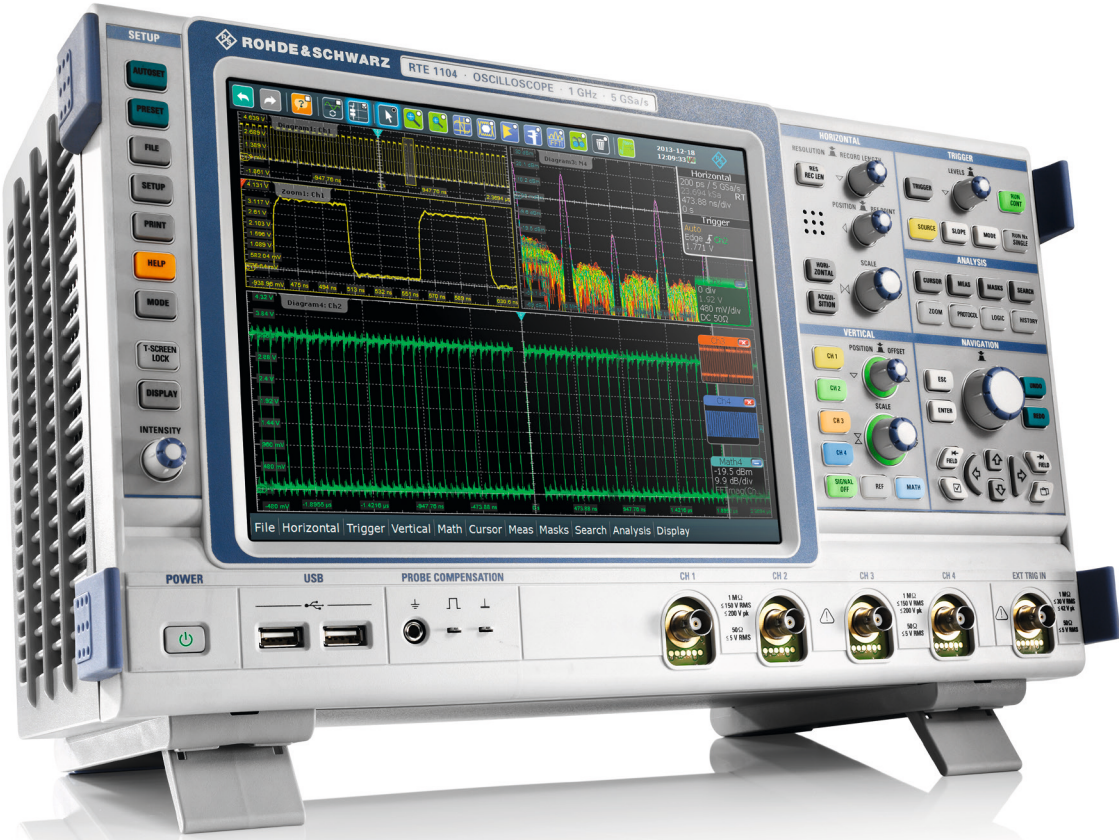


R&S® RTE Digital Oscilloscope Scope of the art



R&S® RTE

Digital Oscilloscope

At a glance

More reliable measurements, more tools and fast results, more fun to use – that's the R&S® RTE oscilloscope. From embedded design development to power electronics analysis to general debugging, the R&S® RTE offers quick solutions for everyday T&M tasks.

The R&S® RTE oscilloscopes are available with two or four channels and a bandwidth of 200 MHz, 350 MHz, 500 MHz or 1 GHz. With a sampling rate of 5 Gsample/s and a memory depth of 10 Msample per channel (can be optionally expanded to 50 Msample per channel), the instruments provide excellent performance parameters.

An acquisition rate of more than one million waveforms per second ensures that signal faults are found quickly. A highly accurate digital trigger system and the excellent dynamic range of the A/D converter with its more than seven effective bits provide precise results.

Besides the cursor functions and automated measurements, the R&S® RTE offers even more analysis tools that help users to complete tasks quickly. At the push of a button, for example, the QuickMeas function simultaneously displays the results of multiple measurement functions for the signal that is currently active. The FFT analysis is also unique. It gives the impression of a live spectrum on the screen and reliably detects sporadic signals.

A broad range of dedicated application solutions is also available, including trigger and decode options for serial buses such as I²C, SPI and CAN, and a power analysis option. The logic analysis capability offered by the R&S® RTE is essential for analyzing digital components of embedded designs. The R&S® RTE-B1 mixed signal option can be added to any base unit and offers 16 additional digital channels. It is possible to decode up to four parallel buses simultaneously.

The wide variety of measurement and analysis functions can be easily operated via the high-resolution 10.4" XGA touchscreen. Transparent dialog boxes ensure that the measurement diagrams always maintain their original size. Signal flow diagrams in the dialog boxes simplify navigation. Signal icons with realtime preview on the edge of the screen clearly show what is currently happening.

The R&S® RTE handles challenges quickly, accurately and easily, providing time domain, logic, protocol and frequency analysis in a single box. The R&S® RTE expands the Rohde&Schwarz scope-of-the-art oscilloscope family.



R&S® RTE

Digital Oscilloscope

Benefits and key features

More confidence in measurement results

- High time resolution combined with deep memory
- Finding rare signal faults quickly
- Accurate triggering using a digital trigger system
- Precise measurements due to single-core A/D converter
- Full measurement bandwidth, even at 1 mV/div

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More functions and faster results

- High measurement speed, even for complex analysis functions
- Wide selection of measurement functions
- QuickMeas: key measurement results at the push of a button
- History function: looking back in time
- Mask test: settings in only seconds
- FFT: the easy way to analyze the signal spectrum

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More fun to use

- Straightforward, smart user guidance
- Fully customizable display
- High-resolution touchscreen
- Fast access to important tools
- Signal details at your fingertip

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Models		
Base unit	Bandwidth	Channels
R&S® RTE1104	1 GHz	4
R&S® RTE1102	1 GHz	2
R&S® RTE1054	500 MHz	4
R&S® RTE1052	500 MHz	2
R&S® RTE1034	350 MHz	4
R&S® RTE1032	350 MHz	2
R&S® RTE1024	200 MHz	4
R&S® RTE1022	200 MHz	2

Logic analysis with the MSO option

- More signal details thanks to high time resolution across the entire memory depth
- Precise triggering on signal events
- High acquisition and analysis rate for fast fault finding
- Straightforward display of digital signals
- Analysis functions
- Analysis of serial protocols, even with digital channels
- Low test point loading due to active probe solution

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Serial protocols: easy triggering and decoding

- Fast measurement configuration
- Isolating protocol events
- Clear display of data
- High acquisition rate for finding errors quickly

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Power analysis

- Special measurement functions and measurement wizard for fast results
- Standards for limiting the harmonic current
- Easy and clear documentation of measurement results
- Extensive accessories for contacting and delay compensation

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EMI debugging with oscilloscopes

- EMI tests during development
- High dynamic range and sensitivity
- Visualization of sporadic emissions
- Correlation between frequency and time

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High-performance probes with extensive accessories

- The Rohde & Schwarz probe family
- High signal fidelity due to excellent specifications
- Easy operation: rugged and ergonomic
- Micro button for convenient instrument control
- R&S® ProbeMeter: integrated voltmeter for precise DC measurements

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Secure investment thanks to easy extensibility

- On-site installation of hardware options
- Software applications on demand
- Free firmware updates
- Bandwidth upgrades, including calibration

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More confidence in measurement results

Rohde & Schwarz has many years of experience in the development of precision test and measurement equipment, which also benefits the R&S® RTE oscilloscopes. They offer tried and tested Rohde & Schwarz quality for meeting stringent requirements.

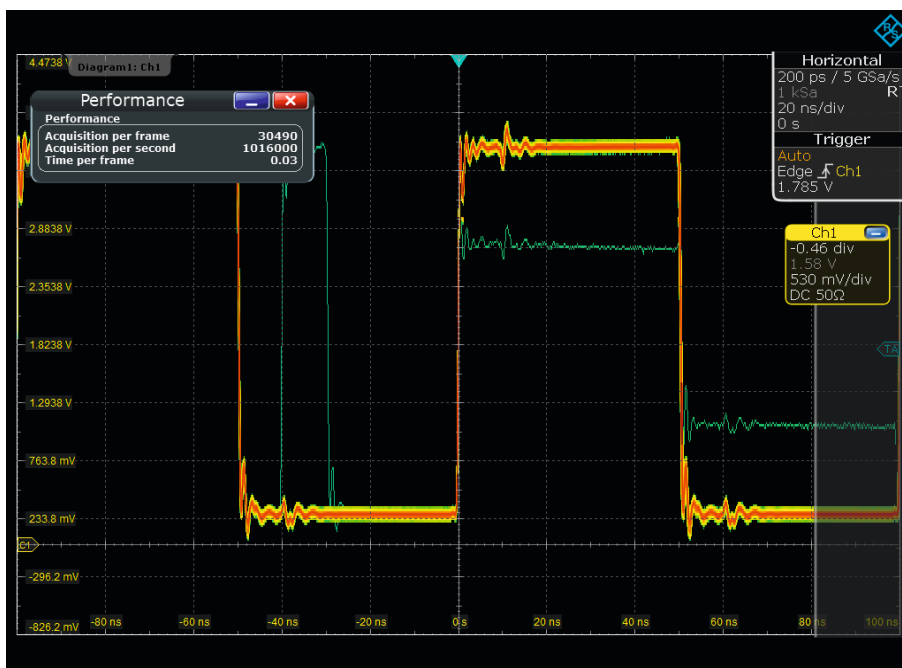
High time resolution combined with deep memory

The more details an oscilloscope can show, the higher the probability that the user will be able to analyze signal faults or important events. As a prerequisite, the oscilloscope must have a high time resolution that is based on a high sampling rate. In addition, many applications also require long record lengths, for instance for analyzing the transients of switched-mode power supplies or the data content of serial protocols. In order to maintain a high sampling rate even for long signal sequences, the oscilloscope requires a deep memory.

The R&S® RTE offers a combination of sampling rate and memory depth that is unique in this class. A sampling rate of 5 Gsample/s at a memory depth of 10 Msample is available per channel (can be optionally expanded to 50 Msample per channel).

Finding rare signal faults quickly

The acquisition cycle of a digital oscilloscope consists of two steps. First, the oscilloscope samples the signal and stores the samples. In a second step, it processes these samples and displays the waveform on the screen. During this period, the oscilloscope is “blind” to the signal. Signal faults that occur during this blind time remain hidden to the user. The less often signal faults occur, the longer it can take to detect them. This makes high acquisition rate and short blind time critical. The core of the R&S® RTE oscilloscope is an ASIC that was especially designed for parallel processing. As a result, the R&S® RTE can acquire, analyze and display more than one million waveforms per second without a special acquisition mode. The high acquisition rate makes it possible to find signal faults faster and more reliably, effectively shortening debugging time.



Due to the high acquisition rate of one million waveforms per second, the R&S® RTE oscilloscopes find rare signal faults very quickly.

Accurate triggering using a digital trigger system

The unique Rohde&Schwarz digital trigger system is also used in the R&S®RTE oscilloscopes. It consists of only one common path for acquisition signal and trigger signal. The instruments determine if the trigger condition has been met by directly analyzing the digitized signal independently of the current sampling rate. As a result, Rohde&Schwarz oscilloscopes have an extremely low trigger jitter and a high measurement accuracy.

The digital trigger increases the oscilloscope's trigger sensitivity because it can validate every acquired sample against the trigger definition. The R&S®RTE is able to trigger on even the smallest signal amplitudes.

In addition, the digital trigger system permits the user to adjust the trigger hysteresis to the signal quality, ensuring consistently reliable and stable triggering.

Another innovation is the flexible adjustment of the cut-off frequency of the digital lowpass filter. The same filter settings can be used for both the trigger signal and the measurement signal. As a result, RF noise on the trigger signal can be suppressed, for instance, while simultaneously capturing and displaying the unfiltered measurement signal.

Precise measurements due to single-core A/D converter

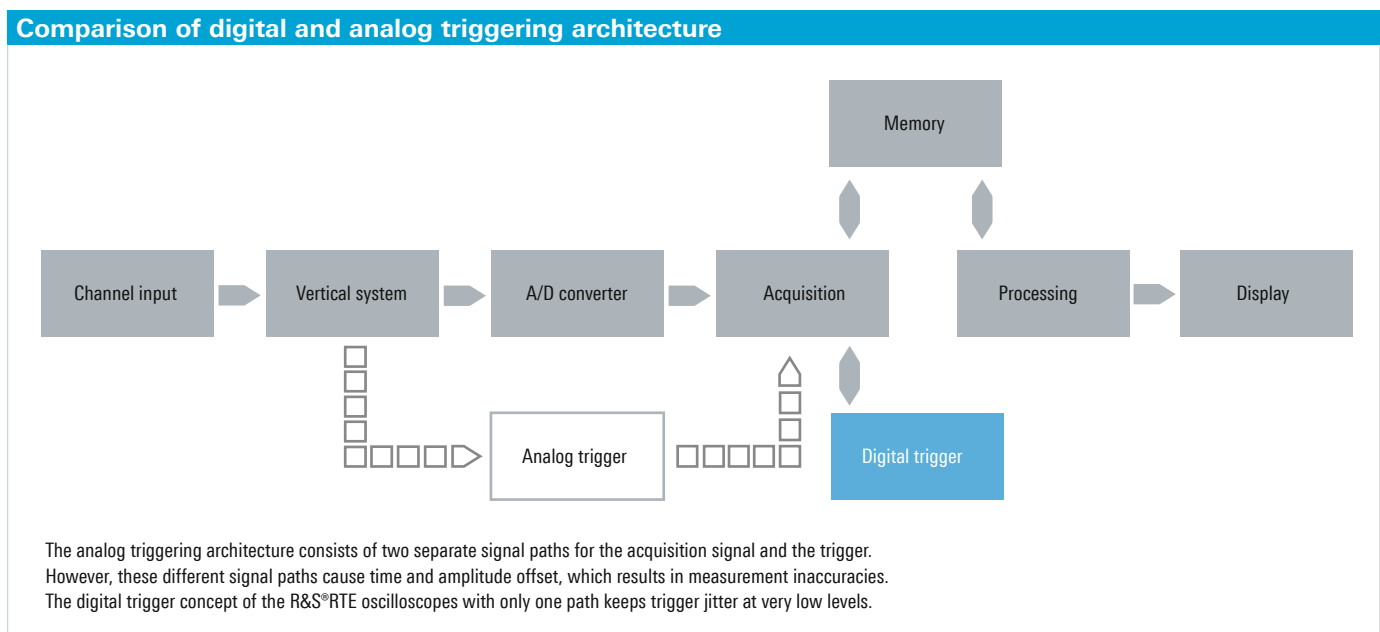
The accuracy of signal digitization depends on the A/D converter's effective number of bits (ENOB). Especially the small signal amplitudes of high-speed digital interfaces, or signal analysis in the frequency domain, place more stringent requirements on the dynamic range.

Traditionally, 8-bit A/D converters have been used in digital oscilloscopes. These converters consist of multiple slow time-interleaved converters that are connected. However, the higher the number of components that are combined, the larger the errors that arise due to the fact that the behavior of the individual converters is not uniform.

Rohde&Schwarz developed a monolithic A/D converter. This chip's single-core architecture minimizes signal distortion and achieves more than seven effective bits (ENOB).

Full measurement bandwidth, even at 1 mV/div

With their input sensitivity of up to 1 mV/div, the R&S®RTE oscilloscopes offer high vertical resolution. Other oscilloscopes attain such high input sensitivity only by employing software-based zooming or by limiting the bandwidth. The R&S®RTE oscilloscopes, however, show a signal's real sampling points even at 1 mV/div, at full measurement bandwidth. This high measurement accuracy is particularly beneficial when measuring small signal amplitudes.



More functions and faster results

The R&S®RTE includes many integrated measurement tools for detailed signal analysis. They range from simple cursor functions to mask tests to complex mathematical operations. The results are available quickly and are based on a large number of waveforms that provide statistically meaningful information.

High measurement speed, even for complex analysis functions

In the R&S®RTE oscilloscopes, many measurement functions are hardware-implemented:

- Histogram
- Spectrum display
- Mask test
- Cursor measurements
- Selected automatic measurement functions
- Selected mathematical operations

As a result, the acquisition and processing rate remains high, even when analysis functions are active. The oscilloscope enables smooth work, and even complex test sequences are available quickly, making a statistically meaningful analysis possible.

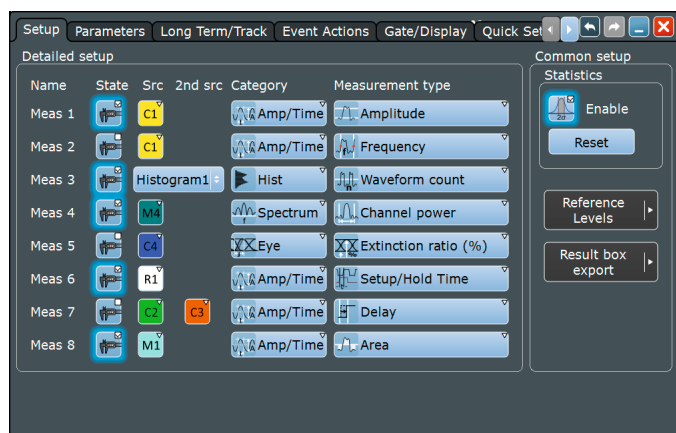
Wide selection of measurement functions

A key feature of digital oscilloscopes are automatic measurements. They permit users to determine the characteristics of a signal quickly and easily. This can be simple measurement of signal characteristics such as frequency and rise and fall times or complex analysis such as determining the switching loss of a switched-mode power supply. The R&S®RTE displays the results of up to eight measurements simultaneously. Automated measurements are divided into four different categories: amplitude and time measurements, histogram measurements, eye diagram measurements and spectral measurements. A total of 78 measurement functions are available. The gating function can be used to limit these functions to a specific signal range. The user can easily define this range on the screen using a finger or the mouse, or link it to existing cursor or zoom ranges.

QuickMeas: key measurement results at the push of a button

The QuickMeas function offered by the R&S®RTE oscilloscopes is unique in this class. The results of multiple measurement functions are simultaneously displayed for the currently active signal. Depending on the requirements, the set of functions can be individually defined with up to eight measurements and saved for later analysis. The QuickMeas function is quickly and easily accessed via the toolbar.

In the R&S®RTE oscilloscopes, up to eight automatic measurements can be configured and activated simultaneously.

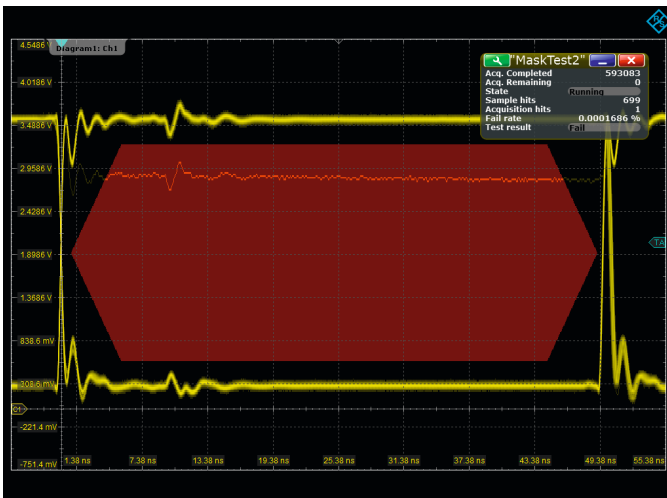


History function: looking back in time

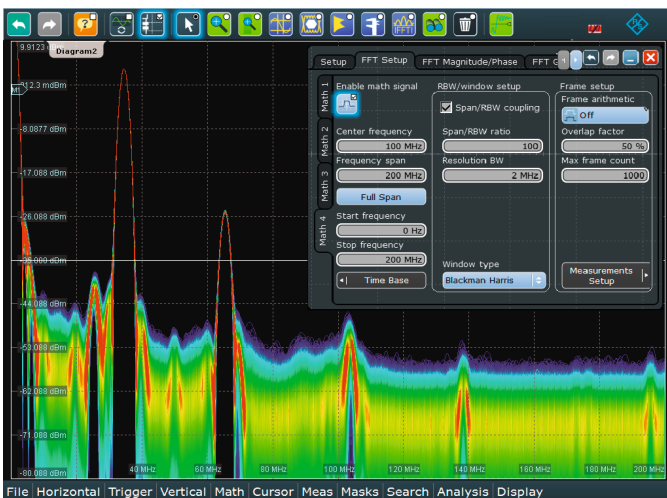
Where does the interference pulse in the signal come from? What caused the loss of a data bit? Finding the real cause of a problem is often only possible by looking at the history of a signal sequence.

The R&S®RTE history function always provides access to previously acquired waveforms. This enables the user to immediately analyze the measurement data stored in memory. Users can scroll through the individual acquisitions with the history player or display them in superimposed form in persistence mode. One timestamp per waveform makes it possible to clearly identify when the event took place. All analysis tools offered by the R&S®RTE are available for analyzing past acquisitions.

The R&S®RTE masks consist of up to 16 segments. Hardware implementation keeps the acquisition rate high, and mask violations are quickly found.



The R&S®RTE FFT function offers accuracy, speed, functionality and ease of use.



The history function can also be used in ultra-segmented mode. The oscilloscope performs a predefined number of acquisitions without interruption. The waveforms are displayed on the screen only after the last acquisition has been captured. The history player can be used to analyze the individual acquisitions. This mode has the advantage of an even shorter blind time (< 300 ns) between the individual acquisitions.

Mask test: settings in only seconds

Mask tests quickly reveal whether a specific signal lies within defined tolerance limits and use statistical pass/fail evaluation to assess the quality and stability of a device under test. Signal anomalies and unexpected results are easy to identify by stopping the measurement if the mask is violated.

Defining masks is easy and flexible with the R&S®RTE. With just a few keystrokes, the user can generate a mask from a reference signal or define masks consisting of up to 16 segments. To get started quickly, the mask segments can be generated on the screen using the mouse or a finger. Later on, the positions of the mask points can be optimized in the mask test dialog box.

FFT: the easy way to analyze the signal spectrum

Thanks to hardware implementation, the FFT in the R&S®RTE is very fast. The high acquisition and postprocessing rate conveys the impression of a live spectrum. Using the persistence mode, rapid signal changes, sporadic signal interference and weak superimposed signals can easily be made visible. The ability to overlap FFT frames enables the R&S®RTE to detect intermittent signals such as pulsed interferers.

Just like in spectrum analyzers, FFT operation is based on entering the center frequency, span and resolution bandwidth. The labeled axial scaling is especially user-friendly.

More fun to use

The R&S®RTE oscilloscopes unite established concepts with new features and turn user wishes into reality. Just unpack the instrument, switch it on – and measure.

Straightforward, smart user guidance

Different tools make operation of the R&S®RTE fast and easy, leading quickly to the desired measurement results.

The controls for vertical settings and the trigger are color-coded. Multicolor LEDs around the rotary knobs visualize the channel that is currently in focus. This color-coding corresponds to the signal display on the screen. This clear mapping allows smooth work, even during complex test and measurement tasks.

Signal flow diagrams in the dialog boxes visualize signal processing; crosslinks lead directly to logically related settings. Forward and back buttons help to navigate quickly between dialog boxes.

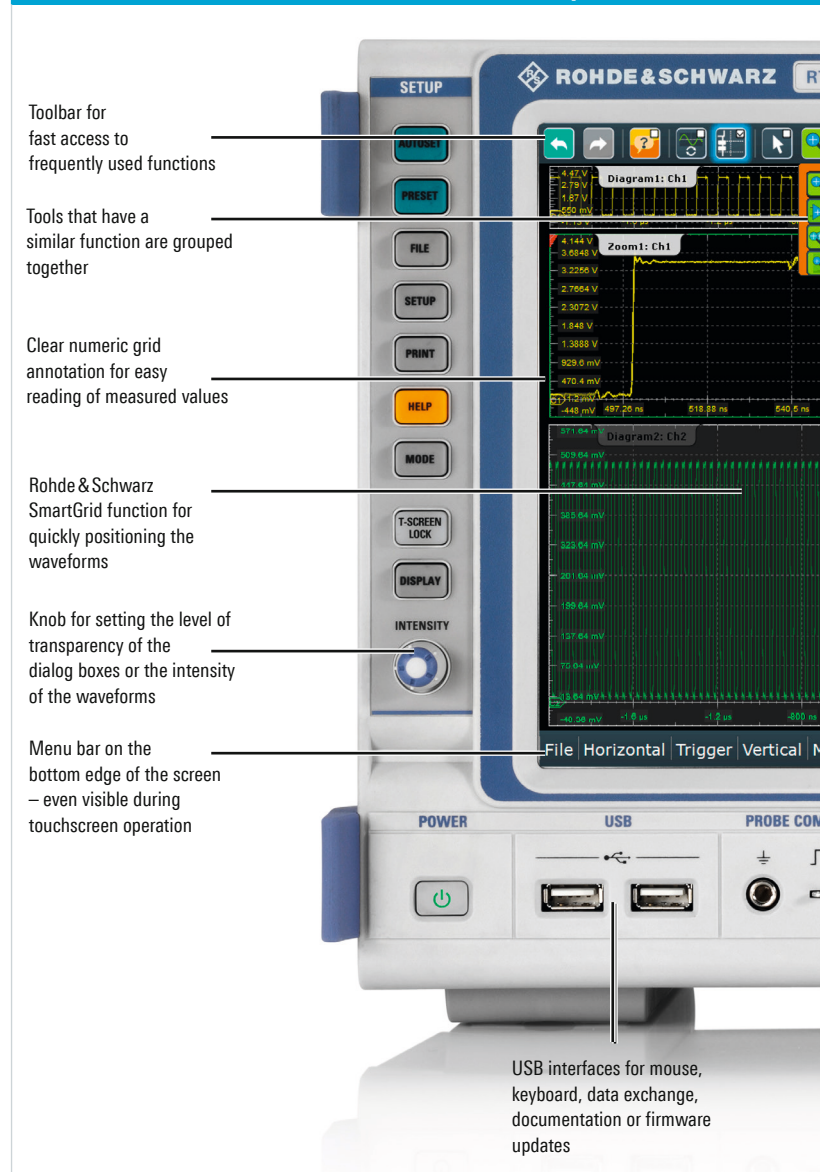
Semi-transparent dialog boxes are an elegant way to keep everything in view. The measurement diagrams always maintain their original size. The level of transparency can be set via the intensity button. In addition, users are able to scale the dialog boxes and position them anywhere on the screen.

Depending on user preferences, the R&S®RTE oscilloscopes can be operated via buttons, the mouse or the touchscreen. When activating multiple diagrams, the SmartGrid function helps the user to optimally set up the screen.

Fully customizable display

When working with multiple signals, the screen becomes easily cluttered. R&S®RTE oscilloscopes are different: They display the waveforms and measurement results in realtime in the form of signal icons on the edge of the screen. These miniature views can be dragged and dropped onto the main screen. When multiple waveforms are to be displayed simultaneously, the Rohde&Schwarz SmartGrid function helps the user to keep the screen well organized by flexibly dividing it into several diagrams. Individual waveforms can be displayed in a clear, well-structured manner. The A/D converter range is optimally used for highest accuracy.

Control elements of the R&S®RTE oscilloscopes



High-resolution touchscreen

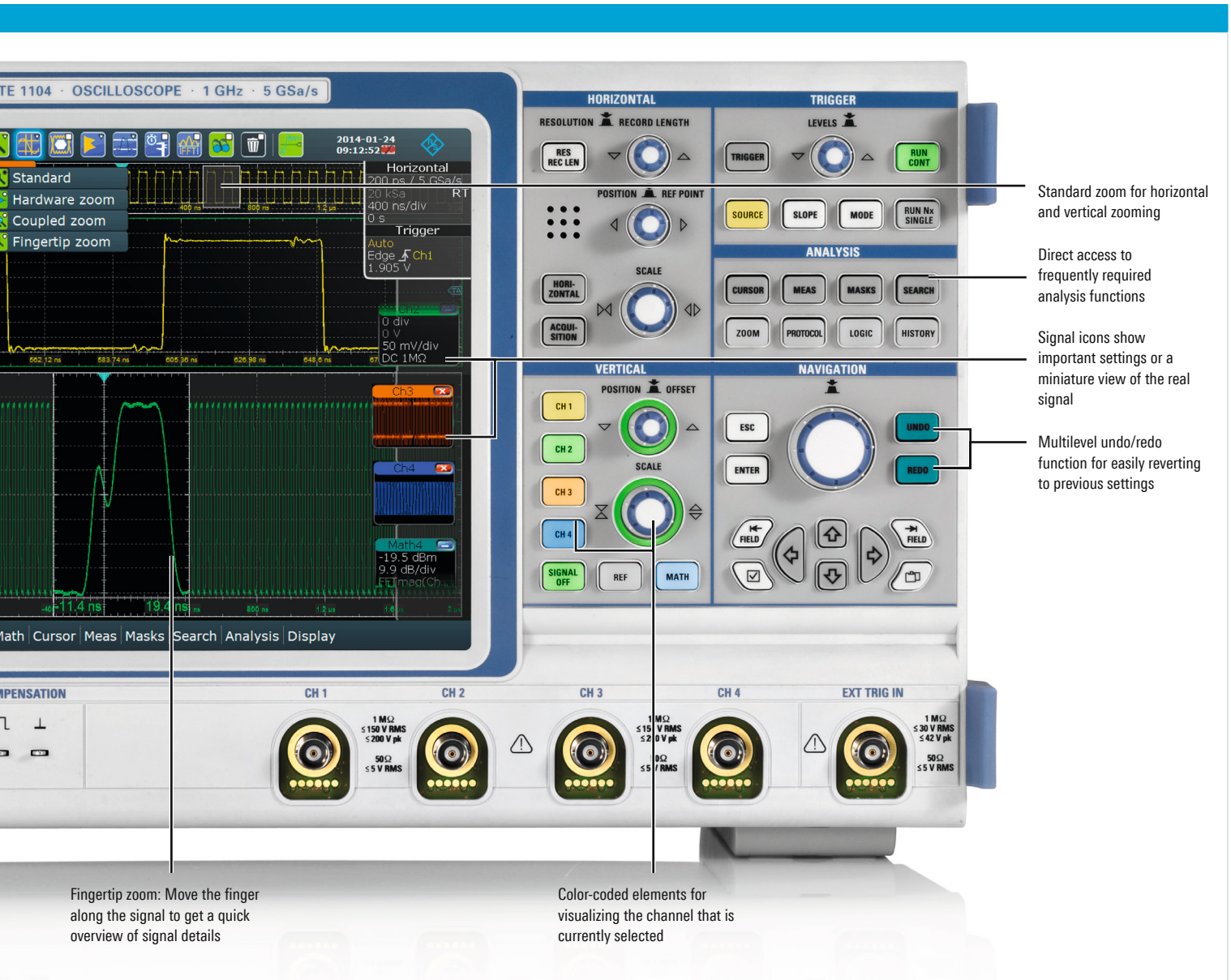
The high-resolution 10.4" XGA touchscreen is one of the highlights of the R&S®RTE oscilloscope. It supports touch operation for all functions. Signals can be dragged and dropped onto the screen, the measurement range can be defined using a finger, and dialog boxes can be scaled and positioned on the screen as required.

Fast access to important tools

A toolbar at the upper edge of the screen provides access to frequently used functions such as measurements, zoom, FFT and recycle bin. The toolbar can be customized to contain the user's favorite tools. There are just two steps involved in using a function: selecting the tool and applying it to the waveform.

Signal details at your fingertip

Zoom is a standard tool of digital oscilloscopes for analyzing the details of a captured signal. In addition to the standard zoom function, the R&S®RTE offers an additional highlight, the fingertip zoom. If this function is selected, a single click on the screen opens a horizontal zoom for the signal. By moving the zoom window along the signal using the fingertip or the mouse, the user obtains a quick overview of the signal characteristics. A normal zoom can be opened for detailed analysis of anomalies.



Standard zoom for horizontal and vertical zooming

Direct access to frequently required analysis functions

Signal icons show important settings or a miniature view of the real signal

Multilevel undo/redo function for easily reverting to previous settings

Fingertip zoom: Move the finger along the signal to get a quick overview of signal details

Color-coded elements for visualizing the channel that is currently selected

Logic analysis with the MSO option

Fast and precise testing of embedded designs: The R&S®RTE-B1 mixed signal option turns the R&S®RTE into an easy-to-use mixed signal oscilloscope (MSO) with 16 digital channels.

More signal details thanks to high time resolution across the entire memory depth

With a sampling rate of 5 Gsample/s, the R&S®RTE-B1 option provides a maximum time resolution of 200 ps for all digital channels. This sampling rate is available across the entire memory depth of 100 Msample per channel. As a result, the MSO option is even capable of detecting critical events such as narrow or widely separated glitches.

Precise triggering on signal events

The R&S®RTE-B1 offers numerous trigger types for debugging and analysis, such as edge, width, pattern and serial pattern. These triggers can be combined with holdoff conditions. For the trigger source, the user can choose between individual digital channels or bus signals.

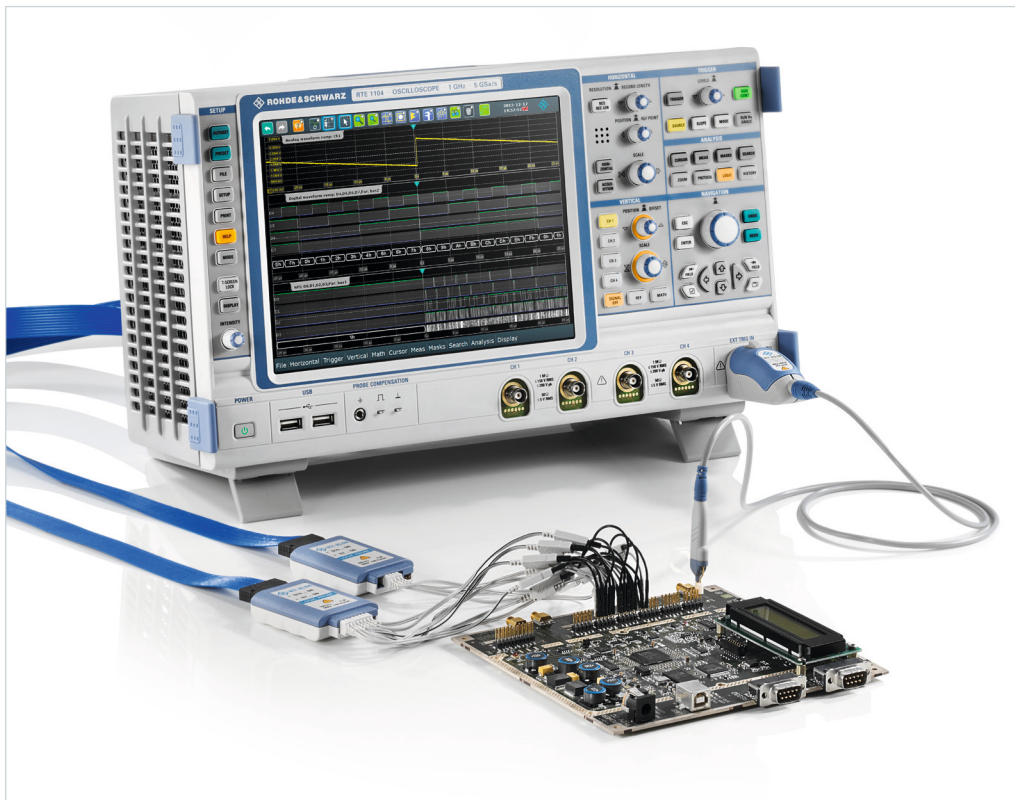
High acquisition and analysis rate for fast fault finding

Signal processing of the digital waveforms is done in hardware. This extends from acquisition and triggering to analysis functions such as cursor functions and measurements, and even includes the visualization of the results. This allows an acquisition and analysis rate of more than 200 000 waveforms per second, ensuring that rare events are detected quickly and reliably.

Straightforward display of digital signals

The R&S®RTE-B1 option supports 16 digital channels and decoding of up to 4 parallel buses simultaneously. Each bus is represented by an icon on the edge of the screen. The icons can be dragged and dropped onto the screen. The Rohde&Schwarz SmartGrid function supports flexible placement of the relevant signals in a suitable diagram. The icon clearly shows the current status of all activated logic channels (high, low, toggle) regardless of the other oscilloscope settings.

The user configures the parallel buses according to the actual bus topology and defines which digital channels are part of the bus, where the binarization decision threshold is placed and whether it is a clocked or unclocked bus. The decoded buses are displayed in a bus format or as an analog waveform. For clocked buses, the decoded contents can also be displayed in tabular format.



The R&S®RTE-B1 option turns the R&S®RTE into a mixed signal oscilloscope. The logic button provides direct access to the digital channels.

Analysis functions

For efficient analysis of measurement waveforms, the R&S®RTE-B1 MSO option offers a wide selection of automatic time measurements, including statistical evaluation. Automatic measurements can be performed on all digital channels and their logical combinations.

In addition to time measurements, the cursor also supports the decoding of the bus value at the cursor position.

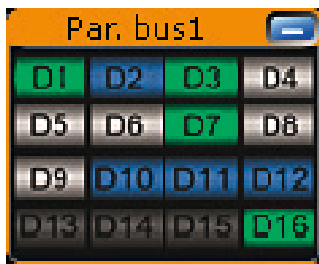
The history function enables the user to access specific measurement waveforms in the acquisition memory and to apply analysis functions to them.

Analysis of serial protocols, even with digital channels

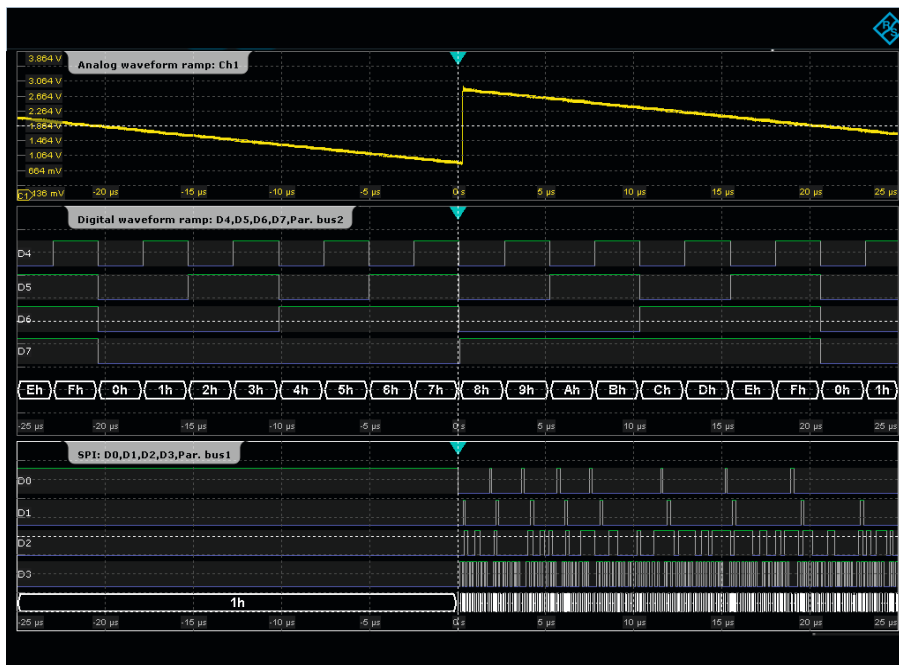
The protocols of serial interfaces such as I²C, SPI, UART/RS-232, CAN, LIN, FlexRay™ and I²S can also be triggered and decoded using the digital channels of the R&S®RTE-B1 option and the appropriate serial protocol options.

Low test point loading due to active probe solution

The 16 digital inputs are grouped into two logic probes with eight channels each. High input impedance combined with low input capacitance of 100 kΩ || 4 pF ensures high signal fidelity and low loading of the test points.



The signal activity of the digital channels is displayed in the signal icon independently of the oscilloscope settings.



Ramp signal of a 4-bit ADC with analog and digital channels as well as SPI bus signal with digital channels.

MSO option	Digital channels	Input impedance	Max. signal frequency	Max. sampling rate	Max. acquisition memory
R&S®RTE-B1	16 channels (2 logic probes)	100 kΩ 4 pF	400 MHz	5 Gsample/s per channel	100 Msample per channel

Serial protocols: easy triggering and decoding

As an option, the R&S® RTE oscilloscopes support triggering and decoding of the protocols for common serial interfaces such as I²C, SPI, CAN and I²S. The options operate at high acquisition rates, offer a wide array of functions and are easy to use – making R&S® RTE oscilloscopes excellent tools for verifying and debugging embedded designs.

Fast measurement configuration

In addition to the user data, serial bus signals include control and address information that is embedded in a frame. Consequently, additional software support is typically required for debugging systems that use serial data buses. Isolating protocol-specific events becomes easier if the oscilloscope can trigger on the content of the serial protocol that is being used and display the decoded message.

The R&S® RTE provides versatile tools for analyzing serial interfaces such as I²C, SPI, UART/RS-232, CAN/LIN, FlexRay™, I²S, MIL and ARINC. Measurements can be configured quickly, and navigation between the individual dialog boxes is smooth and fast thanks to crosslinks. The Find Reference Levels function makes it particularly easy to define the decision level for the logical signals.

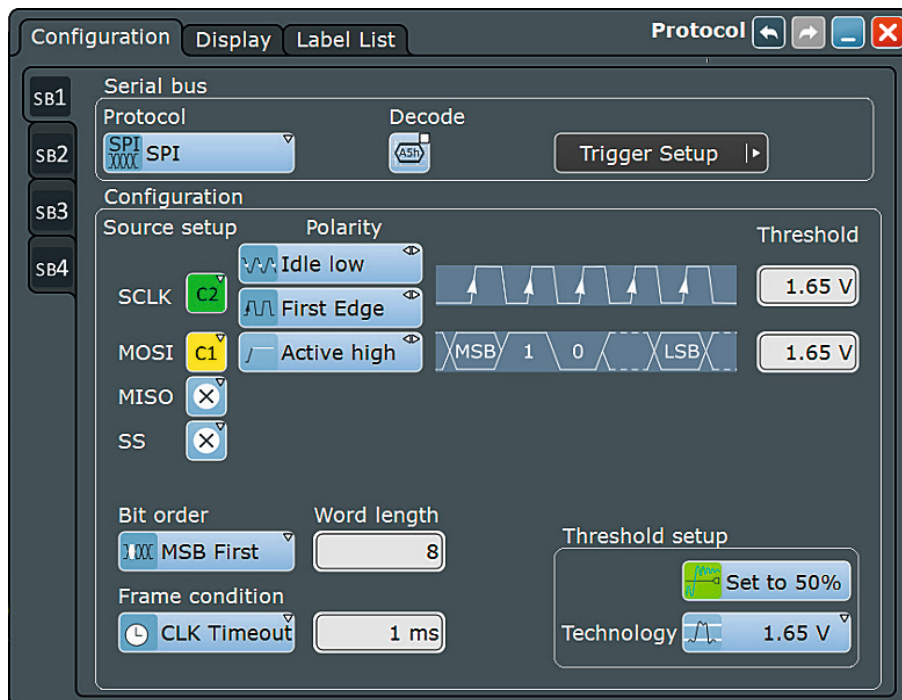
Isolating protocol events

Protocol-specific definition of the trigger conditions is very important for tracking down protocol errors. The R&S® RTE enables triggering on specific protocol content, e.g. addresses or data, as well as on protocol errors.

Options for triggering and decoding

Serial standard	Option
I ² C/SPI	R&S® RTE-K1
UART/RS-232	R&S® RTE-K2
CAN/LIN	R&S® RTE-K3
FlexRay™	R&S® RTE-K4
I ² S/LJ/RJ/TDM	R&S® RTE-K5
MIL-STD-1553	R&S® RTE-K6
ARINC 429	R&S® RTE-K7

The user conveniently configures the serial buses according to the protocol topology.



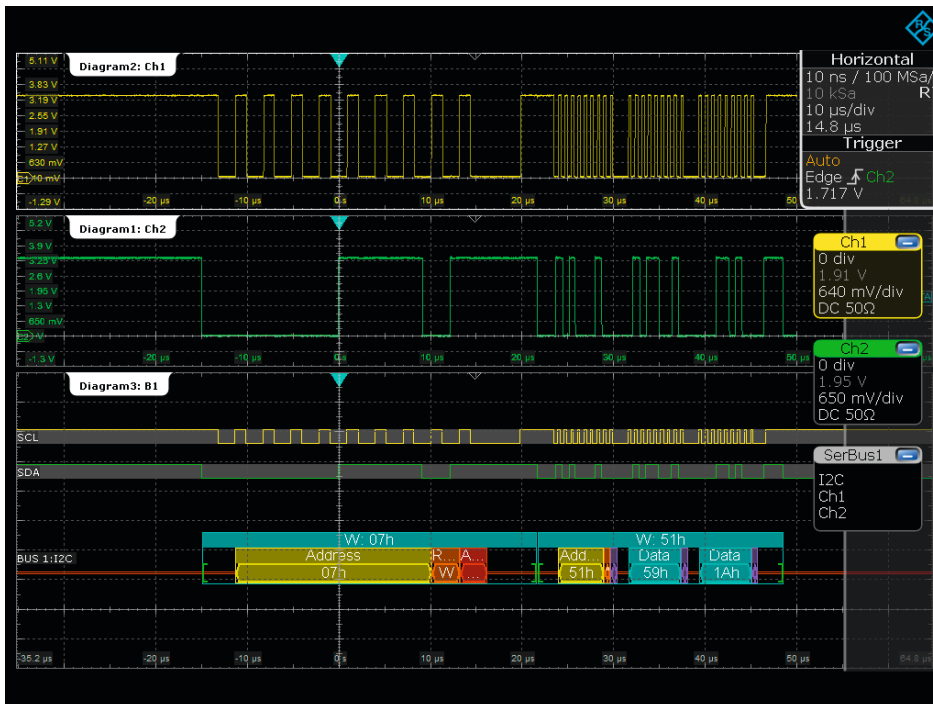
Clear display of data

When displaying decoded data, the individual protocol areas within the logical signals are marked with different colors, and address and data content can be displayed in hex, bin or ASCII format. The signal lines can either be displayed individually or as a group. The Rohde&Schwarz SmartGrid function supports flexible placement of the signals in a suitable diagram. The protocol packets can also be displayed in a table, and the user can configure the table format as needed.

High acquisition rate for finding errors quickly

Data errors at serial interfaces are frequently the result of sporadic signal faults caused by timing of logic components at the limits. High acquisition rates are a key prerequisite for detecting such faults quickly. Rohde&Schwarz oscilloscopes are ideal for these tasks because they decode the protocol-specific trigger results using hardware. Consequently, errors are found reliably and quickly and displayed immediately.

The individual areas of the decoded protocol frame are marked with different colors to provide a clear overview.



Power analysis

Power electronics can be found in all electronic and electrical devices, in consumer goods such as mobile phones as well as in drive controls for industrial equipment. For characterizing the power components, the R&S®RTE-K31 power analysis option provides automated measurement functions, guides the user through the test setup and documents the measurement results.

Special measurement functions and measurement wizard for fast results

When analyzing power electronics, the input and output and the internal transfer function of the component have to be characterized. The R&S®RTE-K31 power analysis option provides the necessary measurement functions, including inrush current, output spectrum and safe operating area (SOA).

After a measurement function is selected, the measurement wizard guides the user through the test setup. Detailed illustrations help the user to make the correct connections. The oscilloscope then configures itself automatically and delivers quick results. The configuration can be modified or the oscilloscope can be fully manually configured in order to document specific signal details.

Standards for limiting the harmonic current

Depending on the application, different standards for limiting the harmonic current must be met when developing switched-mode power supplies. The R&S®RTE-K31 option supports the user during testing of all conventional standards: EN61000-3-2 classes A, B, C, D, MIL-STD-1399 and RTCA DO-160.

Measurement functions of the R&S®RTE-K31 software option	
Measurement	Measurement functions
Input	Power quality, inrush current, harmonic current
Power converter control	Modulation analysis, internal impedance in the power-on state, slew rate
Power path	Safe operating area (SOA), power on/off, switching losses, efficiency
Output	Residual ripple, transient response, output spectrum

Measurement wizard for easy and fast testing.

Safe Operating Area [X]

Channels Settings Details

Differential voltage probe:

- Connect the + to the drain of the transistor
- Connect the - to the source of the transistor

Current probe:

- Connect it to the source of the transistor

Voltage
Ch1 Channel 1

Current
Ch2 Channel 2

Power Menu Execute

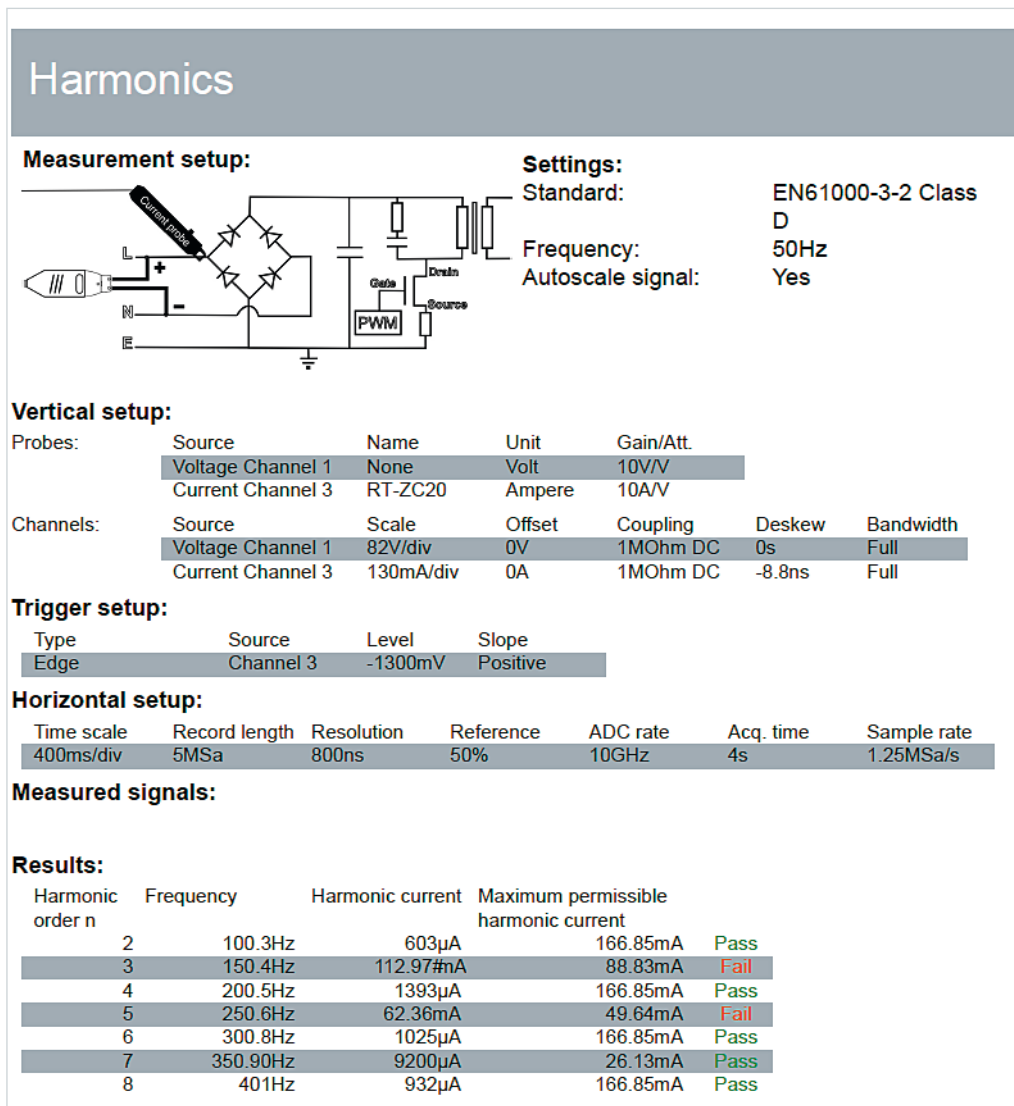
Easy and clear documentation of measurement results

Each result can be added to the test report simply by pressing a button. The test report documents the current setup and configuration. Users can flexibly define the level of detail for the report and customize the layout, for example, by adding a company logo. The available output formats are PDF and RTF.

Extensive accessories for contacting and delay compensation

A wide range of passive and active probes permits measurements in common voltage and current ranges. The R&S®RT-ZF20 probe deskew and calibration test fixture can be used to synchronize the measurement signals from the current and voltage probes. The R&S®RTE-K31 power analysis option automatically deskews the current probe and voltage probe signals at the push of a button.

Extensive result documentation.



EMI debugging with oscilloscopes

The R&S®RTE oscilloscope is a valuable tool for analyzing EMI problems in electronic circuits. High input sensitivity, high dynamic range and a powerful FFT implementation are key features for capturing and analyzing unwanted emissions.

Together with the R&S®HZ-15 near-field probe set, R&S®RTE oscilloscopes are ideal for EMI tests during development.



EMI tests during development

When debugging EMI problems in electronic circuits, development engineers face the challenging problem of identifying and eliminating the sources of unwanted emissions quickly and accurately. One of the most important test instruments during circuit development is the oscilloscope. Many problems can be eliminated during development by using oscilloscopes for EMI debugging.

High dynamic range and sensitivity

The R&S®RTE oscilloscope is a powerful tool for EMI debugging. Its high dynamic range and input sensitivity of 1 mV/div at full measurement bandwidth make it possible to detect even weak emissions. The powerful FFT implementation is well-suited for the required analysis in the frequency domain thanks to its easy operation, high acquisition rate and functions such as color-coding of the spectral display according to the frequency of occurrence. In combination with a near-field probe, EMI problems can be quickly located and analyzed.

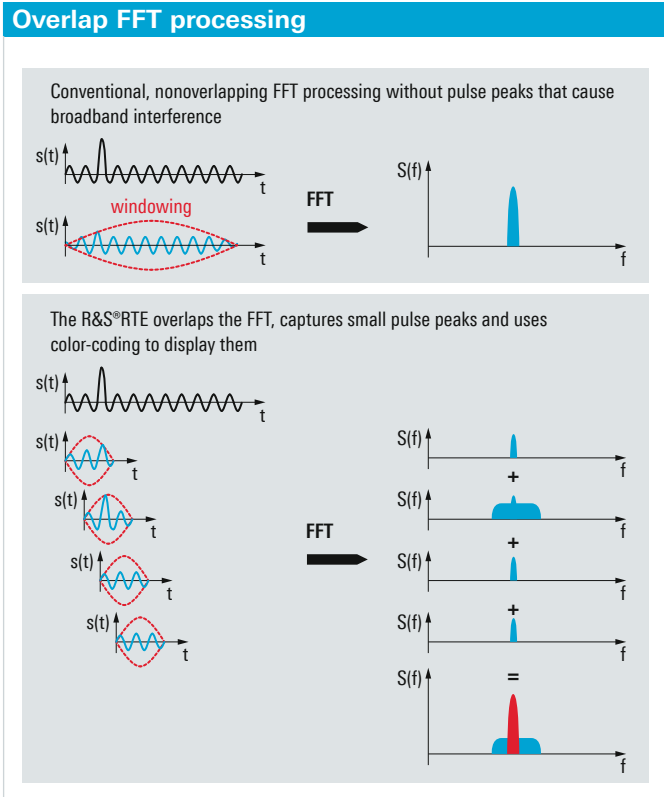
Visualization of sporadic emissions

One special feature is overlap FFT. The oscilloscope splits the captured time domain signal into overlapping segments and calculates an individual spectrum for each segment. These spectra are then color-coded according to their frequency of occurrence and combined to a complete spectrum. The complete spectrum provides a very good overview of the type and frequency of occurrence of EMI emissions. Even sporadic signals are visible.

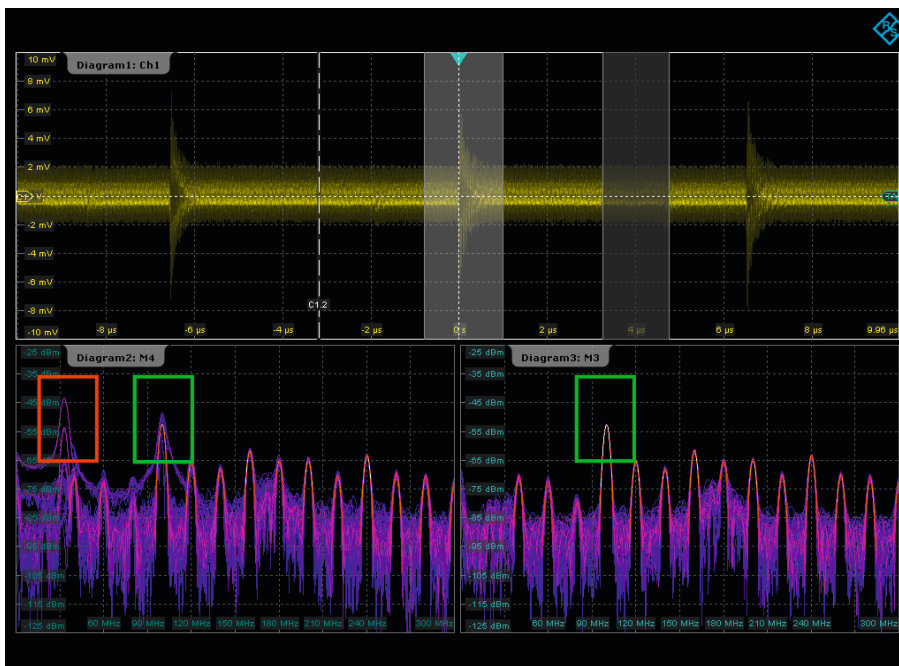
Another highlight is the flexible definition of masks in the frequency domain using the mask function. The stop-on-violation condition stops the acquisition exactly at the signal that violated the frequency mask. This solves the most challenging EMI problem – detecting and analyzing sporadic emissions.

Correlation between frequency and time

The gated FFT function of the R&S®RTE oscilloscopes makes it possible to restrict FFT analysis to a user-defined region of the acquired time domain signal. Users can move this time window across the entire signal to determine which segments of the time domain signal correlate to which events in the spectrum. This makes it possible, for example, to correlate unwanted emissions from switched-mode power supplies with overshoots from the switching transistor.



Gated FFT displays the spectrum for defined time segments of the acquired signal. The two time segments that have undergone FFT processing are highlighted in gray (the resulting spectra are displayed on the left and right below). Gated FFT makes it possible to correlate intermittent EMI emissions to the time domain signal. The red box shows the part of the spectrum caused by an unwanted emission, and the green boxes show a part of the spectrum that is constant and therefore present in both spectra.



High-performance probes with extensive accessories

High-quality active and passive probes complete the R&S® RTE oscilloscopes. They measure with high accuracy, are reliable and easy to use.

Practical design: micro button for convenient instrument control. Diverse probe tips and ground leads are included in the equipment supplied.



The Rohde & Schwarz probe family

Passive probes are suited for general measurements on low-frequency signals with less stringent accuracy requirements. The R&S® RTE comes with one passive probe per oscilloscope channel. The R&S® RT-ZH10/-ZH11 passive high-voltage probes are used for voltages over 400 V.

Active probes are used whenever the load on the device under test must be low or when the measurement signal contains high-frequency components that must not be distorted. Even signals in the kilohertz range can contain high-frequency components of well over 100 MHz on their edges. Rohde & Schwarz offers an entire family of high-end active probes, both single-ended and differential. The table on page 20 shows which of these are especially suited for the R&S® RTE.

High signal fidelity due to excellent specifications

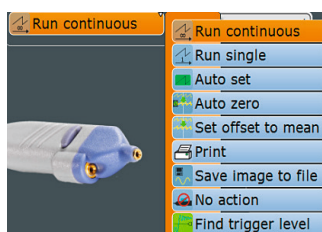
Besides bandwidth, the crucial parameters for probes are input impedance and dynamic range. With their high input impedance, the active probes put only a minimal load on a signal source. The very large vertical dynamic range prevents signal distortion especially at high frequencies. Measurements are not interrupted for compensation processes since the probes' offset and gain errors are nearly independent of temperature (e.g. zero drift < 90 $\mu\text{V}/^\circ\text{C}$ for single-ended probes).

Easy operation: rugged and ergonomical

What do users expect from a good probe? Reliable connection with the test point and the oscilloscope, mechanical robustness, electrical reliability, as well as a practical design for easy operation. That is exactly what all probes for Rohde & Schwarz oscilloscopes offer.

Micro button for convenient instrument control

The situation is all too familiar: The user has carefully positioned the probes on the device under test and now wants to start the measurements – but does not have a hand free. This will not happen with the Rohde & Schwarz active probes. The micro button is situated on the probe tip, and different functions such as run/stop, autoset or adjust offset can be assigned to this button.

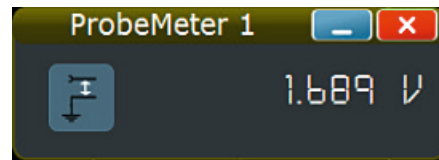


Menu for configuring the micro button.

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

Is the supply voltage correct? Is DC voltage superimposed? These questions from everyday practice are answered by the active probes' integrated voltmeter (R&S®ProbeMeter). It always shows the DC value of a measurement signal with the full dynamic range – regardless of the other instrument settings. Compared to a traditional oscilloscope channel, the R&S®ProbeMeter offers a much higher DC measurement accuracy. The following advantages simplify everyday measurement tasks:

- Fast verification of supply voltages and signal levels without changing the oscilloscope's settings
- Automatic compensation of the DC component for AC measurements with optimal dynamic range
- DC value of a measurement signal as a reference for trigger level setting



R&S®ProbeMeter: high DC measurement accuracy regardless of instrument settings and in parallel with the measurement channel.



R&S®RT-ZC20 current probe (100 MHz, 30 A (RMS)).



R&S®RT-ZD01 high-voltage differential probe (100 MHz, 1 kV (RMS)).



Rohde & Schwarz active probes.



R&S®RT-ZD10/20.



R&S®RT-ZS10/20.

Probe	Bandwidth	Attenuation factor	Input impedance	Input capacitance	Dynamic range	Extras
Passive probes						
R&S®RT-ZP10	500 MHz	10:1	10 MΩ	~ 10 pF	400 V (RMS)	
R&S®RT-ZH10	400 MHz	100:1	50 MΩ	7.5 pF	1 kV (RMS)	
R&S®RT-ZH11	400 MHz	1000:1				
Active probes						
R&S®RT-ZS10E	1.0 GHz	10:1	1 MΩ	0.8 pF	±8 V	
R&S®RT-ZS10	1.0 GHz					R&S®ProbeMeter and micro button for instrument control
R&S®RT-ZS20	1.5 GHz					
Differential probes						
R&S®RT-ZD01	100 MHz	100:1/1000:1	8 MΩ	3.5 pF	±140 V/±1400 V	
R&S®RT-ZD10	1.0 GHz	10:1	1 MΩ	0.6 pF	±5 V	R&S®ProbeMeter and micro button for instrument control
		100:1		1.3 pF	70 V DC, 46 V AC (peak)	
R&S®RT-ZD20	1.5 GHz	10:1		0.6 pF	±5 V	

Probe	Bandwidth	Max. current (RMS/peak)	Rise time	Sensitivity error	Max. input voltage	Extras
Current probes						
R&S®RT-ZC10	10 MHz	150 A/±300 A	35 ns	±1% up to 150 A (RMS)	600 V (CAT II), 300 V (CAT III)	External power supply required, e.g. R&S®RT-ZA13
R&S®RT-ZC20	100 MHz	30 A/±50 A	3.5 ns	±1% up to 30 A (RMS)	300 V (CAT I)	

Secure investment thanks to easy extensibility

Rohde & Schwarz oscilloscopes are a safe investment because they handle current requirements and future challenges. With their numerous software and hardware options as well as bandwidth upgrades, they enable customized solutions for a wide variety of measurement tasks.

On-site installation of hardware options

The R&S®RTE can be quickly adapted to new requirements. Its unique plug & play concept makes upgrading and retrofitting of options easy. All hardware options, such as the digital channels for logic analysis, can be inserted into the slot on the rear panel without opening the oscilloscope. This approach has many advantages:

- Installation of new options for new tasks within minutes
- Instrument immediately ready for continued use
- No additional installation costs
- No additional expense for alignment or recalibration after installation of options

Software applications on demand

The base unit includes the complete functionality of an advanced oscilloscope but is also extensible in steps. For example, analysis options are available for serial buses or for power measurements on switched-mode power supplies. The R&S®RTE keeps pace with the challenges.

Free firmware updates

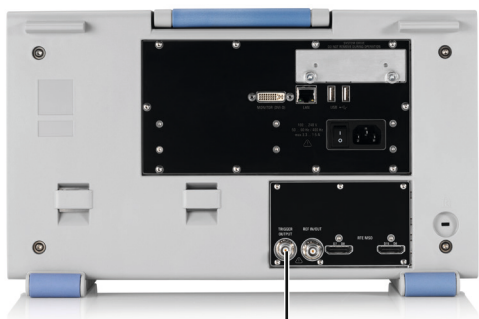
The oscilloscope's firmware can be updated using a USB storage device or the LAN port. Free firmware updates can be simply downloaded from the Internet at www.rohde-schwarz.com.

Bandwidth upgrades, including calibration

Sometimes investment budgets are limited, or not all future bandwidth requirements are known at the time of purchase. Options are available for upgrading the bandwidth of all R&S®RTE oscilloscopes. An R&S®RTE1024 oscilloscope with 200 MHz bandwidth, for example, can be upgraded to 1 GHz.

All upgrade options include a complete check of the instrument and calibration at a Rohde & Schwarz service center.

Additional functionality



One slot for options,
e.g. the R&S®RTE-B1 MSO option

Specifications in brief

Specifications in brief		
Vertical system		
Number of channels	R&S®RTE1022/RTE1032/RTE1052/RTE1102	2
	R&S®RTE1024/RTE1034/RTE1054/RTE1104	4
Analog bandwidth (–3 dB) at 50 Ω	R&S®RTE1022/RTE1024	≥ 200 MHz
	R&S®RTE1032/RTE1034	≥ 350 MHz
	R&S®RTE1052/RTE1054	≥ 500 MHz
	R&S®RTE1102/RTE1104	≥ 1 GHz
Rise time	R&S®RTE1022/RTE1024	< 1.75 ns
	R&S®RTE1032/RTE1034	< 1 ns
	R&S®RTE1052/RTE1054	< 700 ps
	R&S®RTE1102/RTE1104	< 350 ps
Impedance		50 Ω ± 1.5%, 1 MΩ ± 1% 16 pF ± 1 pF (meas.)
Input sensitivity	max. bandwidth in all ranges	50 Ω: 1 mV/div to 1 V/div 1 MΩ: 1 mV/div to 10 V/div
ENOB of A/D converter	full-scale sine wave, < –3 dB frequency bandwidth	> 7 bit (meas.)
Acquisition system		
Realtime sampling rate		max. 5 Gsample/s on each channel
Acquisition memory	standard configuration, per channel/1 channel active	R&S®RTE 2-channel model: 10/20 Msample R&S®RTE 4-channel model: 10/40 Msample
	max. upgrade (R&S®RTE-B102 option), per channel/1 channel active	R&S®RTE 2-channel model: 50/100 Msample R&S®RTE 4-channel model: 50/200 Msample
Acquisition rate		> 1 000 000 waveforms/s
Decimation modes	any combination of decimation mode and waveform arithmetics	sample, peak detect, high resolution, root mean square
Waveform arithmetics		off, envelope, average
Interpolation modes		linear, sin(x)/x, sample&hold
Horizontal system		
Timebase range		50 ps/div to 50 s/div
Timebase accuracy	after delivery/calibration	±5 ppm
Channel deskew		±100 ns
Trigger system		
Trigger types		edge, glitch, width, runt, window, timeout, interval, slew rate, data2clock, pattern, state, serial pattern, TV/video, serial bus trigger (optional)
Sensitivity	definition of trigger hysteresis	can be set automatically or manually from 0 div to 5 div
Analysis and measurement functions		
Automated measurements		77 measurement functions
Cursor measurements		2 cursor sets, each consisting of two horizontal and two vertical cursors
Waveform mathematics		4 math waveforms; mathematics, logical operations, comparison, FIR filter, FFT
MSO option		
Digital channels		16 (2 logic probes)
Input impedance		100 k 4 pF
Sampling rate		5 Gsample/s per channel
Acquisition memory		100 Msample per channel
Parallel buses		up to 4

Specifications in brief

General data

Dimensions	W × H × D	427 mm × 249 mm × 204 mm (16.81 in × 9.8 in × 8.03 in)
Weight	without options, nominal	8.8 kg (19.4 lb)
Screen		10.4" LC TFT color touchscreen, 1024 × 728 pixel (XGA)
Interfaces		1 Gbps LAN, 4 × USB 2.0, GPIB (optional), DVI for external monitor, external trigger, trigger output

For data sheet, see PD 3606.9033.22 and www.rohde-schwarz.com

Ordering information

Designation	Type	Order No.
Base unit (including standard accessories: per channel: R&S®RT-ZP10, accessories bag, quick start guide, CD with manual, power cord)		
Digital Oscilloscope		
200 MHz, 5 Gsample/s, 10/20 Msample, 2 channels	R&S®RTE1022	1317.2500.22
200 MHz, 5 Gsample/s, 10/40 Msample, 4 channels	R&S®RTE1024	1317.2500.24
350 MHz, 5 Gsample/s, 10/20 Msample, 2 channels	R&S®RTE1032	1317.2500.32
350 MHz, 5 Gsample/s, 10/40 Msample, 4 channels	R&S®RTE1034	1317.2500.34
500 MHz, 5 Gsample/s, 10/20 Msample, 2 channels	R&S®RTE1052	1317.2500.52
500 MHz, 5 Gsample/s, 10/40 Msample, 4 channels	R&S®RTE1054	1317.2500.54
1 GHz, 5 Gsample/s, 10/20 Msample, 2 channels	R&S®RTE1102	1317.2500.02
1 GHz, 5 Gsample/s, 10/40 Msample, 4 channels	R&S®RTE1104	1317.2500.04
Hardware options (plug-in)		
Mixed Signal, 400 MHz, 5 Gsample/s, 16 channels, 100 Msample per channel	R&S®RTE-B1	1317.4961.02
GPIB Interface	R&S®RTE-B10	1317.4978.02
Replacement SSD Hard Disk, incl. firmware	R&S®RTE-B18	1317.7002.02
Replacement Hard Disk, incl. firmware	R&S®RTE-B19	1317.7019.02
Memory Upgrade, 20 Msample per channel	R&S®RTE-B101	1317.7331.02
Memory Upgrade, 50 Msample per channel	R&S®RTE-B102	1317.7348.02
Bandwidth upgrades ¹⁾		
Upgrade of the R&S®RTE1022/4 to 350 MHz bandwidth, incl. calibration	R&S®RTE-B200	1317.7254.02
Upgrade of the R&S®RTE1022/4 to 500 MHz bandwidth, incl. calibration	R&S®RTE-B201	1317.7260.02
Upgrade of the R&S®RTE1022/4 to 1 GHz bandwidth, incl. calibration	R&S®RTE-B202	1317.7277.02
Upgrade of the R&S®RTE1032/4 to 500 MHz bandwidth, incl. calibration	R&S®RTE-B204	1317.7283.02
Upgrade of the R&S®RTE1032/4 to 1 GHz bandwidth, incl. calibration	R&S®RTE-B205	1317.7290.02
Upgrade of the R&S®RTE1052/4 to 1 GHz bandwidth, incl. calibration	R&S®RTE-B207	1317.7302.02
Software options		
I ² C/SPI Serial Triggering and Decoding	R&S®RTE-K1	1317.7125.02
UART/RS-232 Serial Triggering and Decoding	R&S®RTE-K2	1317.7131.02
CAN/LIN Serial Triggering and Decoding	R&S®RTE-K3	1317.7148.02
FlexRay™ Serial Triggering and Decoding	R&S®RTE-K4	1317.7154.02
I ² S/LJ/RJ/TDM Serial Triggering and Decoding	R&S®RTE-K5	1317.7160.02
MIL-STD-1553 Serial Triggering and Decoding	R&S®RTE-K6	1325.9781.02
ARINC 429 Serial Triggering and Decoding	R&S®RTE-K7	1325.9798.02
Power Analysis	R&S®RTE-K31	1317.7177.02
Probes		
500 MHz, passive, 10:1, 10 MΩ 9.5 pF, max. 400 V	R&S®RT-ZP10	1409.7550.00
400 MHz, passive, high-voltage, 100:1, 50 MΩ 7.5 pF, 1 kV (RMS)	R&S®RT-ZH10	1409.7720.02
400 MHz, passive, high-voltage, 1000:1, 50 MΩ 7.5 pF, 1 kV (RMS)	R&S®RT-ZH11	1409.7737.02
1.0 GHz, active, 1 MΩ 0.8 pF	R&S®RT-ZS10E	1418.7007.02
1.0 GHz, active, 1 MΩ 0.8 pF, R&S®ProbeMeter, micro button	R&S®RT-ZS10	1410.4080.02
1.5 GHz, active, 1 MΩ 0.8 pF, R&S®ProbeMeter, micro button	R&S®RT-ZS20	1410.3502.02
100 MHz, high-voltage, active, differential, 8 MΩ 3.5 pF, 1 kV (RMS) (CAT III)	R&S®RT-ZD01	1422.0703.02
1.0 GHz, active, differential, 1 MΩ 0.6 pF, R&S®ProbeMeter, micro button, incl. 10:1 external attenuator, 1.3 pF, 70 V DC, 46 V AC (peak)	R&S®RT-ZD10	1410.4715.02
1.5 GHz, active, differential, 1 MΩ 0.6 pF, R&S®ProbeMeter, micro button	R&S®RT-ZD20	1410.4409.02
10 MHz, current, AC/DC, 0.01 V/A, 150 A (RMS)	R&S®RT-ZC10	1409.7750.02
100 MHz, current, AC/DC, 0.1 V/A, 30 A (RMS)	R&S®RT-ZC20	1409.7766.02

¹⁾ The bandwidth upgrade is performed at a Rohde&Schwarz service center, where the oscilloscope will also be calibrated.

Designation	Type	Order No.
Probe accessories		
Accessory Set for R&S®RT-ZP10 passive probe (2.5 mm probe tip)	R&S®RT-ZA1	1409.7566.00
Spare Accessory Set for R&S®RT-ZS10/10E/20	R&S®RT-ZA2	1416.0405.02
Pin Set for R&S®RT-ZS10/10E/20	R&S®RT-ZA3	1416.0411.02
Mini Clips	R&S®RT-ZA4	1416.0428.02
Micro Clips	R&S®RT-ZA5	1416.0434.02
Lead Set	R&S®RT-ZA6	1416.0440.02
Pin Set for R&S®RT-ZD10/20/30	R&S®RT-ZA7	1417.0609.02
SMA Adapter	R&S®RT-ZA10	1416.0457.02
Probe Power Supply	R&S®RT-ZA13	1409.7789.02
External Attenuator, 10:1, 2.0 GHz, 70 V DC, 46 V AC (peak)	R&S®RT-ZA15	1410.4744.02
Accessories		
Front Cover, for R&S®RTO/RTE digital oscilloscopes	R&S®RTO-Z1	1317.6970.02
Soft Case, for R&S®RTO/RTE digital oscilloscopes and accessories	R&S®RTO-Z3	1304.9118.02
Transit Case, with trolley function, for R&S®RTO/RTE digital oscilloscopes and accessories	R&S®RTO-Z4	1317.7025.02
Probe Pouch, for R&S®RTO/RTE digital oscilloscopes	R&S®RTO-Z5	1317.7031.02
Probe Deskew and Calibration Test Fixture	R&S®RT-ZF20	1800.0004.02
19" Rackmount Kit, for R&S®RTO/RTE digital oscilloscopes with 6 HU	R&S®ZZA-RTO	1304.8286.00

Service 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, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Calibration Coverage, three years	R&S®CW3	
Extended Warranty with Calibration Coverage, four years	R&S®CW4	

Service that adds value

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

About Rohde & Schwarz

The Rohde & Schwarz electronics group is a leading supplier of solutions in the fields of test and measurement, broadcasting, secure communications, and radiomonitoring and radiolocation. Founded more than 80 years ago, this independent global company has an extensive sales network and is present in more than 70 countries. The company is headquartered in Munich, Germany.

Sustainable product design

- ▮ Environmental compatibility and eco-footprint
- ▮ Energy efficiency and low emissions
- ▮ Longevity and optimized total cost of ownership

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

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R&S® RTE Digital Oscilloscope

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