Осциллограф RTE1000

Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
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Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
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Тверь (4822)63-31-35
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Тула (4872)74-02-29
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Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
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AT A GLANCE

Truly uncompromised in performance and impressively user-friendly – that's the R&S®RTE oscilloscope.

With bandwidths from 200 MHz to 2 GHz and top performance parameters, the R&S®RTE oscilloscopes set standards in their class:

- Highest sampling rate of 5 Gsample/s and deepest memory of 200 Msample for accurate acquisition of long signal sequences
- Acquisition rate of more than one million waveforms/s for finding signal faults quickly
- Extremely low-noise frontends and 16-bit vertical resolution in high definition mode for precise results
- Highly accurate digital trigger system with virtually no jitter for triggering on smallest signal details in realtime

Tools such as QuickMeas, fast mask tests, powerful spectrum analysis, history function and 77 automatic measurement functions are supplied as standard. Results are available fast thanks to hardware-assisted implementation of the measurement tools in the ASIC. The results are based on a large number of waveforms to pro-vide statistically conclusive information.

R&S®RTE oscilloscopes support dedicated application solutions for complex analyses, including trigger and decoding options for serial protocols and a power analysis option. The mixed signal option provides 16 digital channels for analyzing logical components in embedded designs.

The powerful R&S®RTE is impressively easy to use thanks to its high-resolution 10.4" XGA touchscreen.

R&S®RTE oscilloscopes offer a fully integrated multi-domain test solution with time, frequency, protocol and logic analysis functions. This one-box solution makes it possible to quickly detect errors even in complex designs.

From embedded design development to power electronics analysis to general debugging, the R&S®RTE oscilloscopes handle everyday T&M challenges quickly, accurately and easily.

BENEFITS

More confidence in measurement results
▶ page 4

More fun to use
▶ page 6

More functions and faster results
▶ page 10

Engineered for multi-domain challenges
▶ page 13

Powerful probes
▶ page 29

Extensive range of accessories
▶ page 32

Models

Base unit	Bandwidth	Channels		Sampling rate	Acquisition memory	Vertical resolution	Acquisition rate	Mixed signal analysis (MSO)
		analog	digital					
R&S®RTE1022	200 MHz	2	16	5 Gsample/s	50 Msample per channel, max. 200 Msample	up to 16 bit	1 million waveforms/s	400 MHz, 5 Gsample/s, 100 Msample, > 200 000 waveforms/s
R&S®RTE1024	200 MHz	4						
R&S®RTE1032	350 MHz	2						
R&S®RTE1034	350 MHz	4						
R&S®RTE1052	500 MHz	2						
R&S®RTE1054	500 MHz	4						
R&S®RTE1102	1 GHz	2						
R&S®RTE1104	1 GHz	4						
R&S®RTE1152	1.5 GHz	2						
R&S®RTE1154	1.5 GHz	4						
R&S®RTE1202	2 GHz	2						
R&S®RTE1204	2 GHz	4						

MORE CONFIDENCE IN MEASUREMENT RESULTS

- **One million waveforms/s**
- **Very low inherent noise of 100 µV at 1 mV/div and 1 GHz**
- **Full measurement bandwidth up to 2 GHz, even at 500 µV/div**
- **Up to 16-bit vertical resolution**
- **Memory up to 200 Msample**
- **Minimal trigger jitter < 1 ps**
- **Trigger hysteresis can be adjusted to signal quality**

Precise measurements due to very low inherent noise

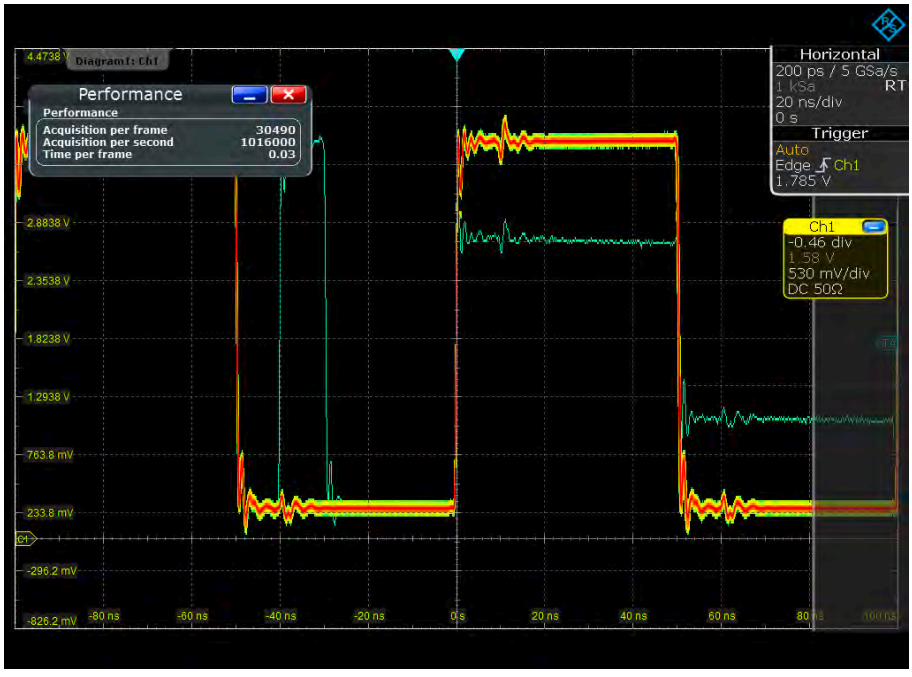
The R&S®RTE was developed with the objective of minimizing noise, from matched BNC-compatible inputs with 18 GHz bandwidth to high-precision A/D converters and extremely low-noise frontends. At 1 GHz bandwidth and 1 mV/div input sensitivity, the R&S®RTE oscilloscopes have a very low RMS noise of 100 µV, allowing precise measurements even at the smallest vertical resolutions.

Single-core A/D converter and up to 16-bit vertical resolution

developed a monolithic A/D converter for the R&S®RTE oscilloscopes. The chip's single-core archi-tecture minimizes signal distortion and achieves more than seven effective bits over the entire frequency range. With the low-noise frontend, this is the foundation for the oscilloscopes' extraordinarily high measurement accuracy and dynamic range. Increasing the vertical resolution to up to 16 bit with the high definition mode (HD mode) makes even the smallest signal details visible.

Full measurement bandwidth, even at 500 µV/div

Thanks to very low-noise frontends, the R&S®RTE oscilloscopes offer an input sensitivity down to 500 µV/div. This is unmatched on the market. Other oscilloscopes attain 1 mV/div sensitivity only by employing software-based zooming or by limiting the bandwidth. R&S®RTE oscilloscopes, however, show a signal's real sampling points over the full measurement bandwidth, even at 500 µV/div sensitivity. This high measurement accuracy is particularly beneficial when measuring small signal amplitudes.



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

High time resolution combined with 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 50 Msample is available per channel. This ensures high time resolution and excellent signal fidelity, even for long acquisition sequences, e.g. when analyzing transients of switched-mode power supplies.

Finding rare signal faults quickly thanks to one million waveforms/s

The acquisition cycle of a 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. Fast detection of rare signal faults requires an oscilloscope with short blind time and a high acquisition rate. The core of R&S®RTE oscilloscopes 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.

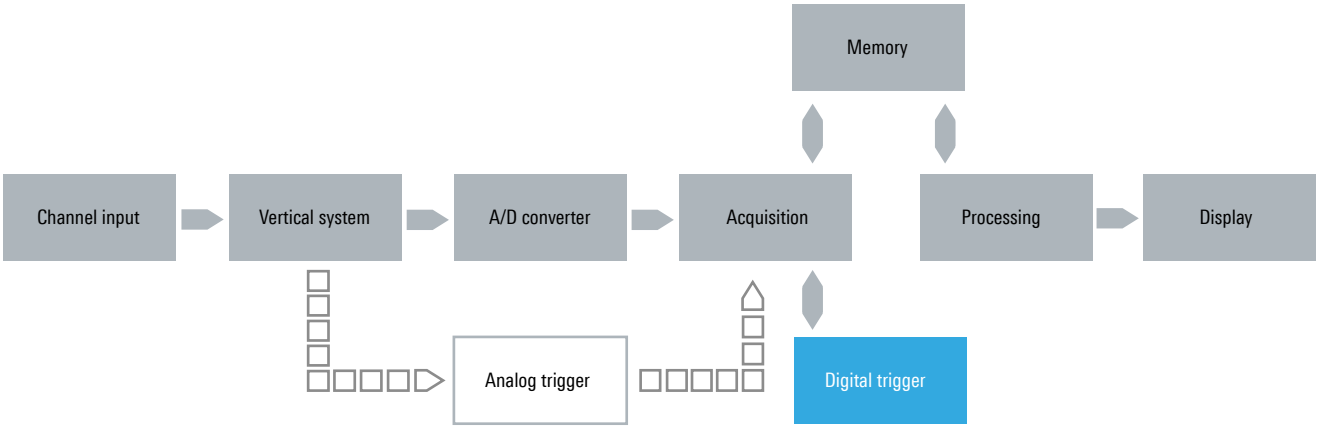
Accurate triggering with a digital trigger system

The unique digital trigger system is also used in the R&S®RTE oscilloscopes. It consists of 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. This is why oscilloscopes have extremely low trigger jitter, very high trigger sensitivity and high measurement accuracy.

Precise fault detection with diverse trigger modes

R&S®RTE oscilloscopes have 14 different trigger modes for precisely isolating relevant signal events. In addition to simple trigger conditions such as edge, pulse width and runt, it also supports complex conditions such as logical combination of channels, a bit pattern trigger and a video trigger (NTSC, PAL, PAL-M, SECAM, EDTV, HDTV). A wide range of serial protocol trigger options are also available.

Comparison of digital and analog triggering architecture



MORE FUN TO USE

- **High-resolution 10.4" XGA touchscreen**
- **Optimized for touchscreen operation**
- **Drag & drop signals and measurement results flexibly on the screen**
- **Results are only two clicks away thanks to powerful toolbar**
- **Convenient tools such as QuickMeas, fingertip zoom and undo/redo**

High-resolution touchscreen

The high-resolution 10.4" XGA touchscreen is one of the highlights of the R&S®RTE. The oscilloscope is optimized for touchscreen operation:

- Drag & drop signals and measurement results where you want on the screen
- Define zoom and measurement ranges with your finger
- Scale and position dialog boxes on the screen as required
- Activate and configure measurements, histograms and FFT analyses by touch
- Adjust cursors, offsets and the trigger level by touching the lines
- Create masks in only seconds

R&S®RTE toolbar			
	undo	Ref 1	update reference waveform
	redo		label
	help	Preset	default settings
	instrument setups	Auto	autoset
	activate/deactivate signalbar		find trigger level
	selection tool	Single	run single measurement
	zoom	Run Cont	run/stop
	cursor		save waveform
	mask test		clear screen
	histogram		capture screenshot
	automatic measurements		save settings
	QuickMeas		recycle bin
FFT	FFT		search

Fully customizable display

When working with multiple signals, the screen becomes easily cluttered. R&S®RTE oscilloscopes are different. They display waveforms, buses 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 need to be displayed simultaneously, the SmartGrid function helps the user to keep the screen well organized by flexibly dividing it into several diagrams or tabs. Individual waveforms can be displayed in a clear, well-structured manner. The A/D converter range is opti-mally used for highest accuracy.

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 the recycle bin. The toolbar can be customized to contain the user's favorite tools. Related tools are clearly organized in groups. There are just two steps involved in using a function: selecting the tool and applying it to the waveform.

Semi-transparent dialog boxes with signal flow diagrams

Signal flow diagrams in the dialog boxes visualize the signal processing, making it easier to configure measurements. Crosslinks take you directly to logically related settings. Forward/back buttons help to navigate quickly between dialog boxes. Semi-transparent dialog boxes are an elegant way of keeping everything in view. The measurement diagrams always maintain their original size. The level of transparency can be set via the intensity button. Users can scale the dialog boxes and position them anywhere on the screen.

Signal details at your fingertip

Zoom is a standard oscilloscope tool for analyzing the details of a captured signal. R&S®RTE oscilloscopes also offer other useful features:

- Easy definition of zoom ranges with a finger
- Hardware zoom: automatic adjustment of settings for vertical and horizontal scaling to display a selected range
- Fingertip zoom: open a horizontal zoom range in the signal (view signal characteristics by using a finger or the mouse to drag the zoom window along the signal; click the keep function to open the normal zoom)

Fast access to instrument setups

Oscilloscopes allow users to save instrument settings and recall them at any time. R&S®RTE oscilloscopes make it very easy to select the right setup: just click the instrument setup icon on the toolbar to open a dialog box with all of the saved configurations. Each configuration has a screenshot that shows the screen at the time at which it was saved. The user can take advantage of these screenshots to quickly scroll through the possible choices.

Remote control access

R&S®RTE oscilloscopes can also be remote controlled using a PC or other device via remote desktop or VNC. The user sees the same user interface and uses the same functions as on the oscilloscope itself.

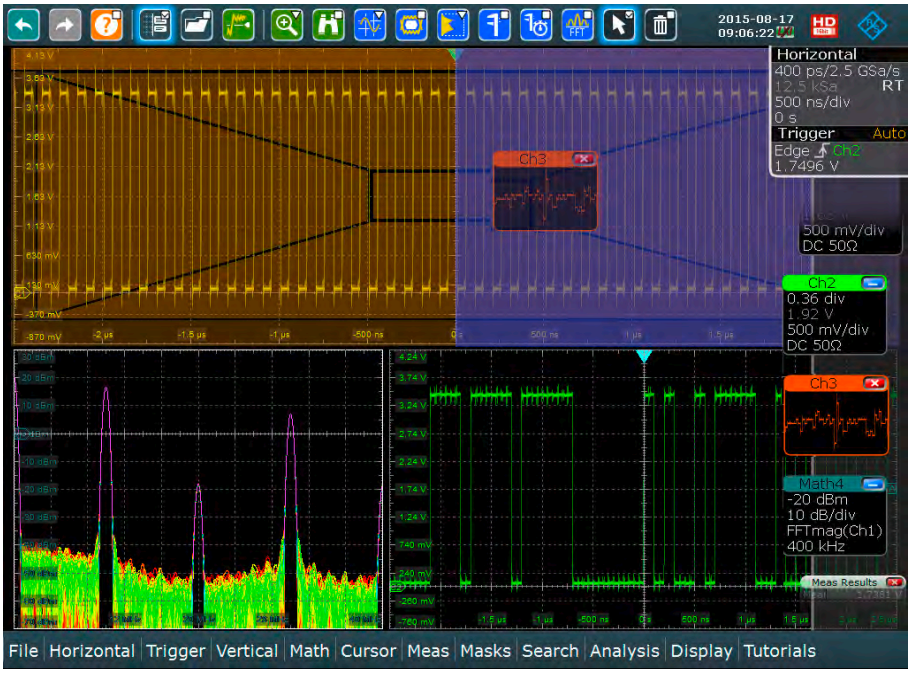
Documentation at the push of a button

R&S®RTE oscilloscopes help you document measurements:

- Print or save screenshots of the waveforms and results
- Easily read signal characteristics thanks to clear grid annotations
- Mark and label anomalies directly in the diagram
- Save waveforms, histograms and measurement results in different formats (e.g. binary or csv file) for in-depth data analysis using PC software

Selection of languages

The R&S®RTE oscilloscopes' user interface supports multiple languages. The language can be changed in just a few seconds – while the instrument is running. The R&S®RTE is a true international instrument.



The user can drag & drop waveforms and result windows on the screen. The SmartGrid function helps users arrange multiple diagrams or tabs on the screen. The size of individual diagrams can be further opti-mized by dragging the edges of the windows.

OVERVIEW OF THE R&S®RTE OSCILLOSCO

Control elements

Tools that have a similar function are grouped together

Toolbar for fast access to frequently used functions

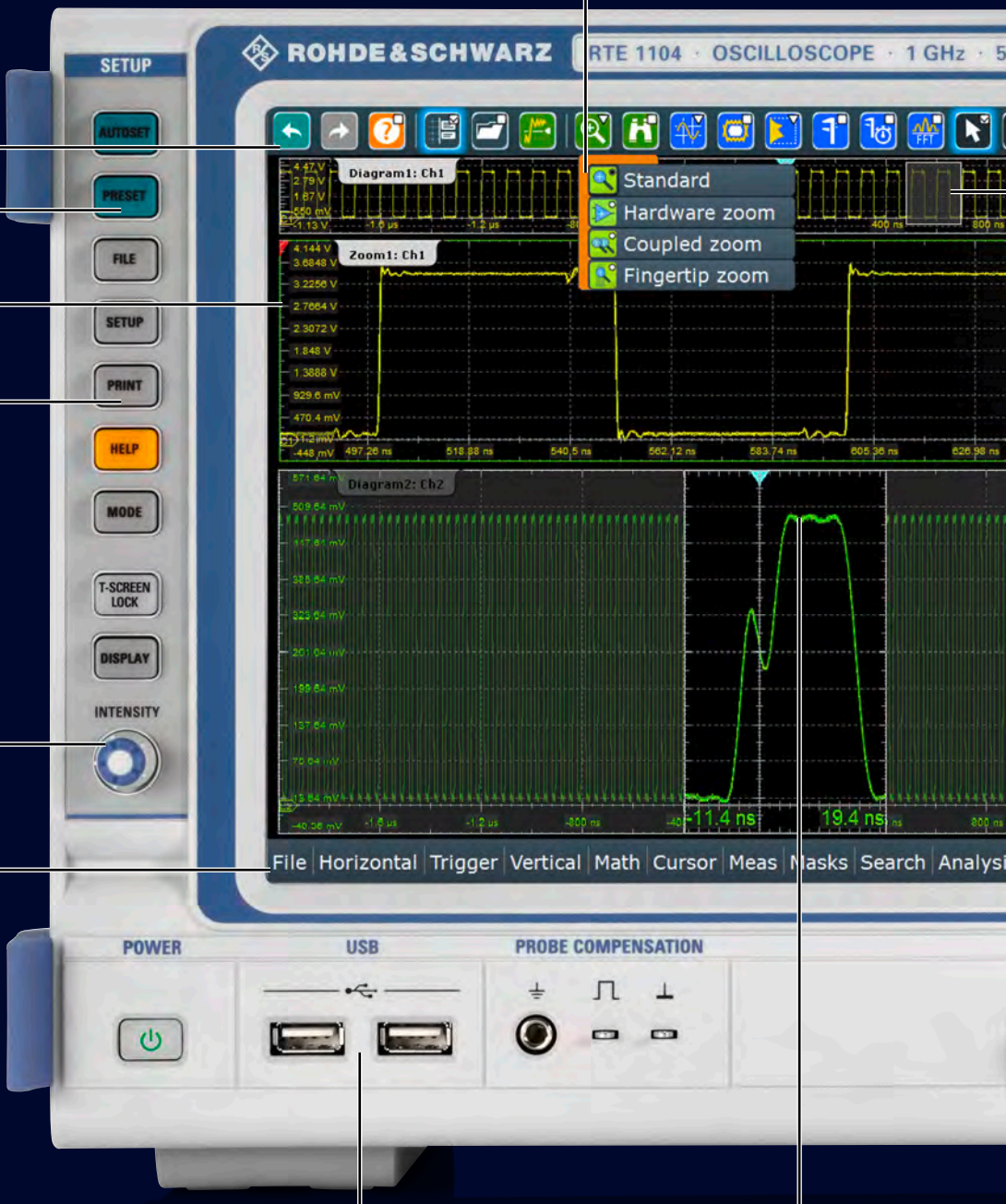
Preset to return to default or user-defined settings

Clear grid annotation for easy reading of measured values

Print or save results at the push of a button

Knob for setting the level of transparency of the dialog boxes or the intensity of the waveforms

Menu bar on the bottom edge of the screen – even visible during touch operation



USB interfaces for mouse, keyboard, data exchange, documentation or firmware updates

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

PE

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 to easily restore previous settings

Color-coded controls indicate the currently selected channel

Tutorials to learn how to operate the oscilloscope

Probe interface for automatic probe detection

MORE FUNCTIONS AND FASTER RESULTS

- **Even in its basic configuration, the R&S®RTE offers a decisive edge when performing everyday measurement tasks:**
- **77 automatic measurement functions including statistical evaluation**
- **QuickMeas for eight results at the push of a button**
- **History function for looking back in time**
- **Powerful FFT-based spectrum analysis**
- **Mask test for identifying signal anomalies**

High measurement speed: even for complex analysis functions

Many of the measurement functions in the R&S®RTE are hardware-implemented:

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

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

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

Automatic measurements: 77 functions available

A key feature of oscilloscopes is automatic measurements. They make it possible to rapidly characterize a signal of interest. 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. Automatic measurements are divided into four different categories: amplitude and time measurements, histogram measurements, eye diagram measurements and spectral measurements. A total of 77 measurement functions are available. The results are presented in a table, with optional statistical evaluation. The gating function can be used to limit the measurements to a specific signal range if required. 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.

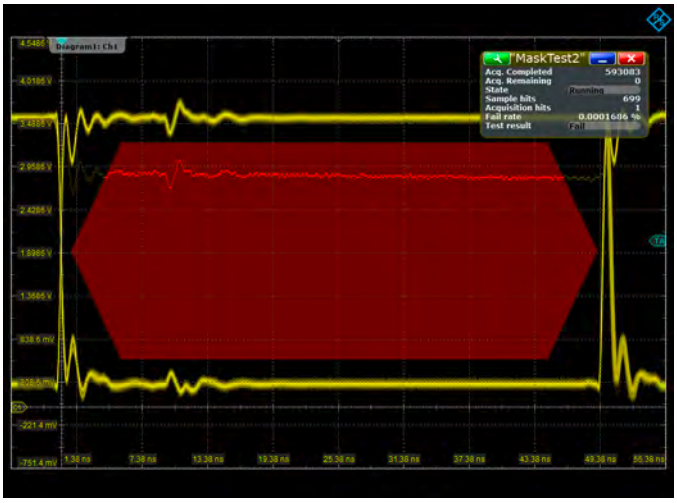
QuickMeas: key measurement results at the push of a button

The QuickMeas function offered by the R&S®RTE oscilloscopes is unique in this class. The results of multiple measurement functions for the currently active signal are simultaneously displayed. 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.

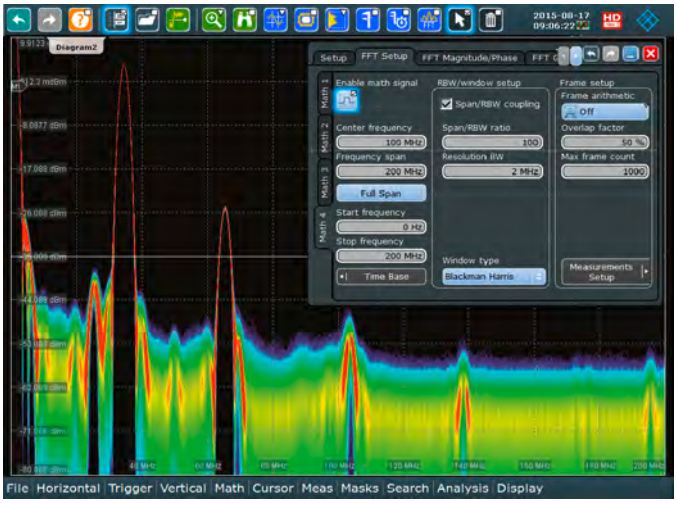
History function: looking back in time

The R&S®RTE history function provides access to previously acquired waveforms – for analog or digital channels, reference or math signals and serial buses. Users can immediately analyze the measurement data stored in memory. They can scroll through the individual acquisitions with the history player or use the persistence mode to display them superimposed. One timestamp per waveform clearly identifies when events took place. Various analysis tools such as automatic measurements, FFT, mask tests and a search function are available for analyzing past acquisitions.

The history function can also be used in ultra-segmented mode. The oscilloscope captures 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 even shorter blind time (< 300 ns) between the individual acquisitions.



R&S®RTE masks consist of up to eight 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.

Mask test: settings in only seconds

Mask tests quickly reveal if a signal lies within defined tolerance limits. This makes it easy to identify signal anomalies and unexpected results. 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 eight segments. To get started quickly, the mask segments can be generated on the screen using the mouse or a finger. The positions of the mask points can be optimized later in the mask test dialog box.

FFT function: the easy way to analyze the signal spectrum

The FFT in the R&S®RTE is very fast. It conveys the impression of a live spectrum. Using the persistence mode, rapid signal changes, signal interferers and weak superimposed signals can easily be made visible. The low-noise frontend and the A/D converter's high effective number of bits (> 7) provide an outstanding dynamic range. The ability to overlap FFT frames enables the R&S®RTE to detect intermittent signals such as pulsed interferers.

Operate the frequency analysis function of the R&S®RTE like a spectrum analyzer. Simply enter the typical parameters: center frequency, span and resolution bandwidth. Select the window type, FFT overlap, gating and logarithmic or linear Y-axis scaling based on the application requirements.

Search and navigation: focus on details

The search and navigation function helps users to maintain an overview when dealing with long acquisition times. Available search criteria include simple signal characteristics (such as edge or pulse width), complex bit sequences and protocol content. Users can search on analog or digital channels, on reference or math waveforms and on serial buses. All events are summarized in a table for easy navigation between different events. Events can be zoomed for detailed analysis.

Math functions: calculations made easy

R&S®RTE oscilloscopes provide four math waveforms that make it easy to solve particularly challenging measurement problems. For example, with just a few keystrokes users can square the voltage waveform and divide it by the resistance in order to display power over time. In addition to basic math functions, advanced functions such as derivatives, logic operations and filters are available. Math waveforms as well as measurement results can be used as arguments for other math functions.

Reference waveforms: fast comparisons

When analyzing faults, it is useful to compare the waveforms with a reference. R&S®RTE oscilloscopes provide four reference waveforms for this purpose. The waveforms are easy to generate using a dedicated key. They can be scaled as well as stored and reloaded internally or externally.

Identifying errors within a serial protocol with the R&S®RTE search function. All events are summarized in a table for easy navigation between different events. Selected events can be zoomed for detailed analysis.

ENGINEERED FOR MULTI-DOMAIN CHALLENGES

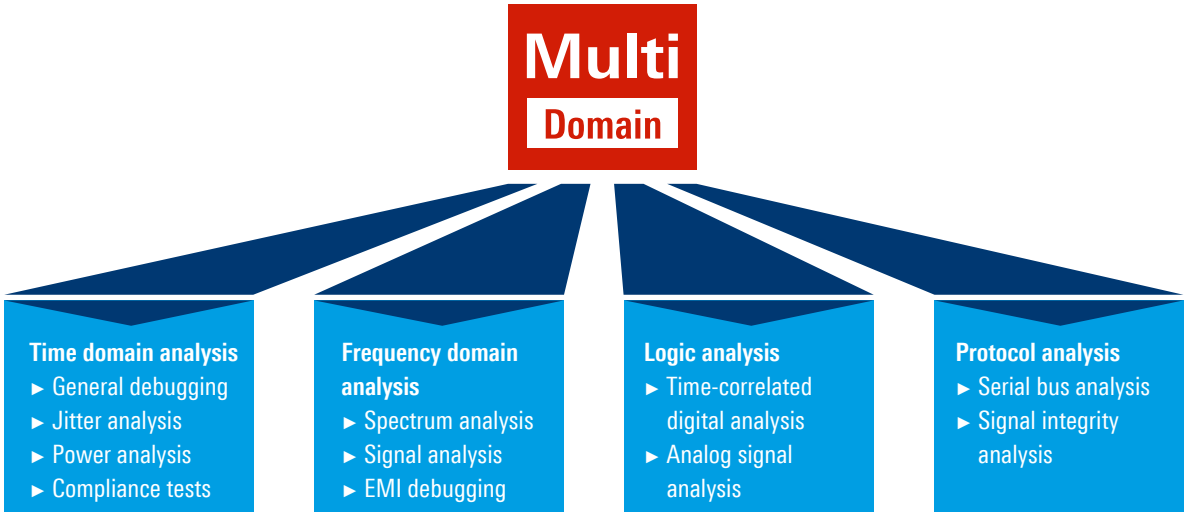
Customer need

New challenges often arise when testing modern embedded designs. Various functional units such as the voltage supply, processor, sensor technology, digital I/Os and radio interfaces are connected with each other at the IC or board level, making them susceptible to mutual interference. Debugging requires time correlation with various signals such as current, voltage, data telegrams, reference clock, sensor and wireless data. Until now, dedicated measuring instruments were used for measurements in the time domain and for spectrum, logic and protocol analysis.

solution

R&S®RTE oscilloscopes offer a fully integrated multi-domain test solution with time, frequency, protocol and logic analysis functions. Users appreciate the standardized user interface with consistent, simple operation of all functions and the fact that all analysis functions are time correlated. The following example clearly demonstrates the benefits. Sporadic failures of embedded design functions are often caused by interference from the internal voltage supply. R&S®RTE oscilloscopes can analyze the quality of the voltage supply in the time and frequency domain, depending on processor and interface activity. This one-box solution makes it possible to quickly detect errors even in complex designs.

R&S®RTE oscilloscopes offer a complete multi-domain test solution



Multi
Domain

LOGIC ANALYSIS: FAST AND PRECISE TESTING OF EMBEDDED DESIGNS

- **Every R&S®RTE can be turned into a mixed signal oscilloscope**
- **16 digital channels**
- **400 MHz, 5 Gsample/s sampling rate and 100 Msample memory**
- **More than 200 000 waveforms/s**
- **Wide range of trigger capabilities with 200 ps resolution**
- **Many analysis tools such as history function and bus display as analog waveform**

More signal details thanks to high time resolution over 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 over the entire memory depth of 100 Msample per channel. As a result, the MSO option is capable of detecting critical events such as narrow or widely separated glitches.

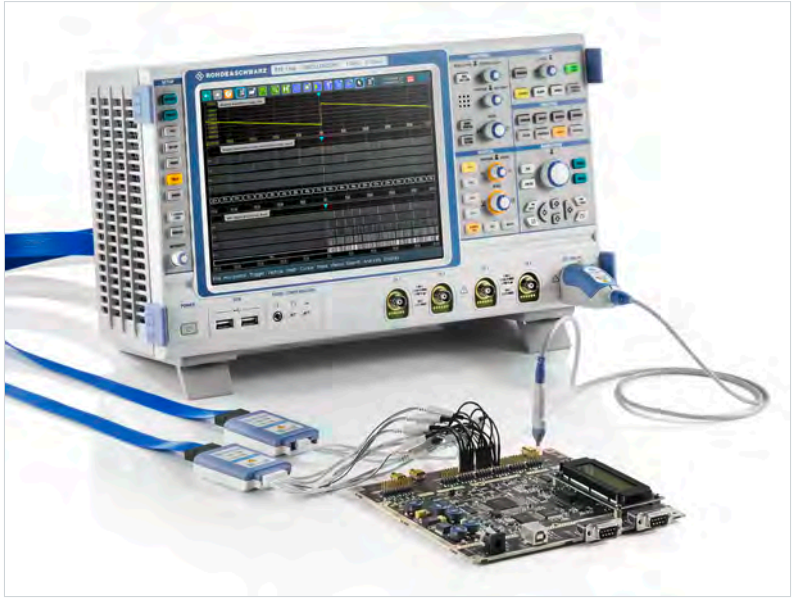
High acquisition and analysis rate for fast fault finding

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 enables 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 simultaneous decoding of up to 4 parallel buses. Each bus is represented by an icon on the edge of the screen. The icons can be dragged and dropped onto the screen. The SmartGrid function is then used to place the corresponding signals in a suitable diagram. To provide a quick overview of the bus activity, the icon 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 the bus is clocked or unclocked. 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 a table.



Upgrade to mixed signal oscilloscope using R&S®RTE-B1. The logic button provides direct access to the digital channels.

Processing and analysis functions

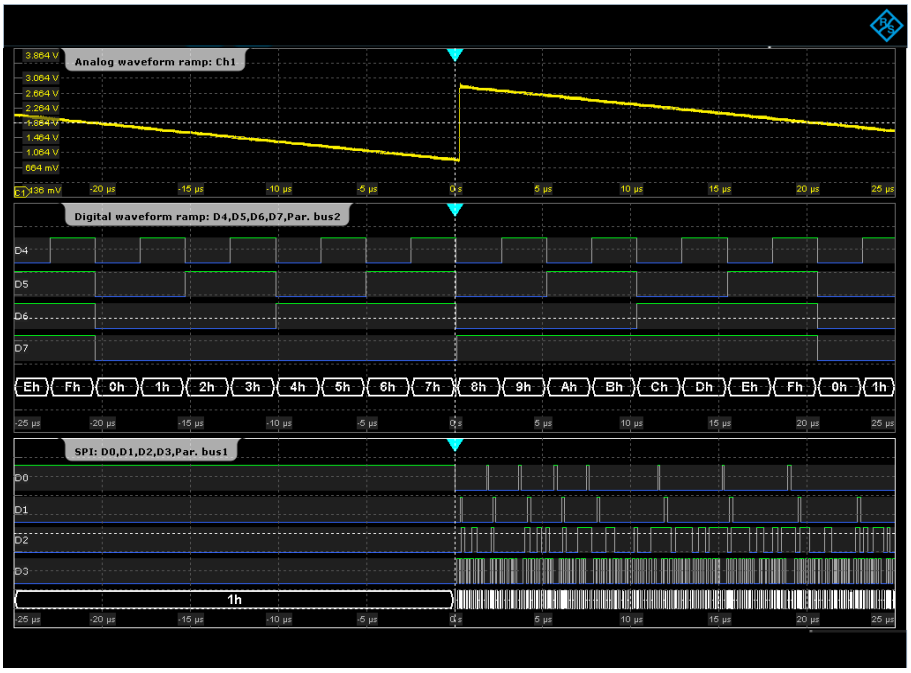
For efficient analysis of measurement waveforms, the MSO option offers a wide selection of automatic time measurements, including statistical evaluation. Automatic measurements can be performed on all digital channels and their logical combinations.

In addition to time measurements, the cursor also shows the decoded bus value at the cursor position. The history function enables users to access and analyze specific measurement waveforms in the acquisition memory.

Analysis of serial protocols with digital channels

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

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, and an 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

Multi Domain

SERIAL PROTOCOLS: EASY TRIGGERING AND DECODING

- **Easy configuration with the app cockpit**
- **Hardware-assisted triggering and decoding**
- **Color-coded telegram data display in honeycomb diagram or in a table**
- **Support of standard CAN-dbc and FIBEX formats**
- **Triggering and decoding of Manchester and NRZ coded serial protocols**
- **Simultaneous decoding of up to four serial buses**
- **Comprehensive search functions for easy analysis of long signal sequences**

Easy configuration with the app cockpit

R&S®RTE oscilloscopes offer a variety of tools for serial interface analysis. The configuration for any given protocol is accomplished in just a few steps with the app cockpit. Navigation between the individual dialog boxes is smooth thanks to crosslinks. The Find Reference Levels function makes it particularly easy to define the decision level for the logical signals.

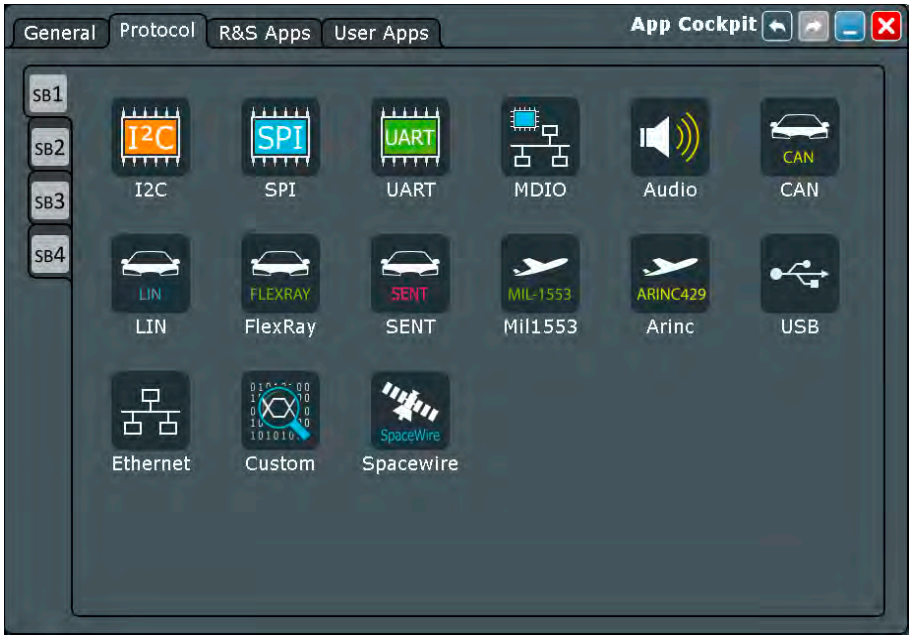
Tools for analyzing serial buses

The software options for analyzing serial interfaces allow users to configure the buses according to the actual protocol topology. Protocol-specific definition of the trigger conditions is 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.

Clear presentation of protocol data

When displaying decoded data, the individual protocol areas within the logical signals are color-coded. Address and data content can be displayed in hex, bin or ASCII format. Label lists can be loaded to simplify the interpretation process. They represent IDs and addresses in the data stream with symbolic aliases such as “Engine Speed” instead of a numerical format. The decoded data is provided in a table as well as in the usual honeycomb diagram.

R&S®RTE oscilloscopes support simultaneous decoding of up to four serial buses. Each bus is represented by an icon on the edge of the screen. The icons can be dragged and dropped onto the screen. The SmartGrid function is then used to place the corresponding signals in a suitable diagram.



Easy configuration with the app cockpit.

Bus analysis

Specific bus measurements are available for in-depth analysis of the decoded data. Quickly determine the stability of your bus by measuring the frame error rate including consecutive frame errors. For analysis of bus timing you can measure the delay between frames or between any trigger event and the bus frame. Running this on Automotive Ethernet, as in this example, you measure the error rates as well as frame timing simultaneously, both very important in development of control applications, e.g. for autonomous driving.

Options for triggering and decoding

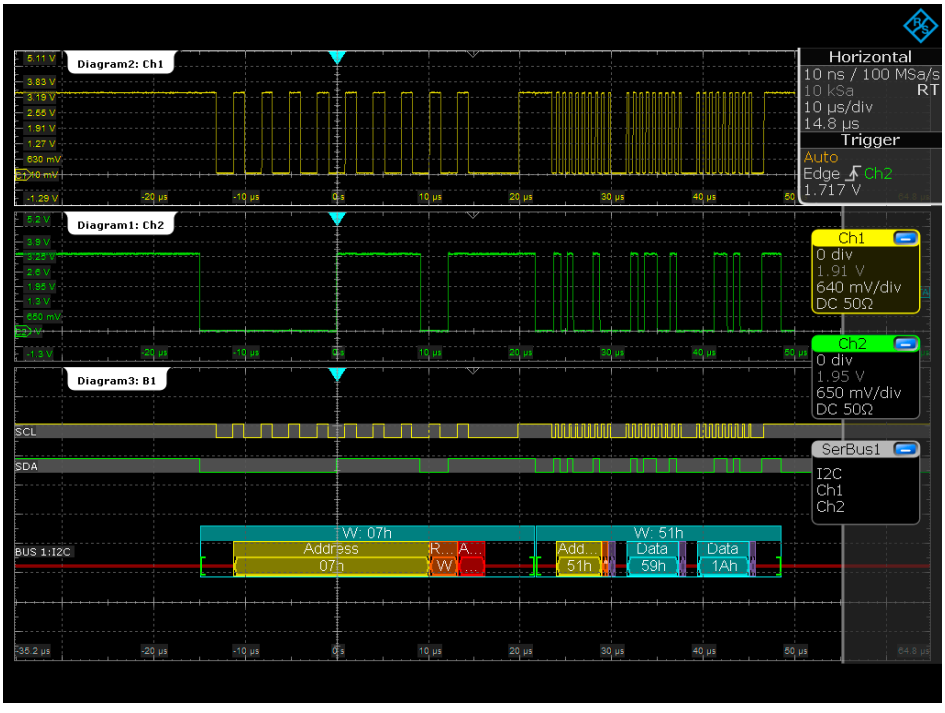
Application	Serial standard	Option
Embedded	I²C/SPI	R&S®RTE-K1
	UART/RS-232/422/485	R&S®RTE-K2
	Ethernet	R&S®RTE-K8
	MDIO	R&S®RTE-K55
	USB 2.0/HSIC	R&S®RTE-K60
	USB-PD	R&S®RTE-K63
Automotive, industrial	CAN/LIN	R&S®RTE-K3
Automotive	CAN-FD	R&S®RTE-K9
	CXPI	R&S®RTE-K76
	SENT	R&S®RTE-K10
	FlexRay™	R&S®RTE-K4
	100BASE-T1/BroadR-Reach®	R&S®RTE-K57
Audio	I²S/LJ/RJ/TDM	R&S®RTE-K5
Aerospace	MIL-STD-1553	R&S®RTE-K6
	ARINC 429	R&S®RTE-K7
	SpaceWire	R&S®RTE-K65
Configurable	Manchester, NRZ	R&S®RTE-K50

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 prereq-uisite for detecting such faults quickly. oscilloscopes are ideal for these tasks because they decode protocol-specific trigger results, allowing fast and reliable debugging.

Intuitive search and navigation

Comprehensive search functions simplify analysis of long signal sequences. Specific message types, content and errors can be quickly isolated. All detected events are shown in a table with timestamps. The user can then examine the individual events in a zoom window with the proper timing correlation and navigate between the events.



The individual areas of the decoded protocol frame are color-coded to provide a clear overview.

HD 16 bit Multi Domain

POWER ANALYSIS

- **Analysis of input and output as well as the transfer function of switched-mode power supplies**
- **Measurement wizard for fast results**
- **Documentation of results at the push of a button**
- **Harmonic current analysis in line with conventional EN, MIL and RTCA standards**

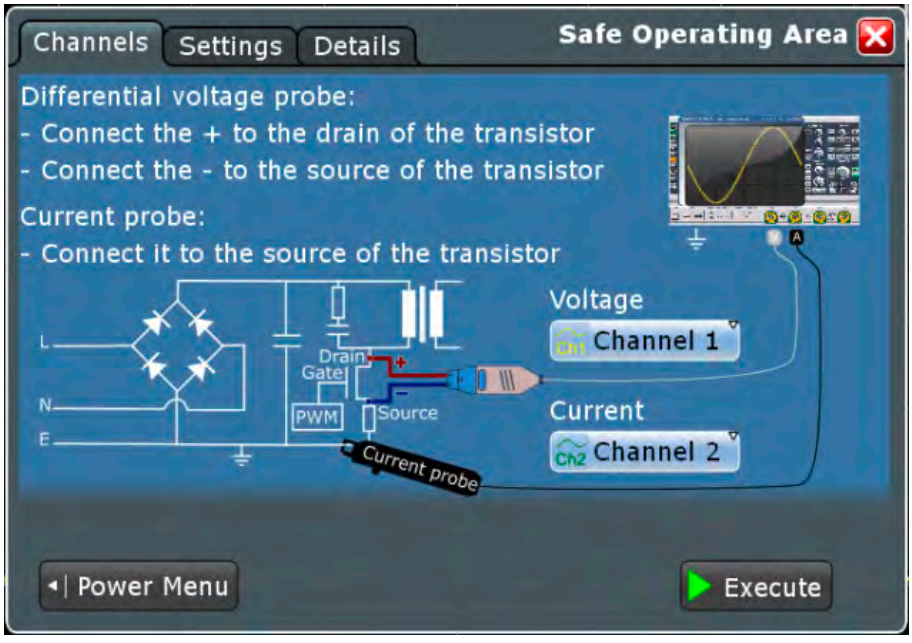
Special measurement functions and measurement wizard for fast results

Analysis tools support verification and debugging during the development of current and voltage supply circuits. The R&S®RTE-K31 power analysis option facilitates analysis of the turn on/turn off behavior, the internal transfer function of the overall circuit, the safe operating area (SOA), the output signal quality and switching losses.

After a measurement function is selected, a measurement wizard guides the user through the test setup. Detailed illustrations simplify the correct contacting of voltage and current probes. The oscilloscope then configures itself automatically based on the selected measurement function and delivers quick results. The configuration can be modified or the oscilloscope can be fully manually configured in order to document specific signal details.

Measurement functions

Measurement	Measurement functions	
Input	current harmonics	EN 61000-3-2 class A, B, C, D
		MIL-STD-1399
		RTCA DO-160
	inrush current	
	power quality	
	power consumption	
Power converter control	modulation analysis	
	slew rate	
	dynamic on-resistance	
Power path	safe operating area (SOA mask editor)	
	turn on/turn off	
	switching loss	
	power efficiency	
Output	output ripple	
	transient response	
	output spectrum	



Measurement wizard for fast and easy testing.

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: EN 61000-3-2 classes A, B, C, D, MIL-STD-1399 and RTCA DO-160.

Simple and clear documentation of measurement results

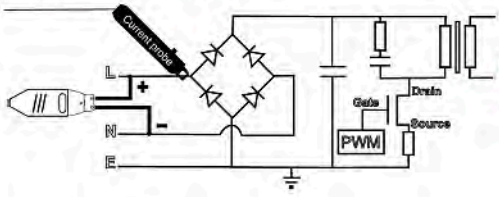
Each result can be added to the test report simply by pressing a button. The test report documents the setup and configuration. Users can flexibly define the level of detail for the report and customize the layout, for example, by adding a company logo. The available output formats are PDF and RTF.

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 deskew fixture for power measurements can be used to time-synchronize the measurement signals from the current and voltage probes. The R&S®RTE-K31 automatically deskews the current probe and voltage probe signals at the push of a button.

Harmonics

Measurement setup:



Settings:

Standard:	EN61000-3-2 Class D
Frequency:	50Hz
Autoscale signal:	Yes

Vertical setup:

	Source	Name	Unit	Gain/Att.
Probes:	Voltage Channel 1	None	Volt	10V/V
	Current Channel 3	RT-ZC20	Ampere	10A/V

	Source	Scale	Offset	Coupling	Deskew	Bandwidth
Channels:	Voltage Channel 1	82V/div	0V	1MOhm DC	0s	Full
	Current Channel 3	130mA/div	0A	1MOhm DC	-8.8ns	Full

Trigger setup:

Type	Source	Level	Slope
Edge	Channel 3	-1300mV	Positive

Horizontal setup:

Time scale	Record length	Resolution	Reference	ADC rate	Acq. time	Sample rate
400ms/div	5MSa	800ns	50%	10GHz	4s	1.25MSa/s

Measured signals:

Results:

Harmonic order n	Frequency	Harmonic current	Maximum permissible harmonic current	
2	100.3Hz	603µA	166.85mA	Pass
3	150.4Hz	112.97#nA	88.83mA	Fail
4	200.5Hz	1393µA	166.85mA	Pass
5	250.6Hz	62.36mA	49.64mA	Fail
6	300.8Hz	1025µA	166.85mA	Pass
7	350.90Hz	9200µA	26.13mA	Pass
8	401Hz	932µA	166.85mA	Pass

Extensive result documentation.

Multi
Domain

SPECTRUM ANALYSIS

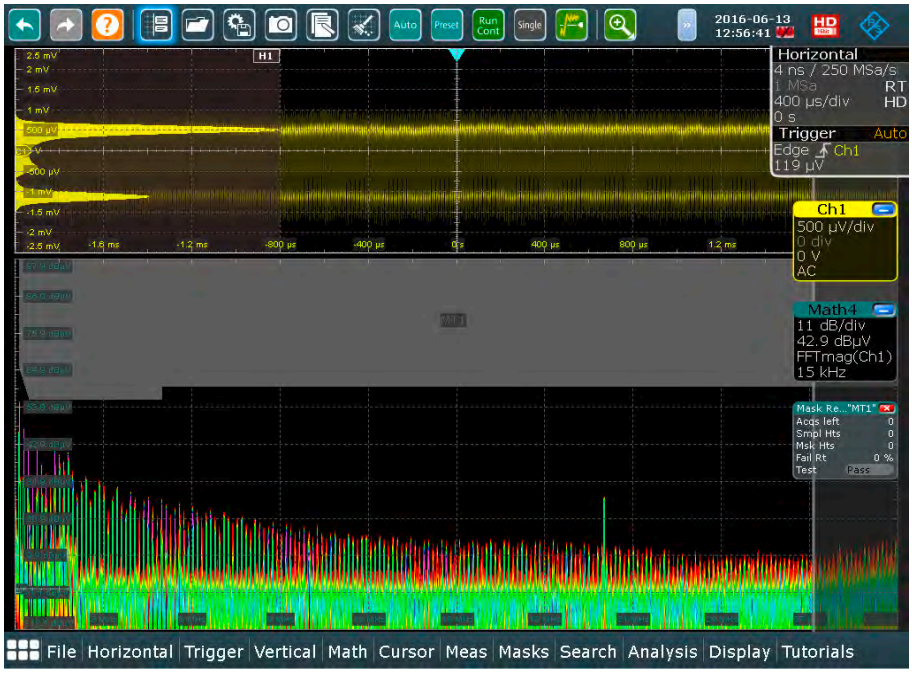
- **Multichannel spectrum analysis**
- **Display of change in power and frequency over time**
- **Frequency analysis with logarithmic display**
- **Fast results with automatic peak list measurement**
- **Outstanding RF performance due to high dynamic range and low inherent noise of the analog frontend**
- **Correlation of time and frequency analysis with numerous analysis functions**

Multichannel spectrum analysis

Frequency analysis is easy with the R&S®RTE oscilloscopes. Simply set the center frequency, span and resolution bandwidth – just like on a spectrum analyzer. Thanks to many years of experience in RF development, the R&S®RTE oscilloscopes offer an excellent dynamic range. The FFT-based spectrum analyzer is ultrafast, making it ideal for capturing sporadic disturbance signals. For debugging, R&S®RTE oscilloscopes simultaneously display the spectrum and the associated signal path and correlate events. The spectrogram mode, different detectors (such as max. hold) and mask tests offer further analysis capabilities.

Display of change in power and frequency over time

The R&S®RTE-K18 spectrum analysis option enables users to analyze time-varying signals in the frequency domain. A spectrogram is a color-coded frequency timing diagram in which the frequency domain is plotted over time. How the signal varies over time is described by the intensity and color of each point in the two-dimensional diagram. R&S®RTE oscilloscopes enable quick analysis of voice and AM/FM modulated signals.



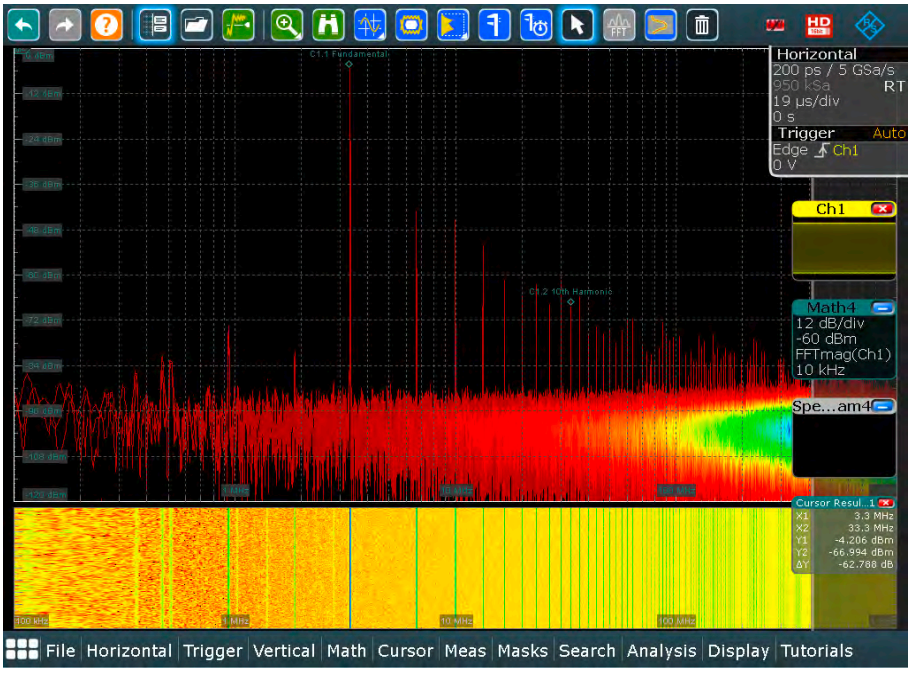
Mask test in the frequency domain.

Frequency analysis with logarithmic display

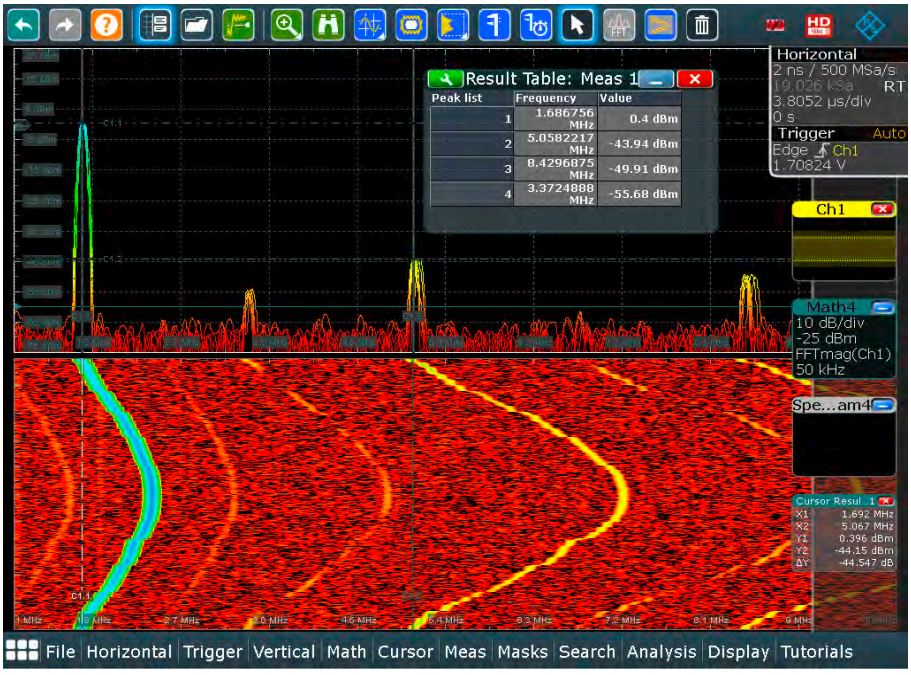
For many measurements, logarithmic scaling of the frequency axis is helpful to better display values of several orders of magnitude. The R&S®RTE-K18 spectrum analysis option supports this function for the spectrum and spectrogram.

Fast results with automatic peak list measurement

The peak list measurement function enables automatic measurement of frequency peaks. The frequency peak list is displayed in a table. The power and frequency of the highest peaks can be marked in the spectrum.



Logarithmic display of the frequency axis with the spectrum analysis option for wideband analysis (up to 2 GHz) of a 3.33 MHz disturbance signal.



Spectrum display of a time varying signal in the frequency domain. Frequency peaks are automatically detected and their variance over time is displayed in a color-coded spectrogram.

Multi
Domain

EMI DEBUGGING: TESTING DURING DEVELOPMENT

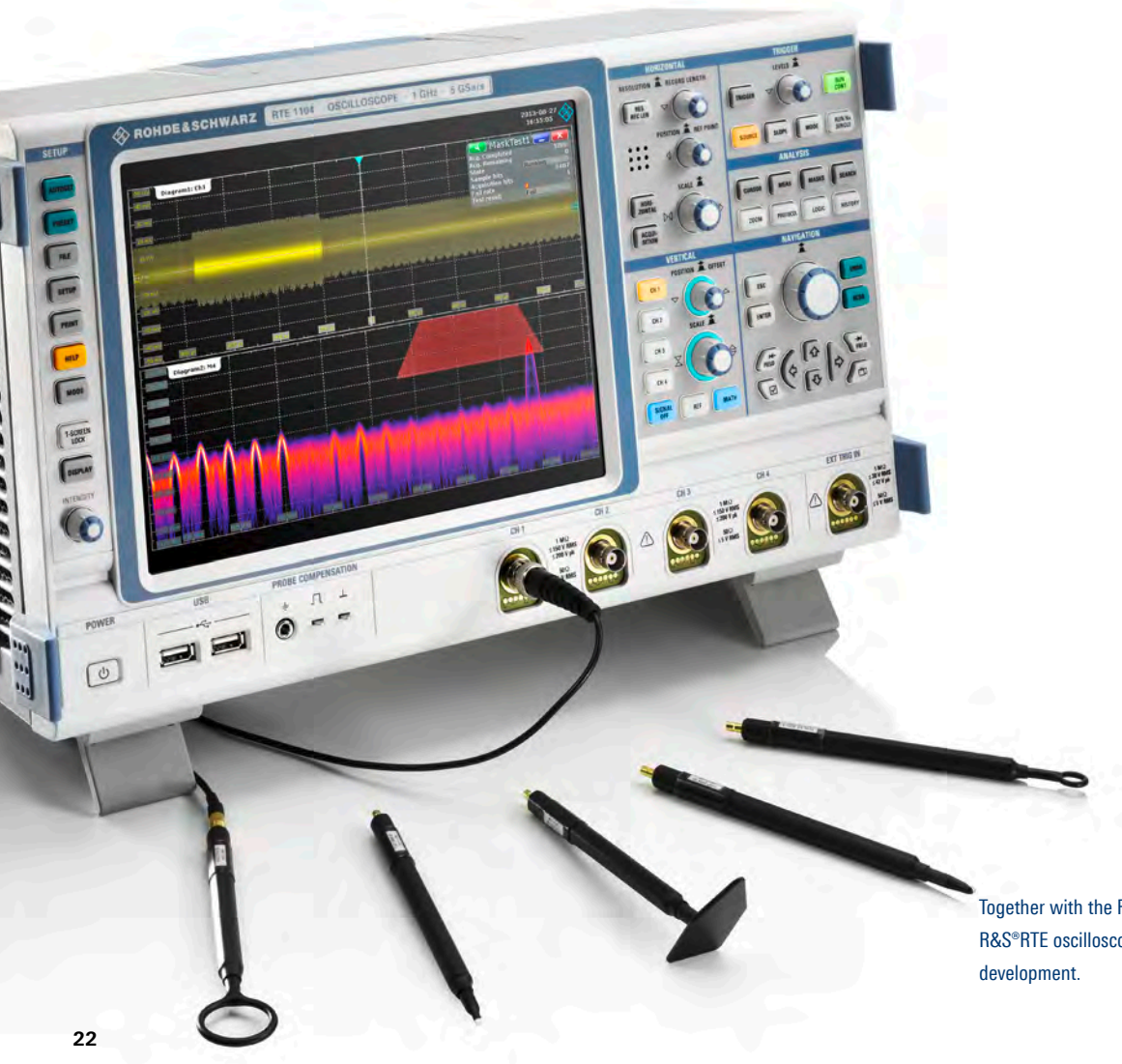
- **High input sensitivity and dynamic range for reliable detection of unwanted emissions**
- **Powerful FFT function with information on the frequency of occurrence of spectral components**
- **Gated FFT for easy correlation between frequency and time**
- **Mask test in the frequency range for targeted analysis of sporadic emissions**

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.

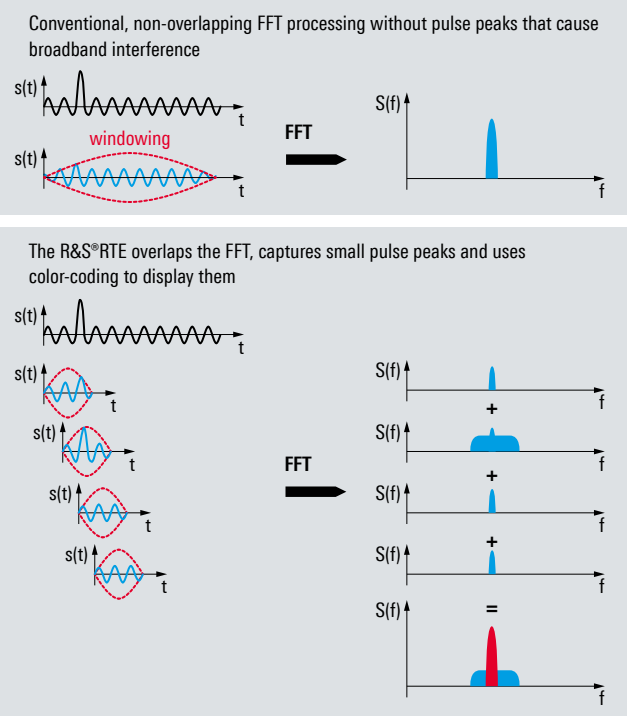
High dynamic range and sensitivity

The R&S®RTE oscilloscope is a powerful tool for EMI debugging. Its high dynamic range and input sensitivity of 500 µV/div at full measurement bandwidth make it possible to detect even weak emissions. The powerful FFT implementation is ideal 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.



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

Overlap FFT processing



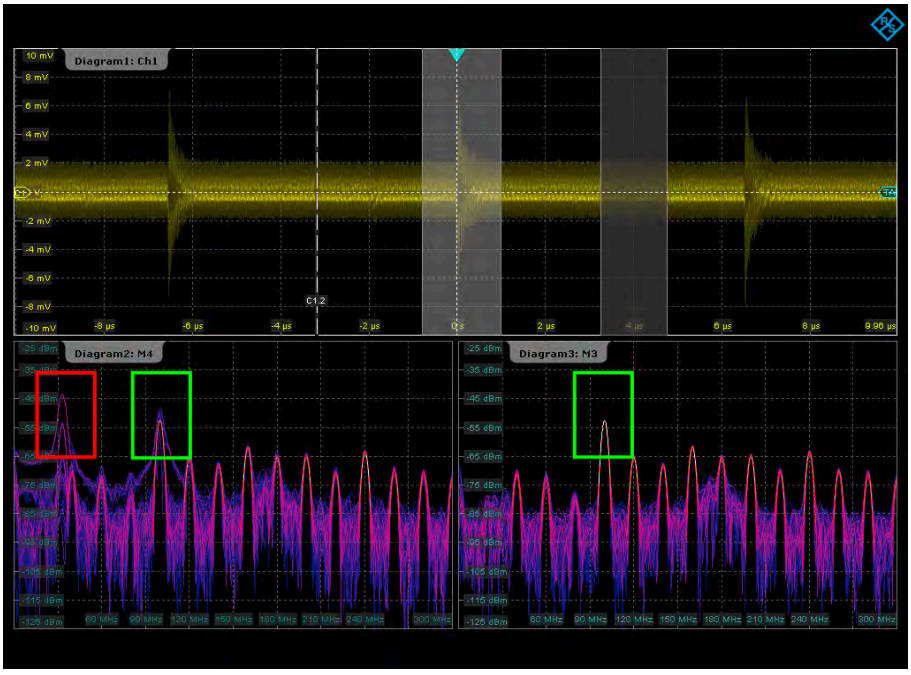
Visualizing sporadic emissions

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 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.

Multi
Domain

INTEGRATED ARBITRARY WAVEFORM GENERATOR

- **Every R&S®RTE can be enhanced to include a 100 MHz arbitrary waveform generator**
- **Single-ended and differential interface stimulation**
- **Test your device with native signals**

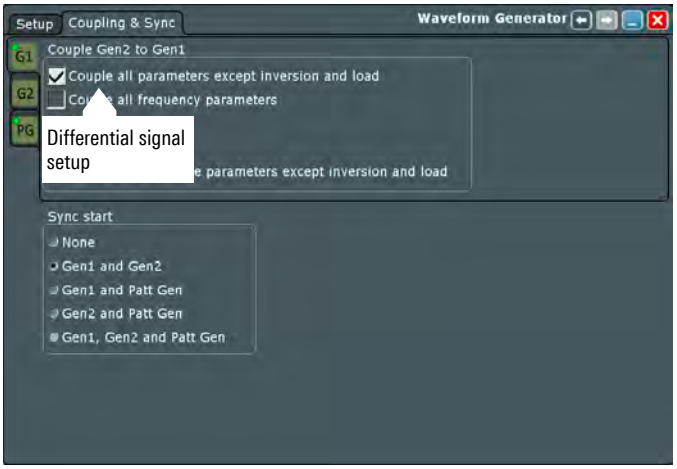
Every R&S®RTE can be enhanced to include a 100 MHz arbitrary waveform generator

The R&S®RTE oscilloscopes are the first in this class to offer a fully integrated two-channel 100 MHz function generator, arbitrary waveform generator and eight-channel pattern generator. With 500 Msample/s and 14-bit resolution, the generator is suitable for education as well as design and R&D. The integrated generator saves space on the test bench and provides both standard and arbitrary stimulus to the DUT. The generator can be operated as a pattern, function or modulation generator. It also supports sweep mode and the playback of arbitrary waveform files.

R&S®RTE-B6 specifications in brief	
Analog output	2 channels
Bandwidth	100 MHz
Sampling rate	500 Msample/s
Operating modes	► Function generator (sine, square, ramp, DC, pulse, cardinal sine, cardiac, Gauss, Lorentz, exponential rise/fall) ► Modulation generator (AM, FM, FSK) ► Sweep generator ► Arbitrary waveform generator
Pattern generator	8 channels
Memory	40 Msample per channel
Resolution	14 bit

Single-ended and differential interface stimulation

For testing differential devices, the generators can be coupled and offset from each other. With the offset capability of amplitude and phase in coupled mode, you can simulate both ideal and non-ideal conditions. Differential devices, such as differential amplifiers or I/Q mixers, can be tested against amplitude impairments and phase imbalances.



Test your device with native signals

Testing your device with real-world signals opens up a new method to test the margins of your design. The R&S®RTE-B6 arbitrary waveform generator lets you play back waveforms that are captured on the oscilloscope. The captured waveforms can be manipulated by changing the amplitude and offset level or be superimposed with noise to evaluate a device against design criteria.

HD 16 bit

HIGH DEFINITION: SEE MORE WITH 16-bit VERTICAL RESOLUTION

- **16-bit vertical resolution**
- **Sharper waveforms for more signal details and even more precise analysis results**
- **Realtime triggering on smallest signal details**
- **No aliasing**

Increased resolution for precise measurement of small signal amplitudes

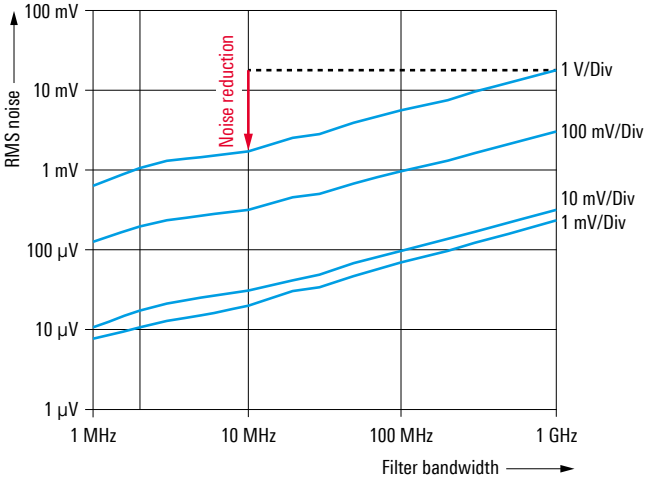
The high definition mode increases the vertical resolution up to 16 bit. This is required to analyze signal details on a signal with high amplitude variations. One example is the characterization of switched-mode power supplies. Here you need to measure the smallest of signal elements on a several hundred volt signal. A resolution higher than 8 bit is a must for precise measurements in such situations.

Resolution as a function of the filter bandwidth

Filter	Resolution
Inactive	8 bit
500 MHz	10 bit
300 MHz	11 bit
200 MHz	12 bit
100 MHz	13 bit
50 MHz	14 bit
30 MHz to 10 kHz	16 bit

Noise reduction

Noise of the R&S®RTE110x oscilloscope (1 GHz model) as a function of the set filter bandwidth in high definition mode. Reducing the noise increases the signal-to-noise ratio, which improves resolution.



16-bit vertical resolution available

The high definition mode increases the vertical resolution of the R&S®RTE oscilloscopes to up to 16 bit – a 256-fold improvement over 8-bit resolution. To achieve this higher resolution, the signal is lowpass filtered after the A/D converter. The filter reduces the noise, thereby increasing the signal-to-noise ratio. Users can adjust the bandwidth of the lowpass filter from 10 kHz to 500 MHz to match the characteristics of the applied signal. The lower the filter bandwidth, the higher the resolution.

The increase in resolution leads to sharper waveforms, showing signal details that would otherwise be masked by noise.

No aliasing

The high definition mode offers crucial advantages over high resolution decimation (also supported by the R&S®RTE oscilloscopes). First, the user knows exactly what signal bandwidth is available due to explicit lowpass filtering. Second, there are no unexpected aliasing effects. Since the high definition mode is not based on decimation, the increase in resolution is not accompanied by a reduction in the sampling rate. When the high definition mode is switched on, the full sampling rate can be used, ensuring the best possible time resolution. Moreover, the high definition mode permits users to trigger on the signals with increased resolution, whereas high resolution decimation only takes place after the trigger unit.

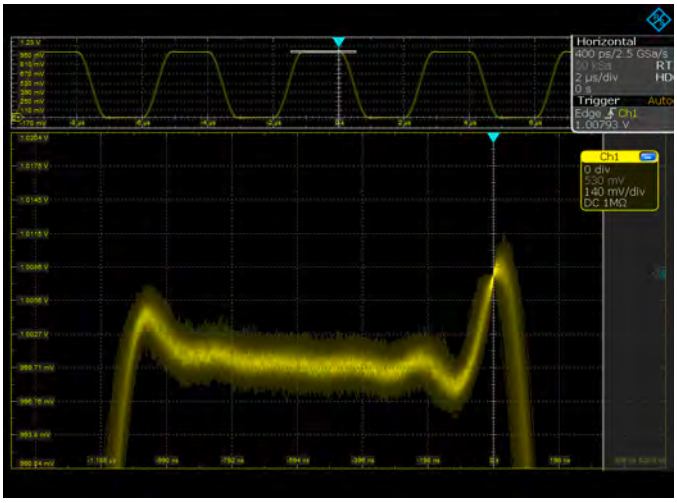
Realtime triggering on smallest signal details

The increased resolution in high definition mode makes it possible to reveal even the smallest signal details. The next step in the debugging process is to trigger on these details for in-depth analysis. Whether this is possible depends greatly on the capabilities of the trigger system. Is it sensitive enough to benefit from the high-resolution signal? The unique digital trigger system offers the required sensitivity. Each of the up to 16-bit samples is checked against the trigger condition and can initiate a trigger. This means that R&S®RTE oscilloscopes are able to trigger on even the smallest signal amplitudes and isolate relevant signal events.

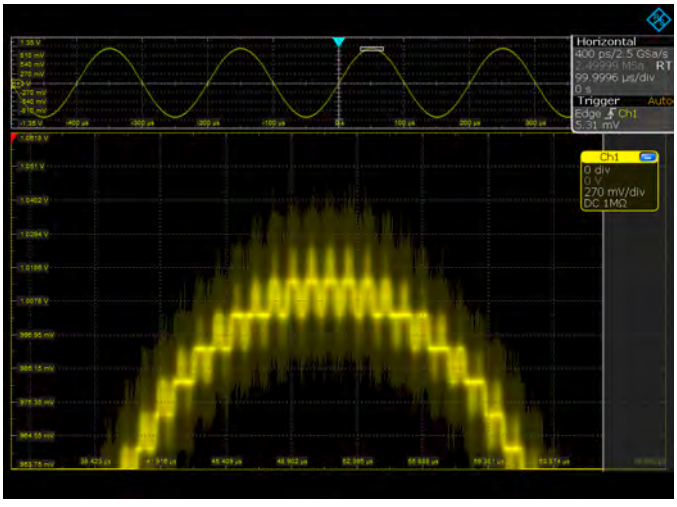
High acquisition rate and full functionality for fast measurement results

Switching on the high definition mode does not compromise measurement speed or functions. Since the lowpass filtering, which improves resolution and noise suppression, is implemented in realtime in the oscilloscope's ASIC, the acquisition and processing rates remain high. The oscilloscope enables smooth operation and measurement results are available quickly.

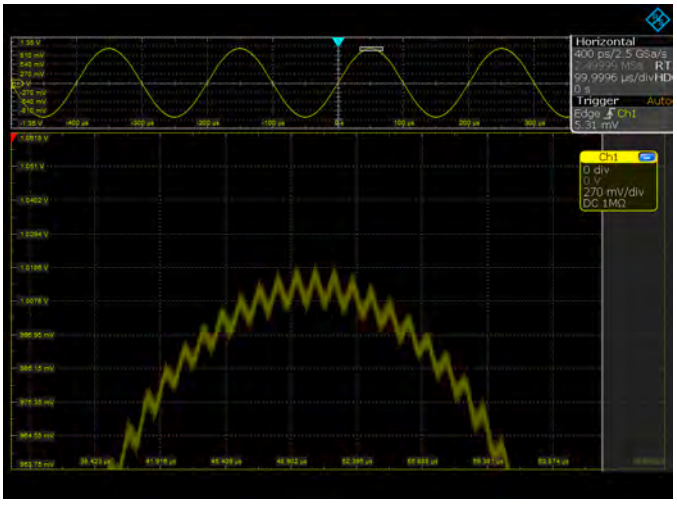
All analysis tools, such as automatic measurements, FFT and the history mode, can also be used in high definition mode.



The high sensitivity of the digital trigger makes it possible to trig-ger on signal overshoots of less than 9 mV, as can be seen in the example below. At a vertical scale of 140 mV/div, this corresponds to only a fraction of one display division.



Zoomed-in peak of a sine wave: the high definition mode is not activated. Only the quantization levels can be seen in the zoom window.



When the high definition mode is switched on, the zoom window shows that another very low-amplitude sine wave is superimposed on the signal.

EXTENSIBLE FOR FUTURE APPLICATIONS

- **On-site configuration of hardware options**
- **Software applications can be upgraded on demand**
- **Always remains up-to-date thanks to firmware updates**

On-site installation of hardware options

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

- Simple and fast setup
- Instrument immediately ready for continued use
- No need for alignment or recalibration after installation of options

Software applications on demand

The base unit features all functions of a state-of-the-art oscilloscope for general applications. For special requirements, the base unit can be extended with software options at any time:

- Triggering and decoding of serial protocols
- Power analysis on switched-mode power supplies
- Multichannel spectrum analysis with spectrogram and peak list display

Always up-to-date

 continually offers regular updates to add new functions to the R&S®RTE oscilloscopes. The oscil-loscope's firmware can be updated using a USB storage device or the LAN port.

SSD replacement without any tools

The R&S®RTE solid-state disk can be exchanged without any tools. Confidential data remains protected.

Higher bandwidth: upgrade including calibration

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 2 GHz. The upgrade option includes a complete check of the instrument and calibration at a ser-vice center.

The R&S®RTE SSD can be removed without any tools.

POWERFUL PROBES

- **Comprehensive probe portfolio for all measurement tasks**
- **High signal fidelity thanks to excellent specifications**
- **R&S®ProbeMeter with 0.01 % measurement accuracy**
- **Active probes with micro button for instrument control**

The 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.

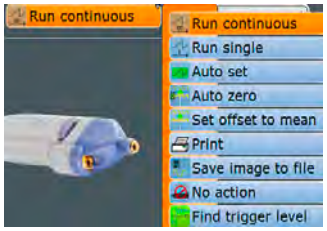
Active probes are used whenever the load on the device under test must be low, or when the measurement signal contains high-frequency components that must not be distorted. Even signals in the kilohertz range can contain high-frequency components of well over 100 MHz on their edges. offers an entire family of high-quality single-ended and differential active probes. The table on page 31 shows the specifications of the probes that work best with the R&S®RTE.

High signal fidelity thanks 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 µV/°C for single-ended probes).

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 active probes. The micro button is situated on the probe tip, and different functions such as run/stop, autoset or adjust off-set can be assigned to this button.



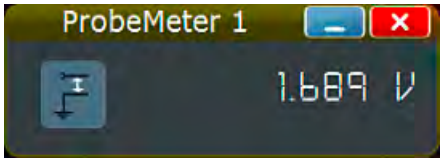
Menu for configuring the micro button.

Practical design: micro button for convenient control of the instrument. Diverse probe tips and ground cables are included as standard accessories.

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. The R&S®ProbeMeter offers a much higher DC measurement accuracy than a traditional oscilloscope channel. The following advantages simplify everyday measurement tasks:

- Fast verification of supply voltages and signal levels without changing the oscilloscope 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, independent of the instrument settings and in parallel with the measurement channel.

► For more information, see the Probes and accessories for oscilloscopes (PD 3606.8866.12).

Selection of probes

R&S®RT-ZC20B current probe (100 MHz, 30 A (RMS))

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

active probes (1.0 GHz to 6.0 GHz)

R&S®RT-ZS10/20/30

R&S®RT-ZD10/20/30

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)	
Active broadband probes						
Single-ended						
R&S®RT-ZS10E	1.0 GHz	10:1	1 MΩ	0.8 pF	±8 V	
R&S®RT-ZS10	1.0 GHz	10:1	1 MΩ	0.8 pF	±8 V	1)
R&S®RT-ZS20	1.5 GHz	10:1	1 MΩ	0.8 pF	±8 V	1)
R&S®RT-ZS30	3.0 GHz	10:1	1 MΩ	0.8 pF	±8 V	1)
Differential						
R&S®RT-ZD10	1.0 GHz	10:1/100:1	1 MΩ	0.6 pF/1.3 pF	±5 V/70 V DC, 46 V AC (peak)	1)
R&S®RT-ZD20	1.5 GHz	10:1	1 MΩ	0.6 pF	±5 V	1)
R&S®RT-ZD30	3.0 GHz	10:1	1 MΩ	0.6 pF	±5 V	1)
Power rail probe						
R&S®RT-ZPR20	2 GHz	1:1	50 kΩ	2 nF	±0.85 V (±60 V offset compensation), optional AC coupling	1)
High-voltage probes						
Single-ended						
R&S®RT-ZH10	400 MHz	100:1	50 MΩ	7.5 pF	1 kV (RMS)	
R&S®RT-ZH11	400 MHz	1000:1	50 MΩ	7.5 pF	1 kV (RMS)	
Differential						
R&S®RT-ZD01	100 MHz	100:1/1000:1	8 MΩ	3.5 pF	±140 V/±1400 V	

1) R&S®ProbeMeter and micro button for instrument control

Probe	Bandwidth	Max. current (RMS/peak)	Rise time	Sensitivity error	Max. input voltage	Extras
Current probes						
R&S®RT-ZC05B	2 MHz	500 A/±700 A	175 ns	±1% up to 500 A (RMS)	600 V (CAT II), 300 V (CAT III)	2)
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)	3)
R&S®RT-ZC10B	10 MHz	150 A/±300 A	35 ns	±1% up to 150 A (RMS)	600 V (CAT II), 300 V (CAT III)	2)
R&S®RT-ZC20	100 MHz	30 A/±50 A	3.5 ns	±1% up to 30 A (RMS)	300 V (CAT 0)	3)
R&S®RT-ZC20B	100 MHz	30 A/±50 A	3.5 ns	±1% up to 30 A (RMS)	300 V (CAT 0)	2)
EMC near-field probe						
R&S®HZ-15	30 MHz to 3 GHz	–	–	–	–	5)

2) probe interface for probe detection and power supply.
3) External power supply required, e.g. R&S®RT-ZA13.
4) Passive and active E and H near-field probe for EMI debugging.
5) E and H near-field probe for EMI debugging, 20 dB gain with R&S®HZ-16.

EXTENSIVE RANGE OF ACCESSORIES

Safe transport and easy rackmounting

Thanks to an extensive selection of storage and transportation accessories, the R&S®RTE is always fully protected and easy to transport. The rackmount kit allows easy installation of the oscilloscope in integrated environments. Active, passive and logic probes can be stored in a special pouch on the rear panel of the R&S®RTE for easy accessibility.

Accessories	
Front cover, for R&S®RTO/RTE oscilloscopes	R&S®RTO-Z1
Soft case, for R&S®RTO/RTE oscilloscopes and accessories	R&S®RTO-Z3
Transit case, with trolley function, for R&S®RTO/RTE oscilloscopes and accessories	R&S®RTO-Z4
Probe pouch, for R&S®RTO/RTE oscilloscopes	R&S®RTO-Z5
19" rackmount kit, for R&S®RTO/RTE oscilloscopes with 6 HU	R&S®ZZA-RTO

SPECIFICATIONS IN BRIEF

Specifications in brief		
Vertical system		
Number of channels	R&S®RTE1022/1032/1052/1102/1152/1202	2
	R&S®RTE1024/1034/1054/1104/1154/1204	4
Analog bandwidth (–3 dB) at 50 Ω	R&S®RTE1022/1024; R&S®RTE1032/1034; R&S®RTE1052/1054; R&S®RTE1102/1104; R&S®RTE1152/1154; R&S®RTE1202/1204	≥ 200 MHz; ≥ 350 MHz; ≥ 500 MHz; ≥ 1 GHz; ≥ 1.5 GHz; ≥ 2 GHz
Rise time	R&S®RTE1022/1024; R&S®RTE1032/1034; R&S®RTE1052/1054; R&S®RTE1102/1104; R&S®RTE1152/1154; R&S®RTE1202/1204	< 1.75 ns; < 1 ns; < 700 ps; < 350 ps; < 233 ps; < 175 ps
Impedance		50 Ω ± 1.5 %, 1 MΩ ± 1 % || 16 pF ± 1 pF (meas.)
Input sensitivity	max. bandwidth in all ranges	50 Ω: 500 µV/div to 1 V/div; 1 MΩ: 500 µV/div to 10 V/div
Resolution		8 bit (7-bit ENOB)
	with high definition mode	16 bit
Acquisition system		
Realtime sampling rate		max. 5 Gsample/s on each channel
Acquisition memory	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
Horizontal system		
Timebase range		50 ps/div to 5000 s/div
Timebase accuracy	after delivery/calibration	±2 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		
Automatic 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
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	8.6 kg (18.96 lb)
Screen		10.4" LC TFT color touchscreen, 1024 × 728 pixel (XGA)
Interfaces		1 Gbit/s LAN, 4 × USB 2.0, GPIB (optional), DVI for external monitor, external trigger, trigger output

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)		
Oscilloscope		
200 MHz, 5 Gsample/s, 50/100 Msample, 2 channels	R&S®RTE1022	1326.2000.22
200 MHz, 5 Gsample/s, 50/200 Msample, 4 channels	R&S®RTE1024	1326.2000.24
350 MHz, 5 Gsample/s, 50/100 Msample, 2 channels	R&S®RTE1032	1326.2000.32
350 MHz, 5 Gsample/s, 50/200 Msample, 4 channels	R&S®RTE1034	1326.2000.34
500 MHz, 5 Gsample/s, 50/100 Msample, 2 channels	R&S®RTE1052	1326.2000.52
500 MHz, 5 Gsample/s, 50/200 Msample, 4 channels	R&S®RTE1054	1326.2000.54
1 GHz, 5 Gsample/s, 50/100 Msample, 2 channels	R&S®RTE1102	1326.2000.62
1 GHz, 5 Gsample/s, 50/200 Msample, 4 channels	R&S®RTE1104	1326.2000.64
1.5 GHz, 5 Gsample/s, 50/100 Msample, 2 channels	R&S®RTE1152	1326.2000.72
1.5 GHz, 5 Gsample/s, 50/200 Msample, 4 channels	R&S®RTE1154	1326.2000.74
2 GHz, 5 Gsample/s, 50/100 Msample, 2 channels	R&S®RTE1202	1326.2000.82
2 GHz, 5 Gsample/s, 50/200 Msample, 4 channels	R&S®RTE1204	1326.2000.84
Hardware options (plug-in)		
Mixed signal, 400 MHz, 5 Gsample/s, 16 channels, 100 Msample per channel	R&S®RTE-B1	1326.3570.02
Digital extension port for R&S®RT-ZVCxx usage with R&S®RTE oscilloscope, included in R&S®RTE-B1	R&S®RTE-B1E	1333.0750.02
Arbitrary waveform generator	R&S®RTE-B6	1326.3012.02
GPIB interface	R&S®RTE-B10	1317.4978.02
Replacement SSD, incl. firmware and operating system (Windows 7)	R&S®RTE-B18	1317.7002.02
Replacement SSD, incl. firmware and operating system (Windows 10)	R&S®RTE-B18	1317.7002.03
Memory upgrade, 20 Msample per channel (standard functionality for R&S®RTE with serial numbers ≥ 300000)	R&S®RTE-B101	1326.1155.02
Memory upgrade, 50 Msample per channel (standard functionality for R&S®RTE with serial numbers ≥ 300000)	R&S®RTE-B102	1326.1161.02
Bandwidth upgrades [1)]		
Upgrade of the R&S®RTE1022/4 oscilloscope to 350 MHz bandwidth	R&S®RTE-B200	1326.1384.02
Upgrade of the R&S®RTE1022/4 oscilloscope to 500 MHz bandwidth	R&S®RTE-B201	1326.1390.02
Upgrade of the R&S®RTE1022/4 oscilloscope to 1 GHz bandwidth	R&S®RTE-B202	1326.1403.02
Upgrade of the R&S®RTE1022/4 oscilloscope to 1.5 GHz bandwidth	R&S®RTE-B203	1326.1410.02
Upgrade of the R&S®RTE1022/4 oscilloscope to 2 GHz bandwidth	R&S®RTE-B204	1326.1426.02
Upgrade of the R&S®RTE1032/4 oscilloscope to 500 MHz bandwidth	R&S®RTE-B205	1326.1432.02
Upgrade of the R&S®RTE1032/4 oscilloscope to 1 GHz bandwidth	R&S®RTE-B206	1326.1449.02
Upgrade of the R&S®RTE1032/4 oscilloscope to 1.5 GHz bandwidth	R&S®RTE-B207	1326.1455.02
Upgrade of the R&S®RTE1032/4 oscilloscope to 2 GHz bandwidth	R&S®RTE-B208	1326.1461.02
Upgrade of the R&S®RTE1052/4 oscilloscope to 1 GHz bandwidth	R&S®RTE-B209	1326.1478.02
Upgrade of the R&S®RTE1052/4 oscilloscope to 1.5 GHz bandwidth	R&S®RTE-B210	1326.1484.02
Upgrade of the R&S®RTE1052/4 oscilloscope to 2 GHz bandwidth	R&S®RTE-B211	1326.1490.02
Upgrade of the R&S®RTE1102/4 oscilloscope to 1.5 GHz bandwidth	R&S®RTE-B212	1326.1503.02
Upgrade of the R&S®RTE1102/4 oscilloscope to 2 GHz bandwidth	R&S®RTE-B213	1326.1510.02
Upgrade of the R&S®RTE1152/4 oscilloscope to 2 GHz bandwidth	R&S®RTE-B214	1326.1526.02
Software options		
I²C/SPI serial triggering and decoding	R&S®RTE-K1	1326.1178.02
UART/RS-232/RS-422/RS-485 serial triggering and decoding	R&S®RTE-K2	1326.1184.02
CAN/LIN serial triggering and decoding	R&S®RTE-K3	1326.1190.02
FlexRay™ serial triggering and decoding	R&S®RTE-K4	1326.1203.02
I²S/LJ/RJ/TDM serial triggering and decoding	R&S®RTE-K5	1326.1210.02
MIL-STD-1553 serial triggering and decoding	R&S®RTE-K6	1326.1226.02
ARINC 429 serial triggering and decoding	R&S®RTE-K7	1326.1232.02
10/100BASE-T Ethernet serial decoding	R&S®RTE-K8	1326.1332.02
CAN-FD serial triggering and decoding	R&S®RTE-K9	1326.1249.02
SENT serial triggering and decoding	R&S®RTE-K10	1326.1603.02
Bus analysis	R&S®RTE-K35	1801.2852.02
Manchester and NRZ serial triggering and decoding	R&S®RTE-K50	1326.1326.02
MDIO serial triggering and decoding	R&S®RTE-K55	1326.1255.02
IEEE 100BASE-T1 serial triggering and decoding	R&S®RTE-K57	1333.0609.02
USB 1.0/1.1/2.0/HSIC serial triggering and decoding	R&S®RTE-K60	1326.1626.02
USB-PD serial triggering and decoding	R&S®RTE-K63	1326.3158.02

Designation	Type	Order No.
SpaceWire serial triggering and decoding	R&S®RTE-K65	1326.2845.02
CXPI serial triggering and decoding	R&S®RTE-K76	1326.3193.02
Spectrum analysis	R&S®RTE-K18	1329.3006.02
Power analysis	R&S®RTE-K31	1326.1278.02
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
3.0 GHz, active, 1 MΩ || 0.8 pF, R&S®ProbeMeter, micro button	R&S®RT-ZS30	1410.4309.02
2.0 GHz, power rail probe, 1:1, 50 kΩ, ±0.85 V, ±60 V offset, R&S®ProbeMeter	R&S®RT-ZPR20	1800.5006.02
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
3.0 GHz, active, differential, 1 MΩ || 0.6 pF, R&S®ProbeMeter, micro button	R&S®RT-ZD30	1410.4609.02
10 MHz, current, AC/DC, 0.01 V/A, 150 A (RMS), BNC	R&S®RT-ZC10	1409.7750K02
100 MHz, current, AC/DC, 0.1 V/A, 30 A (RMS), BNC	R&S®RT-ZC20	1409.7766K02
120 MHz, AC/DC, 1 V/A, 5 A (RMS)	R&S®RT-ZC30	1409.7772K02
2 MHz, current, AC/DC, 0.01 V/A, 500 A (RMS), probe interface	R&S®RT-ZC05B	1409.8204.02
10 MHz, current, AC/DC, 0.01 V/A, 150 A (RMS), probe interface	R&S®RT-ZC10B	1409.8210.02
50 MHz, AC/DC, 0.1 V/A, 30 A (RMS), probe interface	R&S®RT-ZC15B	1409.8227.02
100 MHz, current, AC/DC, 0.1 V/A, 30 A (RMS), probe interface	R&S®RT-ZC20B	1409.8233.02
Multi-channel power probe, 2 × 2 voltage/current channels, for R&S®RTO2000/R&S®RTE	R&S®RT-ZVC02	1326.0259.02
Multi-channel power probe, 2 × 4 voltage/current channels, for R&S®RTO2000/R&S®RTE	R&S®RT-ZVC04	1326.0259.04
Probe accessories		
Accessory set, for R&S®RT-ZP10 passive probe (2.5 mm probe tip)	R&S®RT-ZA1	1409.7566.02
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
N-type adapter, for R&S®RT-Zxx oscilloscope probes	R&S®RT-ZA9	1417.0909.02
SMA adapter	R&S®RT-ZA10	1416.0457.02
Power supply, for R&S®RT-ZC10/20 probes	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
Power rail browser kit, included with R&S®RT-ZPR20	R&S®RT-ZA25	1800.5329.00
Pigtail cable, 15 cm, solder-in, SMA, for R&S®RT-ZPR20	R&S®RT-ZA26	1800.5258.00
Extended cable set, for R&S®RT-ZVC, PCB probing, 1 current and voltage lead, length: 32 cm	R&S®RT-ZA30	1333.1686.02
Extended cable set, for R&S®RT-ZVC, 4 mm probing, 1 current and voltage lead, length: 32 cm	R&S®RT-ZA31	1333.1692.02
Oscilloscope interface cable, for R&S®RT-ZVC (included in R&S®RT-ZVC02/-ZVC04, 1326.0259.02/.04)	R&S®RT-ZA33	1333.1770.02
Extended cable set, for R&S®RT-ZVC, 4 mm probing, 1 current and voltage lead, length: 1 m	R&S®RT-ZA34	1333.1892.02
Extended cable set, for R&S®RT-ZVC, PCB probing, 1 current and voltage lead, length: 1 m	R&S®RT-ZA35	1333.1905.02
Solder-in cable set, for R&S®RT-ZVC, 4 current and voltage solder-in cables, solder-in pins	R&S®RT-ZA36	1333.1911.02
Extended cable set, for R&S®RT-ZVC, BNC connector, 1 current and voltage lead, length: 16 cm	R&S®RT-ZA37	1337.9130.02

Designation	Type	Order No.
Accessories		
Front cover, for R&S®RTO/RTE oscilloscopes	R&S®RTO-Z1	1317.6970.02
Soft case, for R&S®RTO/RTE oscilloscopes and accessories	R&S®RTO-Z3	1304.9118.02
Transit case, with trolley function, for R&S®RTO/RTE oscilloscopes and accessories	R&S®RTO-Z4	1317.7025.02
Probe pouch, for R&S®RTO/RTE oscilloscopes	R&S®RTO-Z5	1317.7031.02
Probe deskew and calibration test fixture	R&S®RT-ZF20	1800.0004.02
Compact probe set for E and H near-field measurements, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02
3 GHz, 20 dB preamplifier, 100 V to 230 V power adapter, for R&S®HZ-15	R&S®HZ-16	1147.2720.02
19" rackmount kit, for R&S®RTO/RTE oscilloscopes with 6 HU	R&S®ZZA-RTO	1304.8286.00

[1] The bandwidth upgrade is performed at a service center, where the oscilloscope will also be calibrated.

Warranty		
Base unit		3 years
All other items [1]		1 year
Service options		
Extended warranty, one year	R&S®WE1	Please contact your local 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	

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

Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

Киргизия (996)312-96-26-47
Россия (495)268-04-70
Казахстан (772)734-952-31

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