R&S®RTA4000 Oscilloscope
Power of ten

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

3 year warranty

ROHDE&SCHWARZ

Data Sheet | Version 05.00

R&S®RTA4000 Oscilloscope
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.

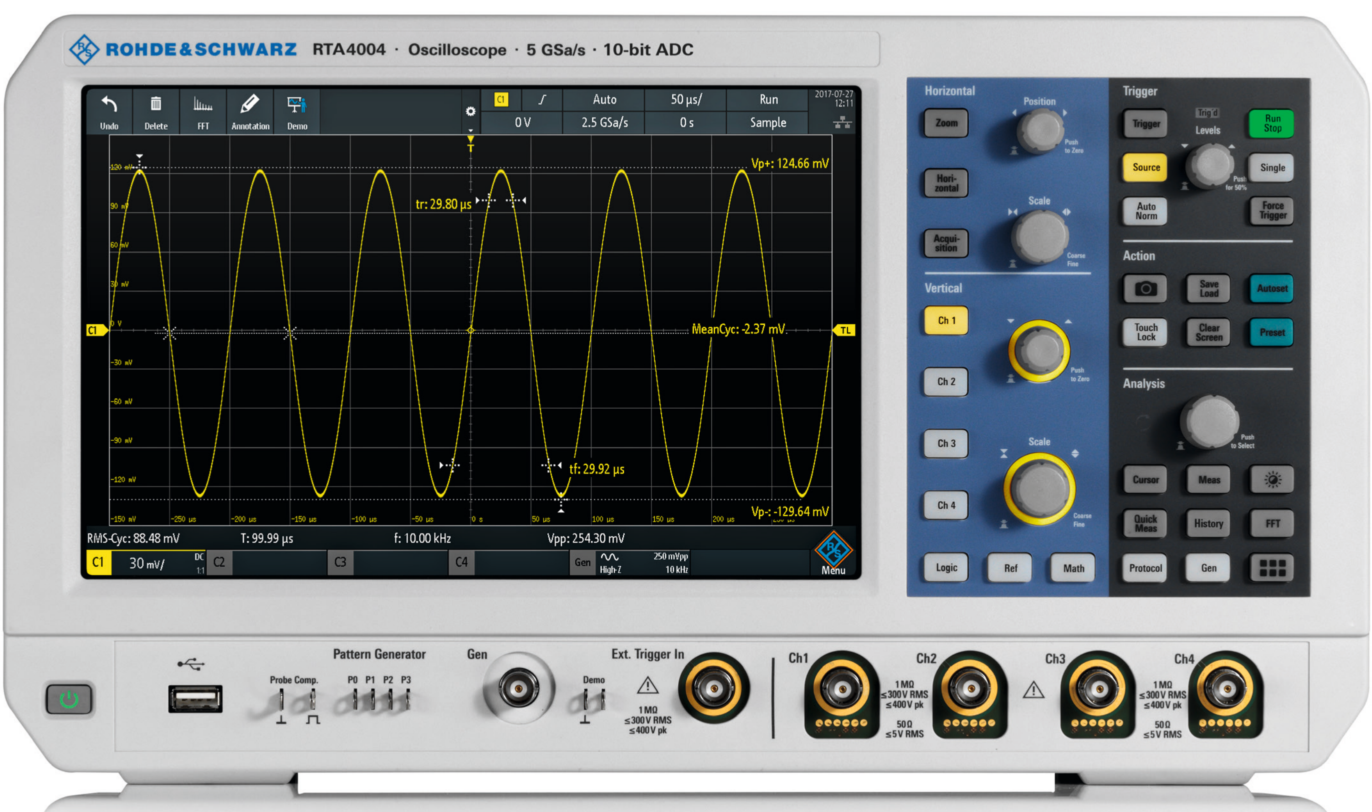
Rohde & Schwarz stands for quality, precision and innovation in all fields of wireless communications. As an independent, family-owned company, Rohde & Schwarz finances its growth from its own funds. The company plans for the long term to the benefit of its customers. Purchasing Rohde & Schwarz products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

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.



Benefits

Choose your Rohde & Schwarz oscilloscope

	R&S®RTC1000	R&S®RTB2000	R&S®RTM3000	R&S®RTA4000
Number of oscilloscope channels	2	2/4	2/4	4
Bandwidth in MHz	50, 70, 100, 200, 300	70, 100, 200, 300	100, 200, 350, 500, 1000	200, 350, 500, 1000
Max. sampling rate in Gsample/s	1/channel, 2 interleaved	1.25/channel, 2.5 interleaved	2.5/channel, 5 interleaved	2.5/channel, 5 interleaved
Max. memory depth in Msample	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
Timebase accuracy in ppm	50	2.5	2.5	0.5
Vertical bits (ADC)	8	10	10	10
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	10000 waveforms/s	300000 waveforms/s in fast segmentated memory mode	2000000 waveforms/s in fast segmentated memory mode	2000000 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 [1]	spectrum analysis [1]

[1] The R&S®RTM-K18 and R&S®RTA-K18 options are not distributed in North America.

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.

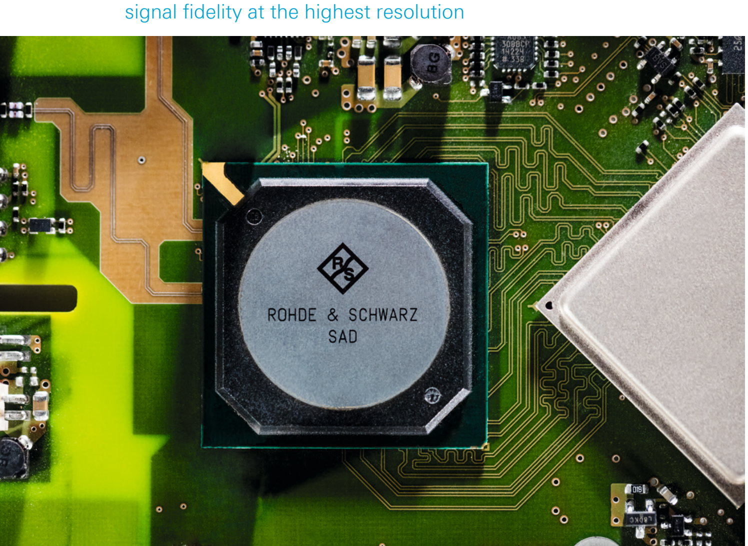
500 µV/div: full measurement bandwidth

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.

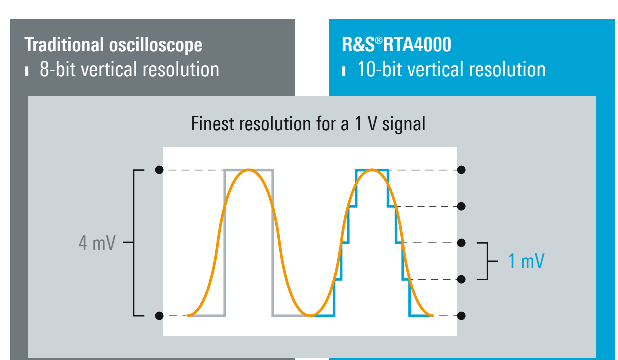
Class-leading low noise

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.

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



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



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.

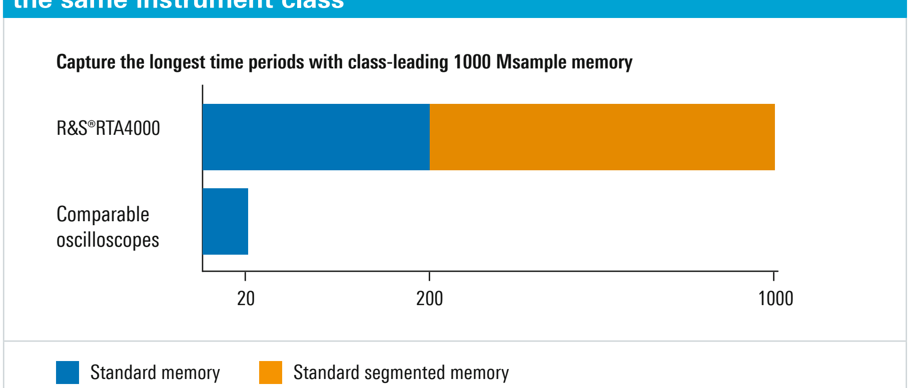
Standard segmented memory: 1 Gsample

The standard segmented memory analyzes signal sequences over a long observation period. For example, protocol-based signals with communications gaps, such as I^2C 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



Large high-resolution display in a compact for

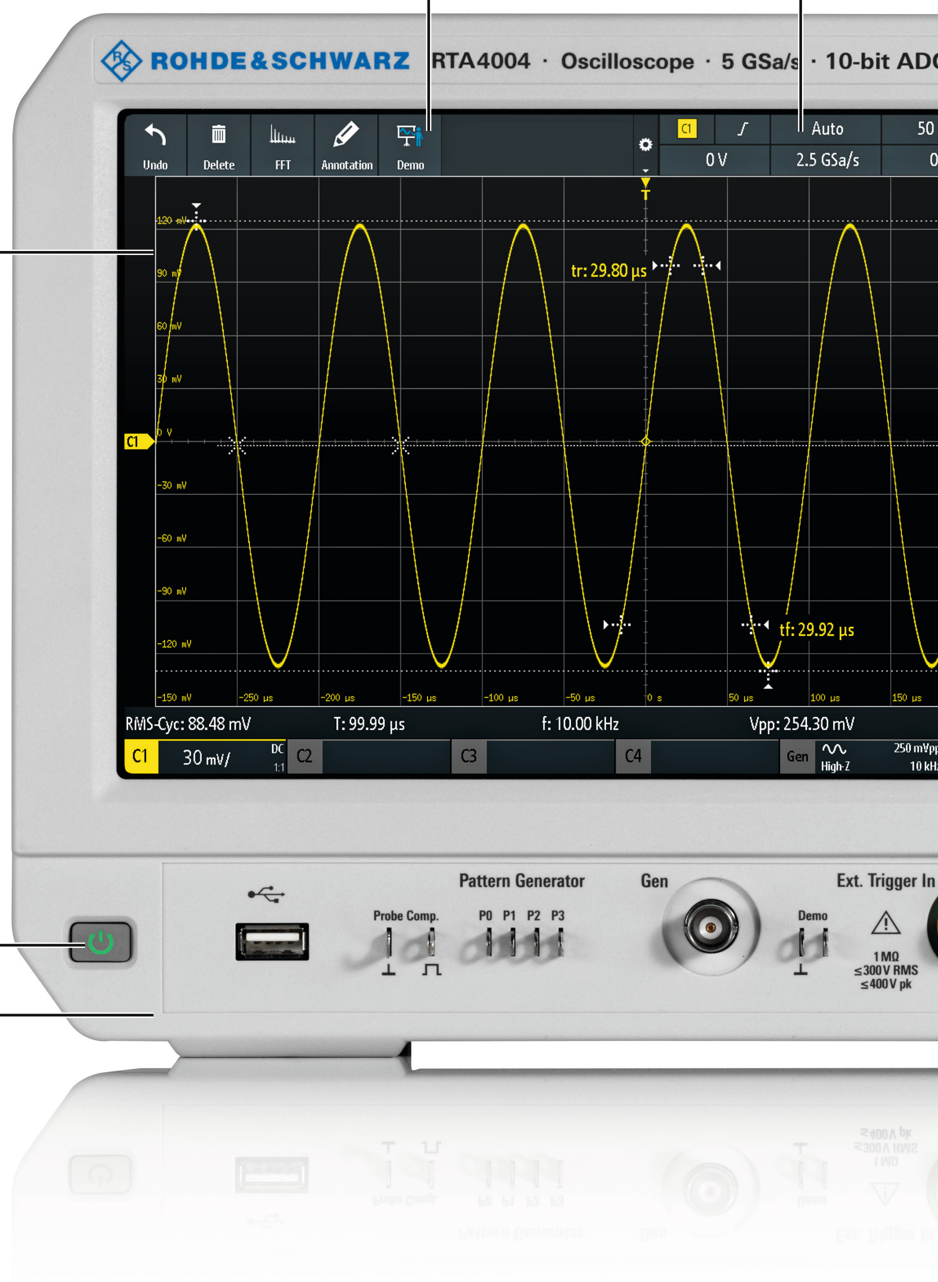
Quick access to important tools
- Drag & drop to use analysis tools
- Toolbar to access functions
- User-defined shortcuts allow fast adjustment of functions

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



m 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

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

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

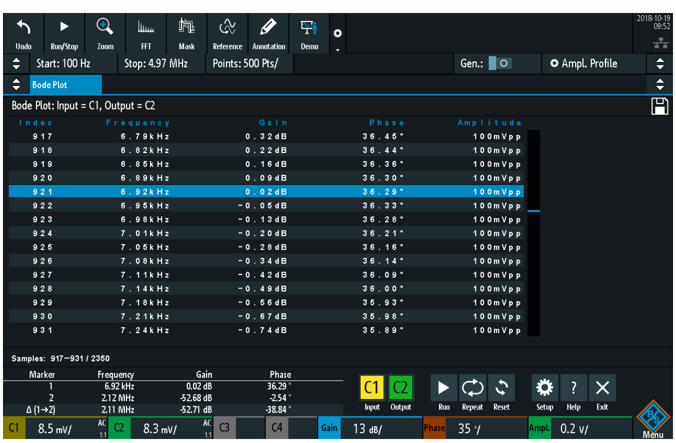
Furthermore, you can view the results in a table. The table of measurement results details information about each measured point, consisting of frequency, gain and phase shift. In case you use cursors, for ease of use, the associated row of the result table is highlighted. For reporting, screenshots,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

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

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-K18 [1] 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 interaction between protocol-based interfaces, digital, analog and frequency components. Simultaneous analysis of all components is a must. Time, frequency and protocol information is correlated, and time references can be quickly recognized. Measurement windows help you select specific areas of the recording, which can simplify, for example, the acquisition of frequency switching operations.

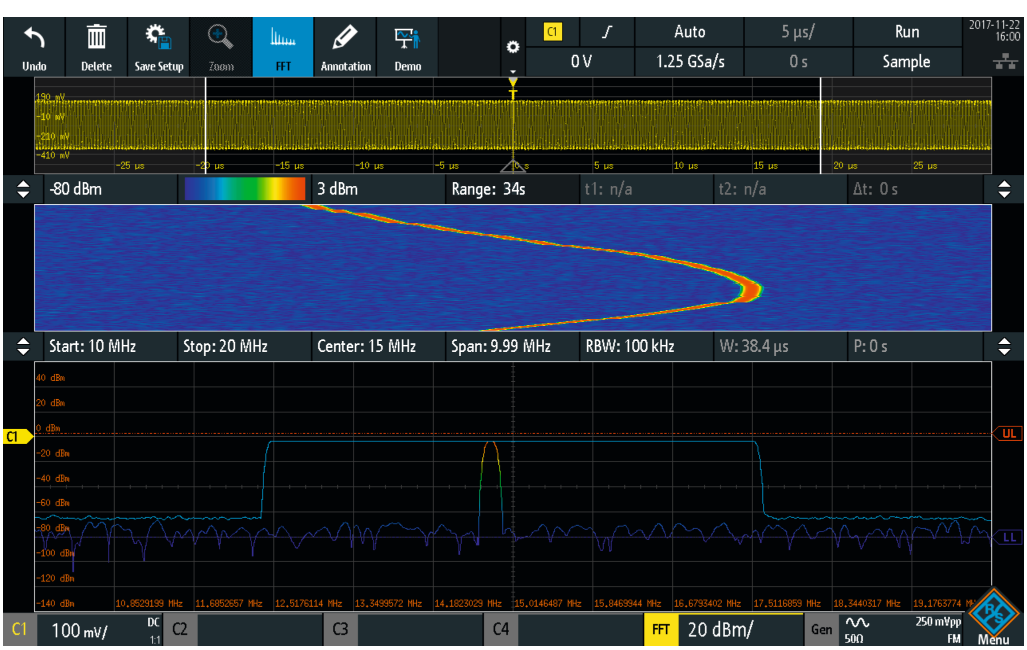
Spectrogram: display of frequency over time

A spectrogram displays the spectrum of frequencies as they vary over time. For easy interpretation, the magnitude 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 reference marker). Selectable delta measurements make it easy to adjust the distances between signal peaks.

[1] The R&S®RTA-K18 option is not distributed in North America.



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.

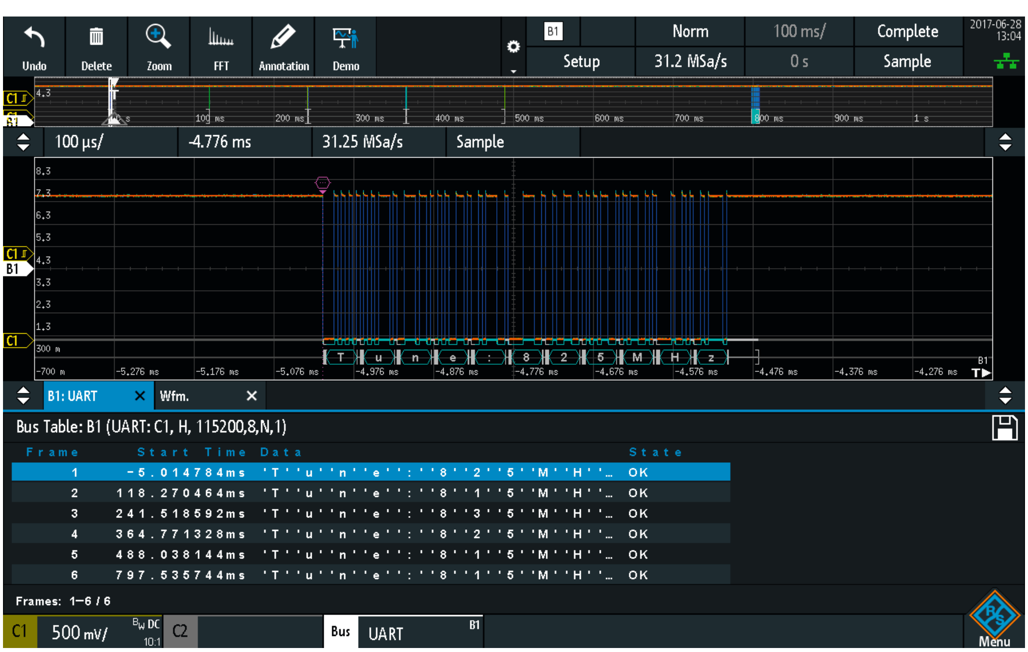
Segmented memory for long time captures

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

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).

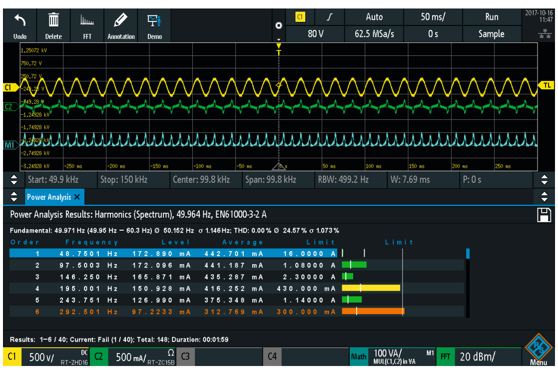
Practical design: micro button for convenient instrument control; diverse probe tips and ground cables are included as standard accessories

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

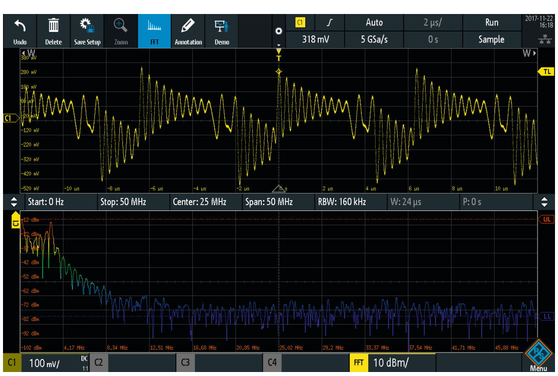
Power integrity

- 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

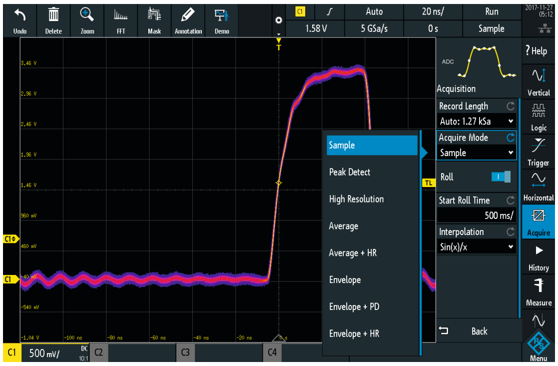
- See power signal details with up to 16-bit resolution
- Capture long periods of time, e.g. a turn-on sequence, with high sample rate
- Complete probe portfolio for measuring from µA to kA and µV to kV



EMI debugging

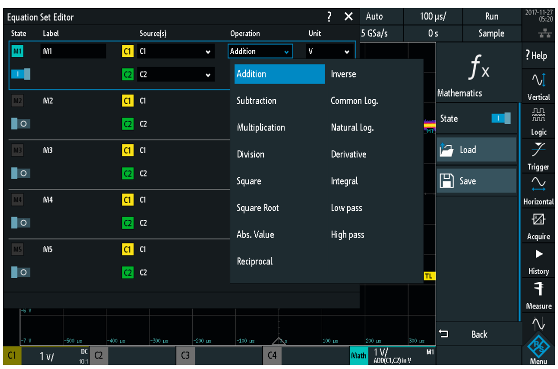
- Near-field probes allow you to sniff out interfering signals
- Time and frequency domain correlation for powerful debugging of emitters
- FFT provides a vivid and fast view in the frequency domain

Capabilities to meet your needs today with ins



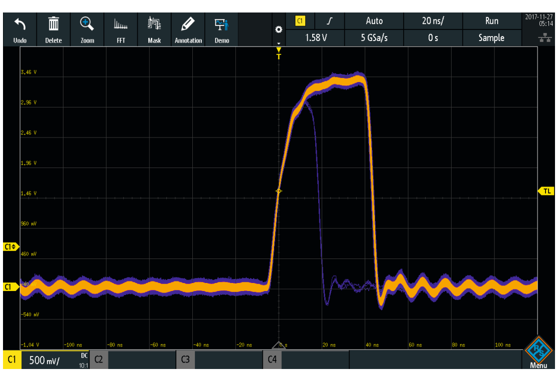
Acquisition modes

- 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



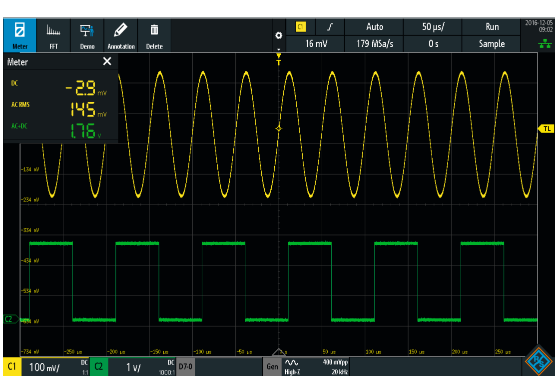
Math and measurements

- 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



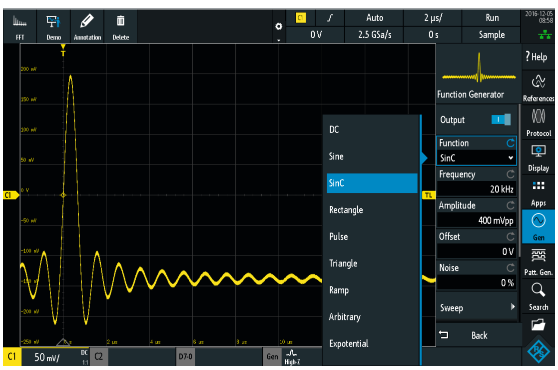
Digital voltmeter

- 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)

urance for the future

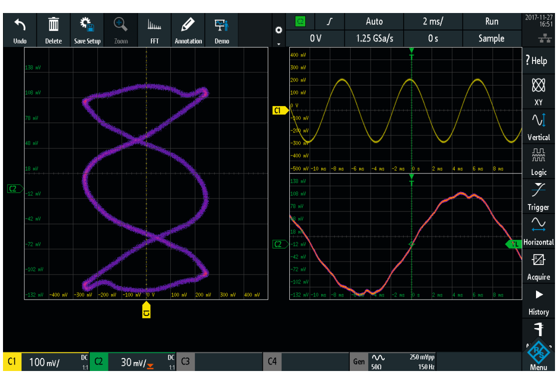
Mixed signal

- 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



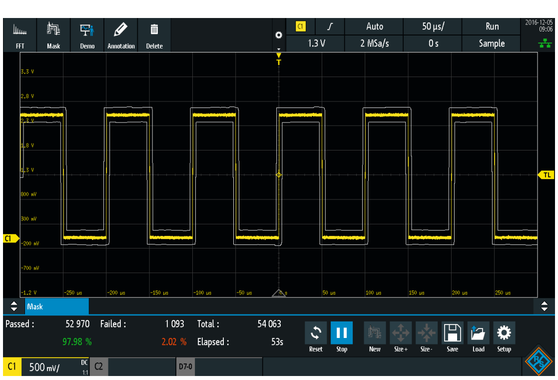
Waveform and pattern generator

- 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 (V_{pp})) 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.

Protection of data

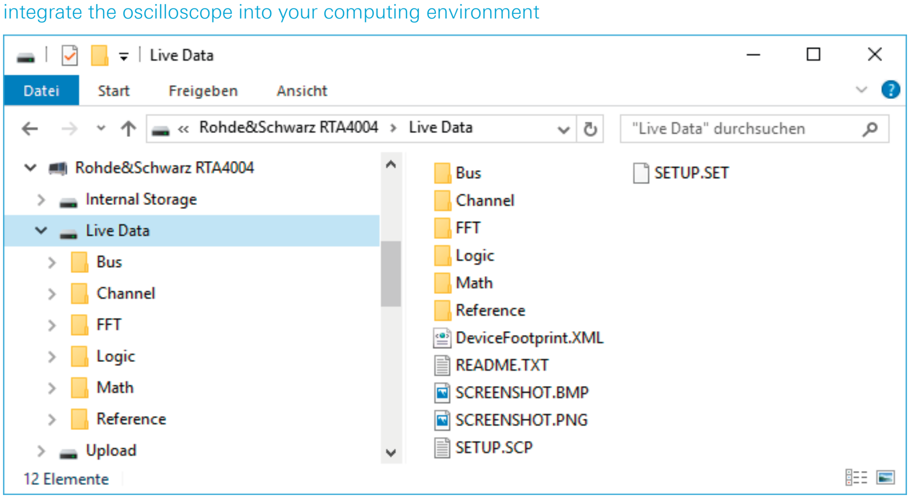
The secure erase function protects sensitive data. This function removes all user data and settings, including device setups and reference waveforms.

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.

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

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



Specifications in brief

Specifications in brief		
Vertical system		
Number of channels	R&S®RTA4004	4
Bandwidth (–3 dB)	R&S®RTA4004 (with R&S®RTA-B24x options)	200 MHz, 350 MHz, 500 MHz, 1 GHz
Rise time (calculated)	R&S®RTA4004 (with R&S®RTA-B24x options)	5 ns, 3.5 ns, 1.75 ns, 1.15 ns
Input sensitivity	max. bandwidth in all ranges	
	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
	input sensitivity ≤ 5 mV/div to ≥ 1 mV/div	±1.5 % of full scale
	input sensitivity < 1 mV/div	±2.5 % of full scale
ADC resolution		10 bit, up to 16 bit with high resolution decimation
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 (V_{pp})
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	RTC1000	RTB2000	RTM3000
Vertical				
Bandwidth	60/100/200/350/500 MHz[1]	50/70/100/200/300 MHz[1]	70/100/200/300 MHz[1]	100/200/350/500 MHz/1 GHz[1]
Number of channels	2 plus DMM/4	2	2/4	2/4
Resolution	10 bit	8 bit	10 bit	10 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
V/div 50 Ω	–			500 µV to 1 V
Horizontal				
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)
Max. memory (per channel/1 channel active)	125 ksample (4-channel model); 250 ksample (2-channel model); 500 ksample (50 Msample in segmented memory mode[2])	1 Msample; 2 Msample	10 Msample; 20 Msample (160 Msample in segmented memory mode[2])	40 Msample; 80 Msample (400 Msample in segmented memory mode[2])
Segmented memory	option	–	option	option
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])
Trigger				
Options	advanced, digital trigger (14 trigger types)[2]	elementary (5 trigger types)	basic (7 trigger types)	basic (10 trigger types)
Mixed signal option				
No. of digital channels[1]	8	8	16	16
Sampling rate of digital channels (in Gsample/s)	1.25	1	1.25	two logic probes: 2.5 on each channel; one logic probe: 5 on each channel
Memory of digital channels	125 ksample	1 Msample	10 Msample	two logic probes: 40 Msample per channel; one logic probe: 80 Msample per channel
Analysis				
Cursor meas. types	4	13	4	4
Stand. meas. functions	33	31	32	32
Mask test	elementary (tolerance mask around the signal)	elementary (tolerance mask around the signal)	elementary (tolerance mask around the signal)	elementary (tolerance mask around the signal)
Mathematics	elementary	elementary	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 (7)	I²C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN (5)	I²C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN (5)	I²C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, I²S, MIL-STD-1553, ARINC 429 (8)
Display functions	data logger	–	–	–
Applications[1), 2)]	high-resolution frequency counter, advanced spectrum analysis, harmonics analysis	digital voltmeter (DVM), component tester, fast Fourier transform (FFT)	digital voltmeter (DVM), fast Fourier transform (FFT), frequency response analysis[3]	power, digital voltmeter (DVM), spectrum analysis and spectrogram, frequency response analysis[3]
Compliance testing[1), 2)]	–	–	–	–
Display and operation				
Size and resolution	7", color, 800 × 480 pixel	6.5", color, 640 × 480 pixel	10.1", color, 1280 × 800 pixel	10.1", color, 1280 × 800 pixel
Operation	optimized for touchscreen operation, parallel button operation	optimized for fast button operation	optimized for touchscreen operation, parallel button operation	
General data				
Dimensions in mm (W × H × D)	201 × 293 × 74	285 × 175 × 140	390 × 220 × 152	390 × 220 × 152
Weight in kg	2.4	1.7	2.5	3.3
Battery	lithium-ion, > 4 h	–	–	–

[1] Upgradeable. [2] Requires an option. [3] Available Q1 2019.

RTA4000	RTE1000	RTO2000	RTP
200/350/500 MHz/1 GHz 1)	200/350/500 MHz/1/1.5/2 GHz 1)	600 MHz/1/2/3/4/6 GHz 1)	4/6/8/13/16 GHz 1)
4	2/4	2/4 (only 4 channels in 4 GHz and 6 GHz models)	4
10 bit	8 bit (up to 16 bit with HD mode)	8 bit (up to 16 bit with HD mode) 2)	8 bit (up to 16 bit with HD mode) 2)
500 µV to 10 V	500 µV to 10 V	1 mV to 10 V (500 µV to 10 V) 2)	
500 µV to 1 V	500 µV to 1 V	1 mV to 1 V (500 µV to 1 V) 2)	1 mV to 1 V
2.5; 5 (2 channels interleaved)	5	10; 20 (2 channels interleaved in 4 GHz and 6 GHz model)	20
100 Msample; 200 Msample (1 Gsample in segmented memory mode)	50 Msample/200 Msample	standard: 50 Msample/200 Msample; max. upgrade: 1 Gsample/2 Gsample	standard: 50 Msample/200 Msample; max. upgrade: 1 Gsample/2 Gsample
standard	standard	standard	standard
64 000 (2 000 000 in fast segmented memory mode)	1 000 000 (1 600 000 in ultra-segmented memory mode)	1 000 000 (2 500 000 in ultra-segmented memory mode)	950 000 (3 200 000 in ultra-segmented memory mode)
basic (10 trigger types)	advanced, digital trigger (13 trigger types)	advanced (includes zone trigger), digital trigger (14 trigger types) 2)	advanced, digital trigger (14 trigger types) with realtime deembedding 2), zone trigger 2)
16	16	16	16
two logic probes: 2.5 on each channel; one logic probe: 5 on each channel	5	5	5
two logic probes: 100 Msample per channel; one logic probe: 200 Msample per channel	100 Msample	200 Msample	200 Msample
4	3	3	3
32	47	47	47
elementary (tolerance mask around the signal)	advanced (user-configurable, hardware based)	advanced (user-configurable, hardware based)	advanced (user-configurable, hardware based)
basic (math on math)	advanced (formula editor)	advanced (formula editor)	advanced (formula editor)
I²C, SPI, UART/RS-232/RS-422/ RS-485, CAN, LIN, I²S, MIL-STD-1553, ARINC 429 (8)	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 (19)	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 Gen1, USB-SSIC, PCIe 1.1/2.0, USB Power Delivery, automotive Ethernet 100BASE-T1 (27)	I²C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, CAN-FD, MIPI RFFE, USB 2.0/ HSIC, MDIO, 8b10b, Ethernet, Manchester, NRZ, MIPI D-PHY, MIPI M-PHY/UniPro, USB 3.1 Gen1, USB-SSIC, PCIe 1.1/2.0, USB Power Delivery, automotive Ethernet 100BASE-T1 (20)
–	histogram, trend, track 2)	histogram, trend, track 2)	histogram, trend, track
power, digital voltmeter (DVM), spectrum analysis and spectrogram, frequency response analysis 3)	power, 16-bit high definition mode (standard), advanced spectrum analysis and spectrogram	power, 16-bit high definition mode, advanced spectrum analysis and spectrogram, jitter, clock data recovery, I/Q data, RF analysis	16-bit high definition mode, advanced spectrum analysis and spectrogram, jitter, RF analysis, realtime deembedding
–	–	various options available (see PD 3607.2684.22)	various options available (see PD 5215.4152.22)
10.1", color, 1280 × 800 pixel	10.4", color, 1024 × 768 pixel	12.1", color, 1280 × 800 pixel	12.1", color, 1280 × 800 pixel
optimized for touchscreen operation, parallel button operation			
390 × 220 × 152	427 × 249 × 204	427 × 249 × 204	441 × 285 × 316
3.3	8.6	9.6	18
–	–	–	–

Base unit

Vertical system

Input channels	R&S®RTA4004	4 channels
Input impedance		50 Ω ± 1.5 % (meas.) 1 MΩ ± 1 % || 14 pF ± 1 pF (meas.)
Analog bandwidth (–3 dB)	at 50 Ω input impedance	
	R&S®RTA4004	> 200 MHz
	R&S®RTA4004 with -B243 option	> 350 MHz
	R&S®RTA4004 with -B245 option	> 500 MHz
	R&S®RTA4004 with -B2410 option	> 1 GHz
	at 1 MΩ input impedance	
	R&S®RTA4004 with	> 200 MHz (meas.)
	R&S®RTA4004 with -B243 option	> 350 MHz (meas.)
	R&S®RTA4004 with -B245 option	> 500 MHz (meas.)
	R&S®RTA4004 with -B2410 option	> 500 MHz (meas.)
Lower frequency limit (–3 dB)	at AC coupling	< 5 Hz (meas.)
Analog bandwidth limits	at 50 Ω input impedance	
	R&S®RTA4004	20 MHz, 100 MHz
	R&S®RTA4004 with -B243 option	20 MHz, 100 MHz, 200 MHz
	R&S®RTA4004 with -B245 option	20 MHz, 100 MHz, 200 MHz, 350 MHz
	R&S®RTA4004 with -B2410 option	20 MHz, 100 MHz, 200 MHz, 350 MHz, 500 MHz
	at 1 MΩ input impedance	
	R&S®RTA4004	20 MHz, 100 MHz
	R&S®RTA4004 with -B243 option	20 MHz, 100 MHz, 200 MHz
	R&S®RTA4004 with -B245 option and R&S®RTA4004 with -B2410 option	20 MHz, 100 MHz, 200 MHz, 350 MHz
Rise time (calculated)	R&S®RTA4004	< 1.75 ns
	R&S®RTA4004 with -B243 option	< 1 ns
	R&S®RTA4004 with -B245 option	< 700 ps
	R&S®RTA4004 with -B2410 option	< 350 ps
Vertical resolution		10 bit, up to 16 bit with high resolution decimation
DC gain accuracy	offset and position = 0 maximum operating temperature change of ±5 °C after self-alignment	
	input sensitivity > 5 mV/div	±1 %
	input sensitivity ≤ 5 mV/div to ≥ 1 mV/div	±1.5 %
	input sensitivity < 1 mV/div	±2.5 %
Input coupling		DC, AC, GND
Input sensitivity	at 50 Ω	0.5 mV/div to 1 V/div
	at 1 MΩ	0.5 mV/div to 10 V/div
Maximum input voltage	at 50 Ω	5 V (RMS), max. 30 V (V_p)
	at 1 MΩ	300 V (RMS), 400 V (V_p), derates at 20 dB/decade to 5 V (RMS) above 250 kHz
Position range		±5 div
Offset range at 50 Ω	input sensitivity	
	≥ 112 mV/div to 1 V/div	±(30 V – 5 div × input sensitivity)
	≥ 33.8 mV/div to 111 mV/div	±(10 V – 5 div × input sensitivity)
	0.5 mV/div to 33.6 mV/div	±(2 V – 5 div × input sensitivity)
Offset range at 1 MΩ	input sensitivity	
	≥ 515 mV/div to 10 V/div	±(250 V – 5 div × input sensitivity)
	≥ 50.5 mV/div to 510 mV/div	±(25 V – 5 div × input sensitivity)
	0.5 mV/div to 50 mV/div	±(2 V – 5 div × input sensitivity)
Offset accuracy		±(0.5 % × |offset| + 0.1 div × input sensitivity + 0.5 mV)
DC measurement accuracy	after adequate suppression of measurement noise by using either high-resolution sampling mode or waveform averaging, or a combination of both	±(DC gain accuracy × |reading – net offset| + offset accuracy)
Channel-to-channel isolation (each channel at same input sensitivity)	input frequency < analog bandwidth	> 50 dB

RMS noise floor at 1 MΩ (meas.)	Input sensitivity	R&S®			
		RTA4004	RTA4004 with -B243 option	RTA4004 with -B245 option	RTA4004 with -B2410 option
	10 V/div	226 mV	250 mV	298 mV	298 mV
	5 V/div	124 mV	132 mV	182 mV	182 mV
	2 V/div	53.1 mV	58.7 mV	81.5 mV	81.5 mV
	1 V/div	29.1 mV	32.9 mV	45.6 mV	45.6 mV
	500 mV/div	12.4 mV	13.2 mV	18.2 mV	18.2 mV
	200 mV/div	5.3 mV	5.9 mV	8.2 mV	8.2 mV
	100 mV/div	3.0 mV	3.4 mV	4.7 mV	4.7 mV
	50 mV/div	1.2 mV	1.2 mV	1.6 mV	1.6 mV
	20 mV/div	0.54 mV	0.59 mV	0.83 mV	0.83 mV
	10 mV/div	0.28 mV	0.32 mV	0.44 mV	0.44 mV
	5 mV/div	0.16 mV	0.19 mV	0.25 mV	0.25 mV
	2 mV/div	0.11 mV	0.14 mV	0.19 mV	0.19 mV
	1 mV/div	0.09 mV	0.10 mV	0.13 mV	0.13 mV
	0.5 mV/div	0.09 mV	0.10 mV	0.13 mV	0.13 mV
RMS noise floor at 50 Ω (meas.)	Input sensitivity	R&S®			
		RTA4004	RTA4004 with -B243 option	RTA4004 with -B245 option	RTA4004 with -B2410 option
	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

Horizontal system

Timebase range		selectable between 0.5 ns/div and 500 s/div
Channel deskew		±500 ns
Trigger offset range	minimum	$\frac{memory\ depth}{actual\ sampling\ rate}$
	maximum	$\frac{2^{33}}{actual\ sampling\ rate}$
Modes		normal, roll
Channel-to-channel skew		< 200 ps (meas.)
Timebase accuracy	after delivery/calibration, at +23 °C	±0.5 ppm
	during calibration interval	±1 ppm

Acquisition system

Maximum realtime sampling rate	normal mode	2.5 Gsample/s
	interleaved mode, if following channels are not used simultaneously: • channel 1 and channel 2 • channel 3 and channel 4 • logic channels	5 Gsample/s
Memory depth per channel	normal mode	100 Msample per channel
	interleaved mode, if following channels are not used simultaneously: • channel 1 and channel 2 • channel 3 and channel 4 • logic channels	200 Msample per channel
Acquisition modes	sample	first sample in decimation interval
	peak detect	largest and smallest sample in decimation interval
	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
	envelope + high resolution	envelope of acquired waveforms with active high resolution
	average + high resolution	average over a series of acquired high resolution waveforms
Number of averaged waveforms		2 to 100 000
Waveform acquisition rate	dot display, single channel, auto record length	up to 64 000 waveforms/s

Trigger system

Trigger level	range	±5 div from center of screen
Trigger modes		auto, normal, single, n single
Hold-off range	time	inactive or 51.2 ns to 13.7 s
Trigger types		edge, width, video, pattern, runt, rise time, fall time, serial bus, line, timeout
Edge trigger A	trigger events	rising edge, falling edge, both edges
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option), external trigger input
	trigger coupling	DC, AC (attenuates < 10 Hz (meas.)), LF reject (attenuates < 10 kHz (meas.))
	trigger filter	HF reject (attenuates > 100 kHz (meas.)), noise reject (attenuates > 100 MHz (meas.))
	selectable trigger hysteresis	automatic, small, medium, large

Trigger A sensitivity hysteresis mode automatic	with DC, AC, LF reject, noise reject	
	1 GHz, 500 MHz, 350 MHz	$> \frac{2.2\ mV_{pp}}{input\ sensitivity} + 1\ div\ (nom.)$ (input sensitivity: [mV/div])
	200 MHz, 100 MHz	$> \frac{1.5\ mV_{pp}}{input\ sensitivity} + 0.8\ div\ (nom.)$ (input sensitivity: [mV/div])
	20 MHz	$> \frac{0.6\ mV_{pp}}{input\ sensitivity} + 0.4\ div\ (nom.)$ (input sensitivity: [mV/div])
	with HF reject	
	all input sensitivities	1 div (meas.)
Edge trigger A and B	trigger events	rising edge, falling edge, both edges
	sources for A trigger	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	trigger coupling of A trigger	DC
	sources for B trigger	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	trigger coupling of B trigger	DC
	selectable trigger hysteresis for A and B trigger	small, medium, large
	trigger B mode	after time or after events
	trigger B minimum time	3.2 ns
	trigger B maximum time	100 s
	trigger B events	1 to 65535
Width trigger	trigger events	pulse width is smaller, greater, equal, unequal, inside interval, outside interval
	minimum pulse width	3.2 ns
	maximum pulse width	6.8 s
	polarity	positive, negative
	sources	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	selectable trigger hysteresis	small, medium, large
Timeout trigger	trigger events	greater than timeout
	minimum timeout	3.2 ns
	maximum timeout	6.8 s
	polarity	stays high, stays low, stays high or low
	sources	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	selectable trigger hysteresis	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®RTA4004	channel 1, channel 2, channel 3, channel 4, ext. trigger input
	sync pulse polarity	positive, negative

Pattern trigger	trigger events	logic condition between active channels
	sources	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-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
	minimum duration time	3.2 ns
	maximum duration time	6.8 s
Runt trigger		triggers on pulse of positive, negative or either polarity that crosses one threshold but fails to cross a second threshold before crossing the first one again
Rise time, fall time	trigger events	time between the crossing of two selectable levels is smaller, greater, equal, unequal, inside interval, outside interval
	minimum rise time	3.2 ns
	maximum rise time	6.8 s
	polarity	rising edge, falling edge, both edges
	sources	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4
Serial bus trigger	supported standards	
	R&S®RTA-K1 option	I^2C, SSPI (two-wire, MOSI/MISO), SPI (three-wire, MOSI/MISO)
	R&S®RTA-K2 option	UART/RS-232/RS-422/RS-485 (RX/TX)
	R&S®RTA-K3 option	CAN/LIN
	R&S®RTA-K5 option	audio (I^2S, LJ, RJ, TDM)
	R&S®RTA-K6 option	MIL-STD-1553
	R&S®RTA-K7 option	ARINC 429
External trigger input	input impedance	1 MΩ ± 1 % with 14 pF ± 2 pF (meas.)
	maximum input voltage at 1 MΩ	300 V (RMS), 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})
	coupling	DC, AC, LF reject
Trigger output	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

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
	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	8
Cursor measurements	type	vertical, horizontal, vertical and horizontal, V-marker
	functions	x and y tracking, coupling of cursors, set to trace, set to screen
Quick measurements	function	fast overview of measurements from one channel, some measurements displayed with result lines in diagram
	sources	
	R&S®RTA4004	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®RTA4004	channel 1, channel 2, channel 3, channel 4
Number of measurements		up to 4
Resolution		up to 3 digits
Bandwidth		1 MHz

Counter

Measurements		frequency, period
Sources	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, trigger signal source
Number of measurements		2
Resolution		7 digits
Frequency range		0.05 Hz to bandwidth of oscilloscope (limited by bandwidth of trigger filter)

Mask testing

Sources	R&S®RTA4004	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)
Captured segments		all segments, failed segments

Waveform maths

Number of math equations		up to 5
Functions		addition, subtraction, multiplication, division, square, square root, absolute value, reciprocal, inverse, log10, ln, derivation, integration, low pass, high pass
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, math waveforms 1 to 4

Fast Fourier transformation (FFT)

Sources	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, math waveforms, references
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 2 to 1024)
Scaling		dBm, dBV, dBµV, V (RMS)

Search function

Functions	search types	edge, width, peak, rise/fall time, runt, data2clock, pattern, window, protocol (available with R&S®RTA-K3, R&S®RTA-K6 and R&S®RTA-K7 options)
	configuration	manual level setting on screen, level with selectable hysteresis
	display of search events	up to 10 000 events in diagram and in result table
	markers on search events	up to 32 markers
	navigation in search events (stop mode)	knob (if result table is active)
Sources	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, math waveforms from 1 to 5, D15 to D0 (with R&S®RTA-B1 option)

Display characteristics

Diagram types	manually changeable vertical window size	Yt, XY, zoom, FFT, spectrogram (with R&S®RTA-K18 option)
XY mode		parallel display of XY diagram and Yt diagrams of input signals for X, Y
Zoom		horizontal and vertical zoom, split screen with overview signal and zoomed signal
Interpolation		sin(x)/x, linear, sample & hold
FFT mode		split screen with Yt diagrams and dedicated frequency diagram, spectrogram (with R&S®RTA-K18 option)
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

Protocol and logic

Bus decode	number of bus signals	4 [1]
	bus types	parallel, parallel clocked
	R&S®RTA-K1 option	SSPI, SPI, I^2C
	R&S®RTA-K2 option	UART/RS-232/RS-422/RS-485
	R&S®RTA-K3 option	CAN, LIN
	R&S®RTA-K5 option	I^2S, LJ, RJ, TDM
	R&S®RTA-K6 option	MIL-STD-1553
	R&S®RTA-K7 option	ARINC 429
	display types	decoded bus, logical signal, frame table (depends on decoded bus)
	position and size	size and position on screen selectable
	data format of decoded bus	hex, decimal, binary, octal, ASCII

History and segmented memory

Acquisition memory		automatic, predefined, manual		
	automatic	automatic segment size and numbers		
	predefined	defined size and automatic numbers		
	manual	user-defined size and numbers		
Memory segmentation	function	memory segments for the acquisition		
	number of segments [2]	record length	segments (up to)	total memory (per channel)
		5 ksample	87 380	436.9 Msample
		10 ksample	87 380	873.8 Msample
		20 ksample	43 690	873.8 Msample
		50 ksample	17 476	873.8 Msample
		100 ksample	9 708	970.8 Msample
		200 ksample	5 140	1028 Msample
		500 ksample	2 131	1065.5 Msample
		1 Msample	1 065	1065 Msample
		2 Msample	536	1072 Msample
		5 Msample	214	1070 Msample
		10 Msample	107	1070 Msample
		20 Msample	53	1060 Msample
		50 Msample	21	1050 Msample
		100 Msample	10	1000 Msample
		200 Msample	5	1000 Msample
	Segmentation is active on all analog and logic channels, protocol decoding and spectrum analysis.			

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

[2] At interleaved mode.

Fast-segmented mode	continuous recording of waveforms in acquisition memory without interruption due to visualization; blind time between consecutive acquisitions less than 200 ns (up to 2 000 000 waveforms/s)	
History mode	function	The history mode always provides access to past acquisitions in the segmented memory.
	timestamp resolution	3.2 ns
	history player	replays the recorded waveforms; repetition possible; adjustable speed; manual next/previous segment; numerical segment number input
	analyze options	overlay all segments, average all segments, envelope all segments

Miscellaneous

Save/recall	device settings	save and recall on internal file system or USB memory stick or on a PC via web interface or USB-MTP
	reference waveforms	save and recall on internal file system or USB memory stick or on a PC via web interface or USB-MTP
	waveforms	save on USB memory stick 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 memory stick or download and save on a PC via web interface or USB-MTP, available file formats: BMP, PNG
	device settings	save and recall on internal file system or USB memory stick or on a PC via web interface or USB-MTP
Camera key		configurable camera key, actions on press: • save screenshot • one-touch
	save screenshot	one-touch off
	one-touch	one or more from the list: • setup • screenshots (PNG, color) • waveforms (BIN-MSB, CI, display data) • references • search event table • bus table • statistics
Instrument security		secure erasure of internal file system and all settings
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		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
External trigger input		BNC, for details see Trigger system
	probe interface	auto detection of passive probes
Waveform generator (requires R&S®RTA-B6 option)		BNC, for details see R&S®RTA-B6, waveform generator, demo lug and GND lug
Probe compensation output	signal shape	rectangle
	frequency	1 kHz
	voltage	V_{low} = 0 V, V_{high} = 1.5 V to 3.3 V (meas.)
Pattern source (requires R&S®RTA-B6 option)	P3 to P0	4 lugs, for details see R&S®RTA-B6, 4-bit pattern generator
	frequency	1 mHz to 25 MHz
	voltage	V_{low} = 0 V, V_{high} = 1.5 V to 3.3 V (meas.)
Ground lug		connected to ground
USB host interface		1 port, type A plug, version 2.0, flash drives only
Rear		
Ethernet interface		1 port, 1 Gbit
AUX OUT (BNC)	trigger out,	for details see Trigger system
	reference frequency	10 MHz ±3.5 ppm (meas.)
	mask violation	pulse
USB device interface		1 port, type B plug, version 2.0
Fixation loop		for securing the instrument with a cable
Security slot		for standard Kensington style lock
Right side		
Digital channel inputs	D15 to D8, D7 to D0	requires R&S®RTA-B1 option

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
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$_{US}$, KC
Calibration interval		1 year
Power supply		
AC supply		100 V to 240 V at 50 Hz to 60 Hz, 1.6 A to 0.7 A
Power consumption		max. 160 W
Safety		in line with • IEC 61010-1, IEC 61010-2-030 • EN 61010-1, EN 61010-2-030 • CAN/CSA-C22.2 No. 61010-1 • CAN/CSA-C22.2 No. 61010-2-030 • UL 61010-1, UL 61010-2-030
Mechanical data		
Dimensions	W × H × D	390 mm × 220 mm × 152 mm (15.35 in × 8.66 in × 5.98 in)
Weight	without options (nom.)	3.3 kg (7.275 lb)
Audible noise	maximum sound pressure level at a distance of 1.0 m	28.3 dB(A)

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

Options

R&S®RTA-B1

Mixed signal option, additional 16 logic channels		
Vertical system		
Input channels		16 logic channels (from 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	400 MHz (meas.)
Maximum input voltage		±40 V (V_p)
Minimum input voltage swing		500 mV (V_{pp}) (meas.)
Threshold groups		from D15 to D12, D11 to D8, D7 to D4 and D3 to D0
Threshold level	user range	±8 V in 25 mV steps
	predefined	CMOS 2.5 V, TTL 1.4 V, ECL -1.3 V
Threshold accuracy		±(100 mV + 3 % of threshold setting)
Comparator hysteresis		small, medium, large
Horizontal system		
Channel deskew	range for each channel	±500 ns
Channel-to-channel skew		< 200 ps (meas.) for same vertical settings on the channels
Acquisition system		
Sampling rate	two logic probes	2.5 Gsample/s on each channel
	one logic probe	5 Gsample/s on each channel
Memory depth	two logic probes	100 Msample for every channel
	one logic probe	200 Msample for every channel
Trigger system		see chapter Trigger system of the base unit
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
Additional cursor function		display of hex. value at the cursor position
Display characteristics		
Channel activity display		independent of the oscilloscope acquisition, the state (stays low, stays high or toggles) of the channels from D15 to D0 is displayed

R&S®RTA-B6

Waveform generator and 4-bit pattern generator		
Waveform generator		
Resolution		14 bit
Sample rate		250 Msample/s
Output impedance		50 Ω ±1 % (meas.)
Amplitude	level	
	in to high Z	20 mV to 10 V (V_{pp})
	in to 50 Ω	10 mV to 5 V (V_{pp})
	accuracy	1.5 %
DC offset	level	
	in to high Z	± 5 V
	in to 50 Ω	± 2.5 V
	accuracy	1.5 % or ±3 mV whatever is greater
Sine	frequency	0.1 Hz to 25 MHz
	SFDR	> 40 dBc (meas.)
	THD	> 40 dBc (meas.)
Rectangle	frequency	0.1 Hz to 10 MHz
Pulse	frequency	0.1 Hz to 10 MHz
	edge time	adjustable
	duty cycle	1 % to 99 %
Ramp, triangle, sinc, exponential	frequency	0.1 Hz to 1 MHz
Arbitrary	sample rate	max. 10 Msample/s
	memory depth	32k point
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
Bus signal source		SPI, I^2C, UART, CAN, LIN
	bandwidth	9600 bit/s to 1 Mbit/s
4-bit counter	frequency	25 mHz to 50 MHz
Programmable pattern	sample rate	20 ns to 1 s, up/down
	square wave frequency	1 mHz to 500 kHz
	memory depth	8096 bit per channel
	pattern idle time	50 ns to 1 s
	amplitude	V_{low} = 0 V, V_{high} = 1.5 V to 3.3 V (meas.)

R&S®RTA-K1

I²C triggering and decoding		
Bus configuration	sources for SCL and SDA	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	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
	displayed format of address	hex, symbolic ID (label list)
	displayed format of data	ASCII, binary, decimal or hex
SPI triggering and decoding		
Bus configuration	sources for CS, CLK, MOSI and MISO	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	bit rate	up to 25 Mbps
	chip select (CS)	active low, active high or missing (SSPI)
	clock (CLK) slope	rise or fall
	data symbol size	1 bit to 32 bit
	idle time for SSPI	12.8 ns to 26.8 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
	displayed format of data	ASCII, binary, decimal or hex
	data decoding	MSB or LSB first

R&S®RTA-K2

UART/RS-232/RS-422/RS-485 triggering and decoding		
Bus configuration	source for RX and TX	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	bit rate	300 bps to 1 Mbps or user-selectable up to 6 Mbps
	end of frame	timeout
	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
	Idle time	up to 26.8 ms
Trigger	trigger events	start bit, start of frame, symbol number, any symbol, pattern of symbols, parity error, stop bit 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, parity
	displayed format of data	ASCII, binary, decimal or hex

R&S®RTA-K3

CAN triggering and decoding		
Bus configuration	signal type	CAN_H, CAN_L
	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; frame navigation; data export as CSV file
Search	search events	frame, error, identifier, identifier + data, identifier + error
	frame event setup	start of frame, end of frame, overload frame, error frame, data ID 11 bit, data ID 29 bit, remote ID 11 bit, remote ID 29 bit
	error event setup	any combination of CRC error, bit stuffing error, form error and ACK error
	identifier setup	frame type (data, remote or both), identifier type (11 bit or 29 bit); condition =, ≠, >, <; identifier selectable from label list
	data setup	data pattern up to 8 byte (hex or binary); condition =, ≠, >, <
	event table	search results displayed as tabulated list; event navigation
LIN triggering and decoding		
Bus configuration	version	1.3, 2.x or SAE J602; mixed traffic is supported
	bit rate	1.2/2.4/4.8/9.6/10.417/19.2 kbps or user-selectable in range from 100 bps to 5 Mbps
	polarity	active high or active low
	label list	associate frame identifier with symbolic ID
Trigger	source	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	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; frame navigation; data export as CSV file
Search	search events	frame, error, identifier, identifier + data, identifier + error
	frame event setup	start of frame, wake up
	error event setup	any combination of checksum error, parity error and sync field error
	identifier setup	range from 0d to 63d; condition =, ≠, >, <; identifier selectable from label list
	data setup	data pattern up to 8 byte (hex or binary); condition =, ≠, >, <
	event table	search results displayed as tabulated list; event navigation

R&S®RTA-K5

Audio (I^2S, LJ, RJ, TDM) triggering and decoding		
Bus configuration	source (data, clock, word/sync)	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	thresholds	per-channel threshold (analog channels), per-group threshold (logic channels), assisted threshold configuration (find level)
	bit rate	up to 30 Mbps
	signal type	I^2S standard, left justified, right justified, TDM
	polarity	data: active high, active low; clock: rising edge, falling edge; word/sync: normal, inverted
	word length	2 bit to 32 bit
	bit order	most significant bit first (MSBF), least significant bit first (LSBF)
	I^2S-specific setup	
	first channel	left, right
	LJ/RJ-specific setup	
	first channel	left, right
	channel offset	0 to 31 bit
	TDM-specific setup	
	number of channels	1 to 8
	channel length	2 bit to 32 bit
	channel offset	0 to (channel length – word length) bits
	channel delay	0 to 31 bit
Trigger	trigger events	data, window, word/sync, error condition
	data setup	define individual value and condition for each audio channel; condition =, ≠, >, <, inside range, outside range, don’t care; trigger when “all” or “any” audio channel conditions are met in single audio frame
	window setup	audio channel setup same as data setup; user-defined window length up to 4 000 000 000 frames
	word/sync setup	rising edge, falling edge
Decode	displayed signals	bus signal, stacked bus signal, logic signal
	color coding of bus signal	color-coded audio channels
	displayed format of data	hex, signed decimal, binary, ASCII
	frame table	decode results displayed as tabulated list with timestamp; frame navigation; data export as CSV file
	track of audio waveform	displays audio channel content as a waveform that is time-correlated to the source signals; user can activate, scale and position each audio channel individually

R&S®RTA-K6

MIL-STD-1553 triggering and decoding		
Protocol configuration	source	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	bit rate	standard bit rate (1 Mbit/s)
	polarity	normal, inverted
	label list	associate frame identifier with symbolic ID
	auto threshold setup	assisted threshold configuration
	timing	max response (4 µs to 200 µs)
Trigger	trigger event setup	sync, word, command word, status word, command and data word, error condition
	sync setup	all words, command/status word, data word
	word setup	all words, command word, status word, data word
	command word setup (type: address/word)	RT address (condition =, ≠, ≥, ≤, in range, out of range); direction (T/R); subaddress (condition =, ≠, ≥, ≤, in range, out of range); data word count (condition =, ≠, ≥, ≤, in range, out of range)
	command word setup (type: mode code)	RT address (condition =, ≠, ≥, ≤, in range, out of range); subaddress (0, 31 or either); mode code from labeled dropdown list
	status word setup	RT address; status flags (message error, instrumentation, service request, broadcast command, busy, subsystem flag, dynamic bus control, terminal flag) individually configurable (1, 0, don't care)
	command and data word setup	transmission type (BC-RT, RT-BC, BC-BC, mode code); RT address (condition =, ≠, ≥, ≤, in range, out of range); subaddress (condition =, ≠, ≥, ≤, in range, out of range); data word count (condition =, ≠, ≥, ≤, in range, out of range); data pattern up to 4 words long (condition =, ≠, ≥, ≤, in range, out of range); payload data index (condition =)
	error condition setup	any combination of sync error, Manchester error, parity error, timing error (see protocol configuration)
Decode	display signals	bus signal; symbolic ID in bus signal when label list in use
	color coding	sync, RT address, subaddress, mode code, status bit field, data, error condition
	displayed format of data	hex, decimal, binary, ASCII
	frame table	decode results displayed as tabulated list, errors highlighted in red; frame navigation; data export as CSV file; column with symbolic ID when label list in use
Search	search events	word, command word, mode code, status word, command and data word, error
	word setup	command, status, data
	command word setup	see trigger settings for "command word setup (type: address/word)"
	mode code setup	see trigger settings for "command word setup (type: mode code)"
	status word setup	see trigger settings for "status word setup"
	command and data word setup	see trigger settings for "command and data word setup"
	error condition setup	all, sync, parity, manchester, timing

R&S®RTA-K7

ARINC 429 triggering and decoding		
Protocol configuration	source	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4, logic channels from D15 to D0 (with R&S®RTA-B1 option)
	bit rate	high (100 kbit/s), low (12.5 kbit/s), or user-defined in range 10 kbit/s to 1 Mbit/s
	polarity	A leg, B leg, normal, inverted
	label list	associate numeric label with symbolic ID; optional definition of ARINC word format in terms of availability of label-specific SDI and SSM fields
	auto threshold setup	assisted threshold configuration
Trigger	trigger event setup	word, label, label and data, error condition, transmission interval
	word setup	word start, word stop
	label setup	label (condition =, ≠, ≥, ≤, in range, out of range)
	data setup	data pattern up to 23 bit long (condition =, ≠, ≥, ≤, in range, out of range); data bit offset; SDI (00,01,10,11); SSM (00,01,10,11); label list can be used to determine availability of trigger properties SSM and SDI for given label value
	error condition setup	any combination of coding error, parity error, gap error
	transmission interval setup	label (condition =); SDI (optional); time interval (condition >, <, in range, out of range)
Decode	display signals	bus signal, logic signal or both; symbolic ID in bus signal when label list in use
	color coding	word begin, word end, label, SDI, data, SSM, parity, error
	displayed format of data	hex, decimal, binary, ASCII
	frame table	decode results displayed as tabulated list, errors highlighted in red; frame navigation; data export as CSV file; column with symbolic ID when label list in use
Search	search events	word, label, label and data, error condition
	word setup	word start, word stop
	label setup	see trigger settings for “label setup”
	data setup	see trigger settings for “data setup”
	error condition setup	coding error, parity error, gap error, any

R&S®RTA-K18

Spectrum analysis and spectrogram		
General	additional displays	spectrum traces and/or spectrogram
Spectrum	sources	
	R&S®RTA4004	channel 1, channel 2, channel 3, channel 4
	setup parameters	center frequency, frequency span, automatic RBW, resolution bandwidth, gate position, gate width, vertical scale, vertical position, spectrum mode
	scaling	dBm, dBV, dBµV, V (RMS)
	span	1 kHz to 1.25 GHz
	resolution bandwidth	span/10 ≥ RBW ≥ span/1000
	windows	flat top, Hanning, Hamming, Blackman, rectangular
	trace types	normal, max. hold, min. hold, average
	spectrum mode	optimized for dynamic range of frequency domain (disables time domain for the same channel)
Spectrogram	color	rainbow, temp. color, monochrome
Marker	peak marker search	standard search parameter: min. level
		advanced search parameter: min. level, excursion, maximum width, distance to next peak
	reference marker	selection via index or frequency range
	markers on peak	up to 100 markers
	sources	any spectrum trace
	table	frequency and magnitude, absolute or relative to reference marker
	marker result display	indicated at wave form: level, frequency
Cursor	measurements on spectrum traces	level, frequency, level and frequency, V-marker
	additional actions for cursor	coupling of cursors, set to trace, set to screen, track scaling, set next and previous peak
Spectrogram measurements	two time cursor	t1, t2, delta t, total time, relative time between segments

R&S®RTA-K31

Power analysis		
General description	The R&S®RTA-K31 power analysis option extends the R&S®RTA firmware with measurement functionality focused on switched mode power supplies (SMPS) and DC/DC converters.	
Input	quality	evaluation of power quality at an AC input; measures real power, apparent power, reactive power, power factor and phase angle of power, frequency, crest factor, RMS of voltage and current
	harmonics	measures up to the 334th harmonic of the incoming line frequency; precompliance checking for IEC 61000-3-2 (A, B, C, D), RTCA DO-160, MIL-STD-1399, max. limit checks
	inrush current	measures peak inrush current and electrical charge within up to 3 configurable measurement zones to analyze the inrush and post-inrush behavior
	consumption	long term measurement of consumed power and energy to analyze nonperiodical signals of e.g. standby devices
Switching/control loop	slew rate	The minimum and maximum slew rate of current or voltage is measured at start and end of the switching cycle.
	modulation	measures modulation of switching frequency, duty cycle (±) and pulse width
	dynamic on-resistance	measures resistance of the switching transistor(s) in active state
Power path	efficiency	measures input and output power to calculate the efficiency of a power device
	switching loss	measures switching loss and conduction loss of a power device
	safe operating area (SOA)	checks violation of voltage and current limits in which a power device can operate without damage; current versus voltage view (linear or log); violation mask is user-defined and editable in linear and log-log views; save/load of masks; export of mask violation data
	turn on/off time	measures relationship between AC and DC current, when turning SMPS off and on
Output	ripple	measures AC components of output voltage or current, AC RMS, mean, period, frequency, duty cycles, min./max./peak-to-peak amplitude
	spectrum	FFT analysis of output, measurement of frequency peaks
	transient response	This measurement captures the device behavior between the event of load changes and stabilization; includes peak (voltage, time), settling time, rise time, overshoot and delay
Deskew	automated	By using the R&S®RT-ZF20 probe deskew and calibration test fixture and Rohde & Schwarz voltage and current probes, the skew between the signals is compensated automatically.
Zero offset	automated	automatic compensation of input offset
Reporting	Report data can be saved for every measurement. Report generation using user-selected test results from historical and current tests. Put repeated and/or different measurements in one report. R&S®Oscilloscope Report Creator can be downloaded from Rohde & Schwarz website free-of-charge.	

R&S®RTA-K36

Frequency response analysis – Bode plot		
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 10 V into high Z
		10 mV to 5 V into 50 Ω
Input and output sources	R&S®RTA4004	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

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	1335.7846.02
Upgrade of R&S®RTA4004 oscilloscopes to 500 MHz bandwidth	R&S®RTA-B245	1335.7852.02
Upgrade of R&S®RTA4004 oscilloscopes to 1 GHz bandwidth	R&S®RTA-B2410	1335.7869.02
Choose your options		
Mixed signal upgrade for non-MSO models, 400 MHz	R&S®RTA-B1	1335.7823.02
Arbitrary waveform and 4-bit pattern generator	R&S®RTA-B6	1335.7830.02
I^2C/SPI serial triggering and decoding	R&S®RTA-K1	1335.7681.02
UART/RS-232/RS-422/RS-485 serial triggering and decoding	R&S®RTA-K2	1335.7698.02
CAN/LIN serial triggering and decoding	R&S®RTA-K3	1335.7717.02
Audio (I^2S, LJ, RJ, TDM) triggering and decoding	R&S®RTA-K5	1335.7723.02
MIL-STD-1553 serial triggering and decoding	R&S®RTA-K6	1335.7730.02
ARINC 429 serial triggering and decoding	R&S®RTA-K7	1335.7746.02
Spectrum analysis and spectrogram [4]	R&S®RTA-K18	1335.7752.02
Power analysis	R&S®RTA-K31	1335.7769.02
Frequency response analysis (Bode plot)	R&S®RTA-K36	1335.7975.02
Application bundle [5], consists of the following options: R&S®RTA-K1, R&S®RTA-K2, R&S®RTA-K3, R&S®RTA-K5, R&S®RTA-K6, R&S®RTA-K7, R&S®RTA-K18, R&S®RTA-K31, R&S®RTA-K36, R&S®RTA-B6	R&S®RTA-PK1	1335.7775.02
Application bundle [6], consists of the following options: R&S®RTA-K1, R&S®RTA-K2, R&S®RTA-K3, R&S®RTA-K5, R&S®RTA-K6, R&S®RTA-K7, R&S®RTA-K31, R&S®RTA-K36, R&S®RTA-B6	R&S®RTA-PK1US	1335.7998.02
Choose your additional probes		
Single-ended passive probes		
500 MHz, 10 MΩ, 10:1, 300 V, 10 pF, 5 mm	R&S®RT-ZP05S	1333.2401.02
500 MHz, 10 MΩ, 10:1, 400 V, 9.5 pF, 2.5 mm	R&S®RT-ZP10	1409.7550.00
38 MHz, 1 MΩ, 1:1, 55 V, 39 pF, 2.5 mm	R&S®RT-ZP1X	1333.1370.02
Active broadband probes: single-ended		
1.0 GHz, 10:1, 1 MΩ, BNC interface	R&S®RT-ZS10L	1333.0815.02
1.0 GHz, active, 1 MΩ, Rohde & Schwarz probe interface	R&S®RT-ZS10E	1418.7007.02
1.0 GHz, active, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZS10	1410.4080.02
1.5 GHz, active, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZS20	1410.3502.02
Active broadband probes: differential		
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	R&S®RT-ZD10	1410.4715.02
1.5 GHz, active, differential, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZD20	1410.4409.02
Power rail probe		
2.0 GHz, 1:1, 50 kΩ, ±0.85 V, ±60 V offset, Rohde & Schwarz probe interface	R&S®RT-ZPR20	1800.5006.02
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

[4] The R&S®RTA-K18 option is not distributed in North America.
[5] The R&S®RTA-PK1 option is not distributed in North America.
[6] The R&S®RTA-PK1US option is only distributed in North America.

Designation	Type	Order No.
High voltage probes: differential		
25 MHz, 20:1/200:1, 4 MΩ, 1.4 kV (CAT III), BNC interface	R&S®RT-ZD002	1337.9700.02
25 MHz, 10:1/100:14 MΩ, 700 V (CAT II), BNC interface	R&S®RT-ZD003	1337.9800.02
100 MHz, 8 MΩ, 1 kV (RMS) (CAT III), BNC interface	R&S®RT-ZD01	1422.0703.02
200 MHz, 10:1, ±20 V, BNC interface	R&S®RT-ZD02	1333.0821.02
800 MHz, 10:1, 200 kΩ, ±15 V, BNC interface	R&S®RT-ZD08	1333.0838.02
200 MHz, 250:1/25:1, 5 MΩ, 750 V (peak), 300 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD07	1800.2307.02
100 MHz, 500:1/50:1, 10 MΩ, 1500 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD15	1800.2107.02
200 MHz, 500:1/50:1, 10 MΩ, 1500 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD16	1800.2207.02
100 MHz, 1000:1/100:1, 40 MΩ, 6000 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD60	1800.2007.02
Current probes		
20 kHz, AC/DC, 0.01 V/A and 0.001 V/A, ±200 A and ±2000 A, BNC interface	R&S®RT-ZC02	1333.0850.02
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-ZC05B	1409.8204.02
10 MHz, AC/DC, 0.01 V/A, 150 A (RMS), BNC interface	R&S®RT-ZC10	1409.7750K02
10 MHz, AC/DC, 0.01 V/A, 150 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC10B	1409.8210.02
50 MHz, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC15B	1409.8227.02
100 MHz, AC/DC, 0.1 V/A, 30 A (RMS), BNC interface	R&S®RT-ZC20	1409.7766K02
100 MHz, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC20B	1409.8233.02
120 MHz, AC/DC, 1 V/A, 5 A (RMS), BNC interface	R&S®RT-ZC30	1409.7772K02
EMC near-field probes		
Probe set for E and H near-field measurements, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02
Logic probes		
400 MHz logic probe, 8 channels	R&S®RT-ZL04	1333.0721.02
Probe accessories		
Probe power supply for R&S®RT-ZC10/20/30	R&S®RT-ZA13	1409.7789.02
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-ZA15	1410.4744.02
Probe pouch	R&S®RT-ZA19	
Power deskew and calibration test fixture	R&S®RT-ZF20	1800.0004.02
3D positioner with central tensioning knob for easy clamping and positioning of probes (span width: 200 mm, clamping range: 15 mm)	R&S®RT-ZA1P	1326.3641.02
Choose your accessories		
Front cover	R&S®RTB-Z1	1333.1728.02
Soft bag	R&S®RTB-Z3	1333.1734.02
Transit case	R&S®RTB-Z4	1335.9290.02
Rackmount kit	R&S®ZZA-RTB2K	1333.1728.02

Warranty		
Base unit		3 years
All other items [7]		1 year
Options		
Extended warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [8]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration (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 [8] 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 [8] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

[7] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

[8] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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