S®ProbeMeter

Extensive probe range for all measurement tasks

A complete portfolio of high-quality passive and active probes covers all measurement tasks. With an input impedance of 1 MΩ, the active probes put only a minimum load on a signal source's operating point. The very large dynamic range, even at high frequencies, prevents signal distortion – for example: 60 V (V pp) at 1 GHz for the active single-ended probes.

Complete portfolio for power measurements

The portfolio of dedicated probes for power measurements includes active and passive probes for the different voltage and current ranges – from µA to kA and from µV to kV. Dedicated power rail probes detect even small and sporadic distortions on DC power rails.
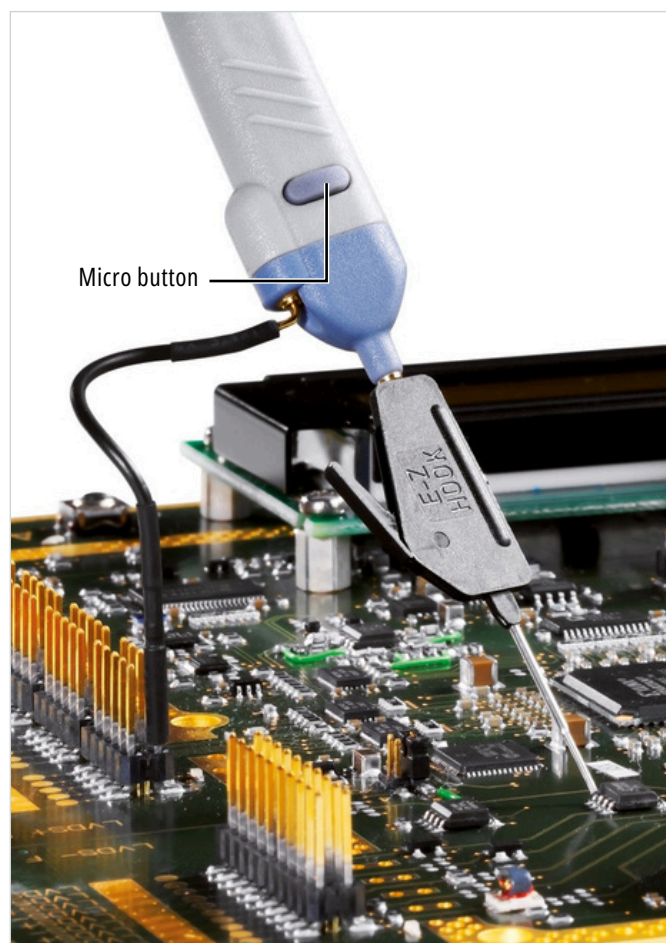
Micro button for convenient instrument control

The situation is all too familiar. You've carefully positioned the probe on the device under test and want to start the measurements – but you don't have a free hand. The micro button on Rohde & Schwarz active probes solves this problem. It is conveniently situated on the probe tip, and you can assign it different functions, such as run/stop, autoset and adjust offset.

R&S®ProbeMeter: integrated voltmeter for precise DC measurements

One connection lets you see the oscilloscope waveform and gives you access to a highly accurate voltmeter that shows the DC value regardless of other instrument settings.

▶ For more information, see the product brochure: Probes and accessories for Rohde & Schwarz oscilloscopes (PD 3606.8866.12).

Micro button

Practical design: micro button for convenient instrument control; diverse probe tips and ground cables are included as standard accessories

| Probe type	Ideal for measuring	Recommended probes
Standard passive probe	Single-ended voltages, max. bandwidth 500 MHz	R&S®RT-ZP10 comes as standard with the R&S®RTA4000
Active broadband probe	Singled-ended voltages, up to 8 GHz bandwidth	R&S®RT-ZS10E, R&S®RT-ZS10, R&S®RT-ZS20
Power integrity probe	Disturbances on power rails with high offsets, greater than 2 GHz bandwidth	R&S®RT-ZPR20
High voltage probe	High single-ended and differential voltages, up to 6 kV	R&S®RT-ZHD007, R&S®RT-ZHD15, R&S®RT-ZHD16, R&S®RT-ZHD60
Current probe	Currents from µAs to kAs	R&S®RT-ZC05B, R&S®RT-ZC10B, R&S®RT-ZC15B, R&S®RT-ZC20B, R&S®RT-ZC30
EMC near-field probe	EMI debugging up to 3 GHz	R&S®HZ-15

COMMON APPLICATIONS

Power integrity

► Measure large DC offsets with the ability to zoom in on small ripples
► Accurately measure ripple and periodic and random disturbances (PARD)
► Spectrum analysis view makes finding coupled sources easier
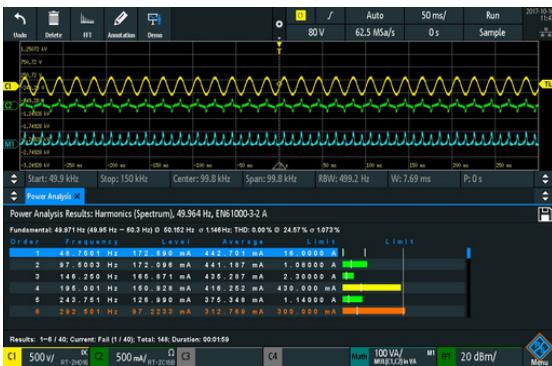
Power analysis

► See power signal details with up to 16-bit resolution
► Capture long periods of time, e.g. a turn-on sequence, with high sample rate
► Complete probe portfolio for measuring from µA to kA and µV to kV

EMI debugging

► Near-field probes allow you to sniff out interfering signals
► Time and frequency domain correlation for powerful debugging of emitters
► FFT provides a vivid and fast view in the frequency domain

CAPABILITIES TO MEET YOUR NEEDS TOD
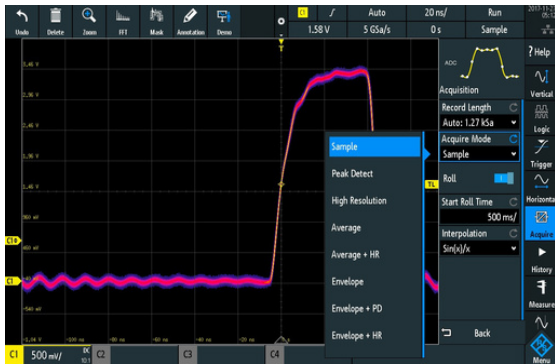
Acquisition modes

► High-resolution: up to 16-bit vertical resolution
► Averaging: up to 100 000 waveforms
► Peak detect
► Envelope
► Averaging plus high resolution
► Envelope plus peak detect
► Envelope plus high resolution
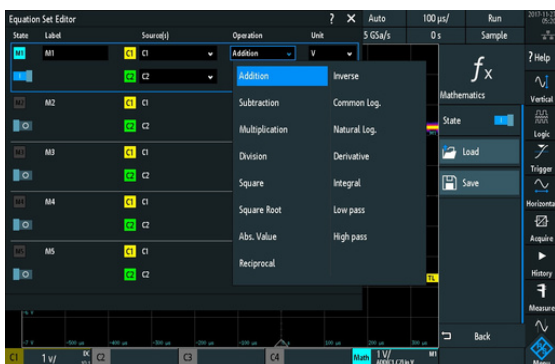
Math and measurements

► Up to five basic or advanced math waveforms
► Advanced math includes equation editor with 30 options
► Up to eight measurements at once
► Over 40 automated measurement options available for each measurement
► Gated measurements and statistics
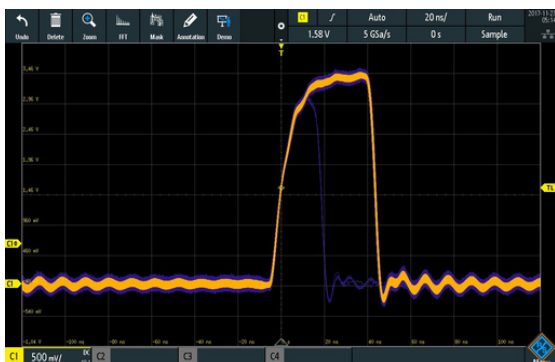
Annotation, R&S®SmartGrid and documentation

► Simplified documentation at the push of a button
► On-screen annotation using the touch display for specific notes
► R&S®SmartGrid to easily resize/layout/configure the display as needed
► Graticule annotation makes it easy to quickly see the V/div and timebase setting
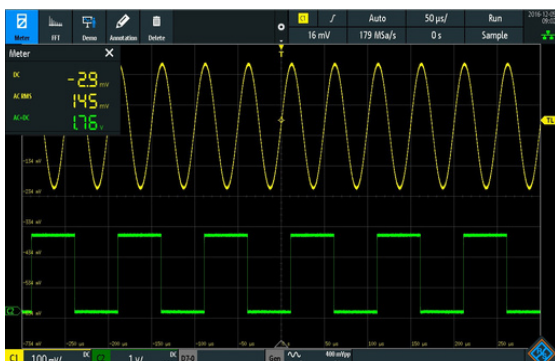
Digital voltmeter

► Integrated 3-digit voltmeter (DVM)
► Integrated 6-digit frequency counter
► Always on, even when the oscilloscope is stopped
► Measurement functions include DC, AC + DC (RMS) and AC (RMS)

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Mixed signal

► Integrated digital channels (16 channels) allow correlated measurements between analog and digital signals
► Up to 5 Gsample/s sample rate for high timing resolution
► Up to 200 Msample of memory allows long time captures
► Ideal for low-speed serial bus analysis
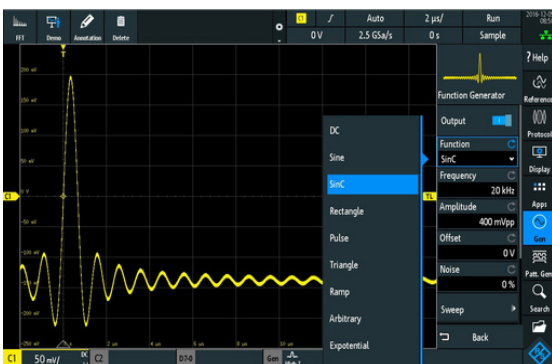
Waveform and pattern generator

► Integrated arbitrary waveform generator to produce signals for device stimulus
► High sample rate (250 Msample/s) and resolution (14 bit) allows accurate signal reproduction
► Modulation and swept mode capabilities
► 50 Ω (2.5 V (V pp)) and 1 MΩ (10 V (Vpp)) output
► 4-bit pattern generator with predefined patterns and the ability to import user-defined patterns
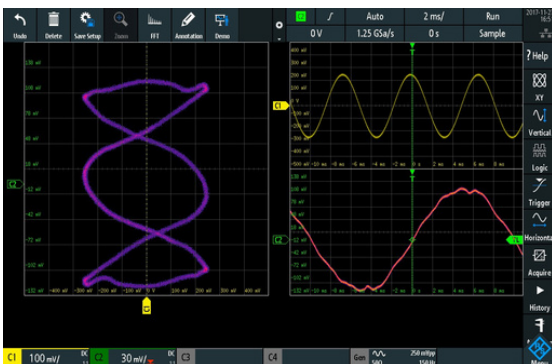
XY mode

► Plot the voltage levels of two channels against each other
► Measure phase shift
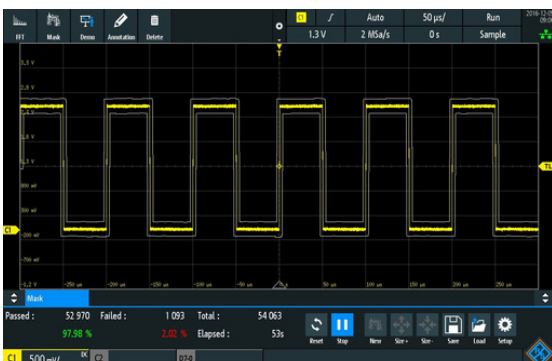
Mask test mode

► Fast limit testing to see if a waveform violates a configured set of conditions
► Import user-defined masks or create a mask of a known good waveform on the oscilloscope
► Save screenshots, waveforms; output a beep or pulse on violations

AND THERE IS SO MUCH MORE ...

▶ Efficient reporting capabilities

▶ Localized GUI and online help

▶ Fully upgradeable via software licenses

▶ Web server functionality for instrument access

▶ Extensive range of probes and accessories

Grows with your needs

The R&S®RTA4000 oscilloscopes flexibly adapt to needed project updates. You simply install the necessary software licenses, e.g. triggering and decoding of serial protocols. The waveform and pattern generator and MSO capabilities 1) are built-in and just need to be activated. The bandwidth can be upgraded up to 1 GHz via keycode. All this makes retrofitting really easy.

Multilingual support: choose among thirteen languages

The R&S®RTA4000 oscilloscope's user interface and online help support thirteen languages (English, German, French, Spanish, Italian, Portuguese, Czech, Polish, Russian, simplified and traditional Chinese, Korean and Japanese). You can change the language in just a few seconds while the instrument is running.

1) The R&S®RTA-B1 MSO option additionally contains two logic probes with 16 digital channels.

Protection of data

The secure erase function protects sensitive data. This function removes all user data and settings, including device setups and reference waveforms.

Connectivity

The R&S®RTA4000 can be directly connected to a PC via the built-in USB host and USB device ports. The USB host transfers screenshots and instrument settings to a USB stick. Media transfer protocol (MTP) implementation ensures seamless integration. The USB device port and the LAN interface enable remote control. The built-in web server functionality allows you to control the oscilloscope and display your screen content to an audience. Data and programming interfaces are included, e.g. for seamless MATLAB® integration.

With the USB MTP implementation, you can easily access live channel data and screenshots and integrate the oscilloscope into your computing environment

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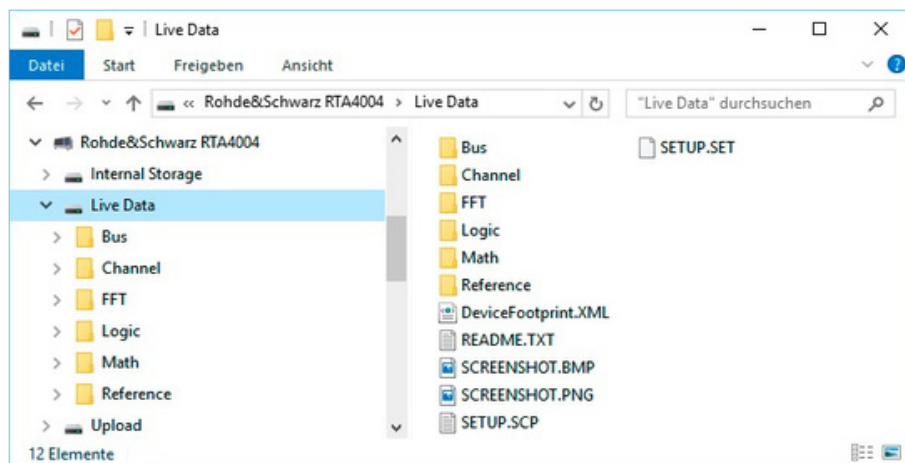
SPECIFICATIONS IN BRIEF

Specifications in brief

Vertical system

Number of channels	R&S®RTA4004	R&S®RTA4004	(with	4 200 MHz, 350 MHz, 500 MHz, 1 GHz
Bandwidth (–3 dB)	R&S®RTA-B24x	options)	R&S®RTA4004	1.75 ns 1 ns 700 ps 350 ps
Rise time (calculated)	R&S®RTA4004 with R&S®RTA-B243 option			
	R&S®RTA4004 with R&S®RTA-B245 option			
	R&S®RTA4004 with R&S®RTA-B2410 option			
	max. bandwidth in all ranges			
Input sensitivity				
	at 1 MΩ			500 µV/div to 10 V/div
	at 50 Ω			500 µV/div to 1 V/div
DC gain accuracy	offset and position = 0, maximum operating temperature change of ±5 °C after self-alignment			
	input sensitivity > 5 mV/div			±1 % of full scale ±1.5 % of full scale ±2.5 % of full
	input sensitivity ≤ 5 mV/div to ≥ 1 mV/div			scale 10 bit, up to 16 bit with high resolution
	input sensitivity < 1 mV/div			decimation
ADC resolution				

Acquisition system

Maximum realtime sampling rate	2.5 Gsample/s; 5 Gsample/s, interleaved
Acquisition memory	100 Msample (200 Msample, interleaved); 1 Gsample segmented memory

Horizontal system

Timebase range	selectable between 0.5 ns/div and 500 s/div

Trigger system

Trigger types	standard	edge, width, video (PAL, NTSC, SECAM, PAL-M, SDTV 576i, HDTV 720p, HDTV 1080i, HDTV 1080p), pattern, line, serial bus
	option	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN/LIN, audio (I²S), ARINC 429, MIL-STD-1553

MSO option

Digital channels	16 (2 logic probes)
Sampling rate	2.5 Gsample/s; 5 Gsample/s, interleaved
Acquisition memory	10 Msample

Waveform generator

Resolution, sample rate		14 bit, 250 Msample/s
Amplitude	high Z; 50 Ω	20 mV to 10 V (V pp); 10 mV to 5 V (Vpp)
DC offset	high Z; 50 Ω	±5 V; ±2.5 V

General data

Screen		10.1" WXGA TFT color display (1280 × 800 pixel)
Interfaces		USB host with MTP, USB device, LAN, powerful web server for remote display and operation
Audible noise	maximum sound pressure level at a distance of 1.0 m	28.3 dB(A)
Dimensions	W × H × D	390 mm × 220 mm × 152 mm (15.4 in × 8.66 in × 5.98 in)
Weight		3.3 kg (7.3 lb)

RMS noise floor at 50 Ω (meas.)

Input sensitivity	R&S®RTA4004	R&S®RTA4004 + R&S®RTA-B243	R&S®RTA4004 + R&S®RTA-B245	R&S®RTA4004 + R&S®RTA-B2410
▶ 1 V/div	▶ 22.7 mV	▶ 22.8 mV	▶ 25.1 mV	▶ 31.4 mV
▶ 500 mV/div	▶ 12.6 mV	▶ 13.7 mV	▶ 15.4 mV	▶ 19.8 mV
▶ 200 mV/div	▶ 5.5 mV	▶ 6.2 mV	▶ 7.0 mV	▶ 9.1 mV
▶ 100 mV/div	▶ 2.7 mV	▶ 3.0 mV	▶ 3.4 mV	▶ 4.6 mV
▶ 50 mV/div	▶ 1.4 mV	▶ 1.6 mV	▶ 1.8 mV	▶ 2.4 mV
▶ 20 mV/div	▶ 0.53 mV	▶ 0.58 mV	▶ 0.65 mV	▶ 0.86 mV
▶ 10 mV/div	▶ 0.26 mV	▶ 0.28 mV	▶ 0.32 mV	▶ 0.41 mV
▶ 5 mV/div	▶ 0.15 mV	▶ 0.18 mV	▶ 0.20 mV	▶ 0.27 mV
▶ 2 mV/div	▶ 0.07 mV	▶ 0.09 mV	▶ 0.10 mV	▶ 0.13 mV
▶ 1 mV/div	▶ 0.06 mV	▶ 0.07 mV	▶ 0.08 mV	▶ 0.11 mV
▶ 0.5 mV/div	▶ 0.05 mV	▶ 0.07 mV	▶ 0.08 mV	▶ 0.11 mV

OSCILLOSCOPE PORTFOLIO

	R&S®RTH1000	R&S®RTC1000	R&S®RTB2000	R&S®RTM3000	R&S®MXO 4
Vertical system					
Bandwidth 1)	60/100/200/350/500 MHz	50/70/100/200/300 MHz	70/100/200/300 MHz	100/200/350/500 MHz/1 GHz	200/350/500 MHz/1/1.5 GHz
Number of channels	2 plus DMM/4	2	2/4	2/4	4
ADC resolution; system architecture	10 bit; 16 bit	8 bit; 16 bit	10 bit; 16 bit	10 bit; 16 bit	12 bit; 18 bit
V/div, 1 MΩ	2 mV to 100 V	1 mV to 10 V	1 mV to 5 V	500 µV to 10 V	500 µV to 10 V
V/div, 50 Ω	–			500 µV to 1 V	500 µV to 1 V
Horizontal system					
Sampling rate per channel (in Gsample/s)	1.25 (4-channel model); 2.5 (2-channel model); 5 (all channels interleaved)	1; 2 (2 channels interleaved)	1.25; 2.5 (2 channels interleaved)	2.5; 5 (2 channels interleaved)	2.5; 5 (2 channels interleaved)
Maximum memory (per channel; 1 channel active)	125 kpoints (4-channel model); 250 kpoints (2-channel model); 500 kpoints	1 Mpoints; 2 Mpoints	10 Mpoints; 20 Mpoints	40 Mpoints; 80 Mpoints	standard: 400 Mpoints; max. upgrade: 800 Mpoints 2)
Segmented memory	standard, 50 Mpoints	–	option, 320 Mpoints	option, 400 Mpoints	standard: 10 000 segments; option: 1 000 000 segments
Acquisition rate (in waveforms/s)	50 000	10 000	50 000 (300 000 in fast segmented memory mode 2))	64 000 (2 000 000 in fast segmented memory mode 2))	> 4 500 000
Trigger					
Types	digital	analog	analog	analog	digital
Sensitivity	–	–	at 1 mV/div: > 2 div	at 1 mV/div: > 2 div	0.0001 div, across full bandwidth, user controllable
Mixed signal option (MSO)					
Number of digital channels 1)	8	8	16	16	16
Analysis					
Mask test	tolerance mask	tolerance mask	tolerance mask	tolerance mask	3)
Mathematics	elementary	elementary	basic (math on math)	basic (math on math)	basic (math on math)
Serial protocols triggering and decoding 1)	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, CAN FD, SENT	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, I2S, MIL-STD-1553, ARINC 429	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, CAN FD, CAN XL, LIN 3)
Applications 1), 2)	high-resolution frequency counter, advanced spectrum analysis, harmonics analysis, user scripting	digital voltmeter (DVM), component tester, fast Fourier transform (FFT)	digital voltmeter (DVM), fast Fourier transform (FFT), frequency response analysis	power, digital voltmeter (DVM), spectrum analysis and spectrogram, frequency response analysis	frequency response analysis
Compliance testing 1), 2)	–	–	–	–	–
Display and operation					
Size and resolution	7" touchscreen, 800 × 480 pixel	6.5", 640 × 480 pixel	10.1" touchscreen, 1280 × 800 pixel	10.1" touchscreen, 1280 × 800 pixel	13.3" touchscreen, 1920 × 1080 pixel (Full HD)
General data					
Dimensions in mm (W × H × D)	201 × 293 × 74	285 × 175 × 140	390 × 220 × 152	390 × 220 × 152	414 × 279 × 162
Weight in kg	2.4	1.7	2.5	3.3	6
Battery	lithium-ion, > 4 h	–	–	–	–

1) Upgradeable.   2) Requires an option.   3) Available with future firmware release.

R&S®RTE1000	R&S®RTO6	R&S®RTP
200/350/500 MHz/1/1.5/2 GHz	600 MHz/1/2/3/4/6 GHz	4/6/8/13/16 GHz
2/4	4	4
8 bit; 16 bit	8 bit; 16 bit	8 bit; 16 bit
500 µV to 10 V	1 mV to 10 V (HD mode: 500 µV to 10 V)	
500 µV to 1 V	1 mV to 1 V (HD mode: 500 µV to 1 V)	2 mV to 1 V (HD mode: 1 mV to 1 V)
5	10; 20 (2 channels interleaved in 4 GHz and 6 GHz model)	20; 40 (2 channels interleaved)
50 Mpoints; 200 Mpoints	standard: 200 Mpoints/800 Mpoints; max. upgrade: 1 Gpoints/2 Gpoints	standard: 100 Mpoints/400 Mpoints; max. upgrade: 3 Gpoints
standard	standard	standard
1 000 000 (1 600 000 in ultra-segmented memory mode)	1 000 000 (2 500 000 in ultra-segmented memory mode)	750 000 (3 200 000 in ultra-segmented memory mode)
digital	digital (includes zone trigger)	advanced (includes zone trigger), digital trigger (14 trigger types) with real-time deembedding 2), high speed serial pattern trigger including 8/16 Gbps clock data recovery (CDR) 2)
0.0001 div, across full bandwidth, user controllable	0.0001 div, across full bandwidth, user controllable	0.0001 div, across full bandwidth, user controllable
16	16	16
user configurable, hardware based	user configurable, hardware based	user configurable, hardware based
advanced (formula editor)	advanced (formula editor, Python interface)	advanced (formula editor, Python interface)
I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, I2S, MIL-STD-1553, ARINC 429, FlexRay™, CAN FD, USB 2.0/HSIC, Ethernet, Manchester, NRZ, SENT, SpaceWire, CXPI, USB Power Delivery, Automotive Ethernet 100BASE-T1	I2C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, I2S, MIL-STD-1553, ARINC 429, FlexRay™, CAN FD, MIPI RFFE, USB 2.0/HSIC, MDIO, 8b10b, Ethernet, Manchester, NRZ, SENT, MIPI D-PHY, SpaceWire, MIPI M-PHY/UniPro, CXPI, USB 3.1 Gen 1, USB-SSIC, PCIe 1.1/2.0, USB Power Delivery, Automotive Ethernet 100/1000BASE-T1	I2C, SPI, UART/RS-232/RS-422/RS-485, SENT, CAN, LIN, CAN FD, MIL-STD-1553, ARINC 429, SpaceWire, USB 2.0/HSIC/PD, USB 3.1 Gen 1/Gen 2/SSIC, PCIe 1.1/2.0/3.0, 8b10b, MIPI RFFE, MIPI D/M-PHY/UniPro, Automotive Ethernet 100/1000BASE-T1, Ethernet 10/100BASE-TX, MDIO, Manchester, NRZ
power, advanced spectrum analysis and spectrogram	power, advanced spectrum analysis and spectrogram, jitter and noise decomposition, clock data recovery (CDR), I/Q data and RF analysis (R&S®VSE), deembedding, TDR/TDT analysis	advanced spectrum analysis and spectrogram, jitter and noise decomposition, real-time deembedding, TDR/TDT analysis, I/Q data and RF analysis (R&S®VSE), advanced eye diagram
–	see data sheet (PD 5216.1640.22)	see data sheet (PD 3683.5616.22)
10.4" touchscreen, 1024 × 768 pixel	15.6" touchscreen, 1920 × 1080 pixel (Full HD)	13.3" touchscreen, 1920 × 1080 pixel (Full HD)
427 × 249 × 204	450 × 315 × 204	441 × 285 × 316
8.6	10.7	18
–	–	–

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ORDERING INFORMATION

Designation	Type	Order No.
Choose your R&S®RTA4000 base model		
Oscilloscope, 200 MHz, 4 channels	R&S®RTA4004	1335.7700.04
Base unit (including standard accessories: 500 MHz passive probe per channel, power cord)		
Choose your bandwidth upgrade		
Upgrade of R&S®RTA4004 oscilloscopes to 350 MHz bandwidth	R&S®RTA-B243	1335.7846.0 2
Upgrade of R&S®RTA4004 oscilloscopes to 500 MHz bandwidth	R&S®RTA-B245	2
Upgrade of R&S®RTA4004 oscilloscopes to 1 GHz bandwidth	R&S®RTA-	1335.7852.0
Choose your options	B2410	2
Mixed signal upgrade for non-MSO models, 400 MHz	R&S®RTA-B1	**1335.7829.0**
Arbitrary waveform and 4-bit pattern generator	R&S®RTA-B6	2
I2C/SPI serial triggering and decoding	R&S®RTA-K1	1335.7830.0
UART/RS-232/RS-422/RS-485 serial triggering and decoding	R&S®RTA-K2	2
CAN/LIN serial triggering and decoding	R&S®RTA-K3	1335.7681.0
Audio (I2S, LJ, RJ, TDM) triggering and decoding	R&S®RTA-K5	2
MIL-STD-1553 serial triggering and decoding	R&S®RTA-K6	1335.7698.0
ARINC 429 serial triggering and decoding	R&S®RTA-K7	2
Power analysis	R&S®RTA-	1335.7717.0
Frequency response analysis (Bode plot)	K31	2
Spectrum analysis and spectrogram	R&S®RTA-	1335.7723.0
Application bundle 1), consists of the following options: R&S®RTA-K1, -K2, -K3, -K5, -K6, -K7, -K31, -K36, -K37, -B6	K36	2
	R&S®RTA-	1335.7730.0
Application bundle 2), consists of the following options: R&S®RTA-K1, -K2, -K3, -K5, -K6, -K7, -K31, -K36, -K37, -B6	K37 / R&S®RTA-PK1US	2 / 1335.7998.02
Choose your additional probes	R&S®RTA-	1335.7746.0
Single-ended passive probes		2
500 MHz, 10 MΩ, 10:1, 300 V, 10 pF, 5 mm 500 MHz, 10 MΩ, 10:1, 400 V, 9.5 pF, 2.5 mm 38 MHz, 1 MΩ, 1:1, 55 V, 39 pF, 2.5 mm	PK1 / R&S®RT- / ZP05S	1335.7769.0 / 1333.2401.0 / 2
Active broadband probes: single-ended	R&S®RT-ZP10	1335.7875.0 / 1409.7550.0
1.0 GHz, 10:1, 1 MΩ, BNC interface 1.0 GHz, active, 1 MΩ, Rohde & Schwarz probe interface 1.0 GHz, active, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface 1.5 GHz, active, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZP1X / R&S®RT- / ZS10L	0 / 1335.7881.0 / 1333.0870.0 / 2
Active broadband probes: differential	R&S®RT-	1418.7005.0
1.0 GHz, active, differential, 1 MΩ, R&S®ProbeMeter, micro button, incl. 10:1 external attenuator, 1 MΩ, 70 V DC, 46 V AC (peak), Rohde & Schwarz probe interface	ZS10E	2
1.5 GHz, active, differential, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZS10	1410.4080.0
	R&S®RT-ZS20	1410.4715.0
Power rail probe	ZD10	1410.3502.0
2.0 GHz, 1:1, 50 kΩ, ±0.85 V, ±60 V offset, Rohde & Schwarz probe interface		2
High voltage single-ended passive probes	R&S®RT- / R&S®RT-ZPR20	1410.4409.0 / 1800.5006.02
	ZD20	2
250 MHz, 100:1, 100 MΩ, 850 V, 6.5 pF 400 MHz, 100:1, 50 MΩ, 1000 V, 7.5 pF 400 MHz, 1000:1, 50 MΩ, 1000 V, 7.5 pF	R&S®RT- / ZH03	1333.0873.0 / 2
High voltage probes: differential	R&S®RT- / ZH10	1409.7720.0 / 2
25 MHz, 20:1/200:1, 4 MΩ, 1.4 kV (CAT III), BNC interface 25 MHz, 10:1/100:1, 4 MΩ, 700 V (CAT II), BNC interface 100 MHz, 8 MΩ, 1 kV (RMS) (CAT III), BNC interface 200 MHz, 10:1, ±20 V, BNC interface 800 MHz, 10:1, 200 kΩ, ±15 V, BNC interface 200 MHz, 250:1/25:1, 5 MΩ, 750 V (peak), 300 V CAT III, Rohde & Schwarz probe interface	**R&S®RT**-ZD002 / **R&S**®RT-ZD003 / R&S®RT-ZD01 / R&S®RT-ZD02 / R&S®RT-ZD08 / R&S®RT-ZHD07	**1409.9700.0** / 2 / 1337.9800.0 / 2 / 1422.0703.0 / 2
		1333.0821.0
		2
		1333.0838.0
		2
		1800.2307.0
		2

1) The R&S®RTA-PK1 option is not distributed in North America.
2) The R&S®RTA-PK1US option is only distributed in North America.

Designation	Type	Order No.
100 MHz, 500:1/50:1, 10 MΩ, 1500 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-	1800.2107.0
200 MHz, 500:1/50:1, 10 MΩ, 1500 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	ZHD15	2
100 MHz, 1000:1/100:1, 40 MΩ, 6000 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-	1800.2207.0
Current probes	ZHD16	2
20 kHz, AC/DC, 0.01 V/A and 0.001 V/A, ±200 A and ±2000 A, BNC interface	R&S®RT-ZC02	1800.0867.02
100 kHz, AC/DC, 0.1 V/A, 30 A, BNC interface	R&S®RT-ZC03	1333.0844.02
2 MHz, AC/DC, 0.01 V/A, 500 A (RMS), Rohde & Schwarz probe interface	R&S®RT-	1409.8204.02
10 MHz, AC/DC, 0.01 V/A, 150 A (RMS), BNC interface	ZC05B	1409.7750K0
10 MHz, AC/DC, 0.01 V/A, 150 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC10	2
50 MHz, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-	1409.8210.02
100 MHz, AC/DC, 0.1 V/A, 30 A (RMS), BNC interface	ZC10B	1409.8227.02
100 MHz, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-	1409.7766K0
120 MHz, AC/DC, 1 V/A, 5 A (RMS), BNC interface	ZC15B	2
EMC near-field probe	R&S®RT-ZC20	1409.8233.02
Probe set for E and H near-field measurements, 30 MHz to 3 GHz	R&S®RT-15	1409.2730K02
Logic probe	ZC20B	2
400 MHz logic probe, 8 channels	R&S®RT-ZC30	1333.0721.02
Probe accessories		
	R&S®RT-ZA13	1409.7789.0
Probe power supply for R&S®RT-ZC10/20/30	R&S®RT-ZA15	2
External attenuator 10:1, 2.0 GHz, 1.3 pF, 60 V DC, 42.4 V AC (peak) for R&S®RT-ZD20/30 probes	R&S®RT-ZA19	1410.4744.0
Probe pouch	R&S®RT-ZF20	2
Power deskew and calibration test fixture		1335.7875.0
3D positioner with central tensioning knob for easy clamping and positioning of probes	R&S®RT-ZA1P	2
(span width: 200 mm, clamping range: 15 mm)		
Choose your accessories		1800.0004.0
Front cover	R&S®RTB-Z1	1333.1728.0
Soft bag	R&S®RTB-Z3	2
Transit case	R&S®RTB-Z4	1326.3641.0
		1333.1734.0
Rackmount kit	R&S®ZZA-RTB2K	2
		1335.9290.0
		2

Warranty		1333.1728.0
Base unit		2 years
All other items 3)		1 year
Options		
Extended warranty, one year	R&S®WE1	
Extended warranty, two years	R&S®WE2	
Extended warranty with calibration coverage, one year	R&S®CW1	Contact your local Rohde & Schwarz sales office.
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	

3) For options installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

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