R&S®RTM
Digital Oscilloscope
Scope of the art

3 year warranty

ROHDE & SCHWARZ

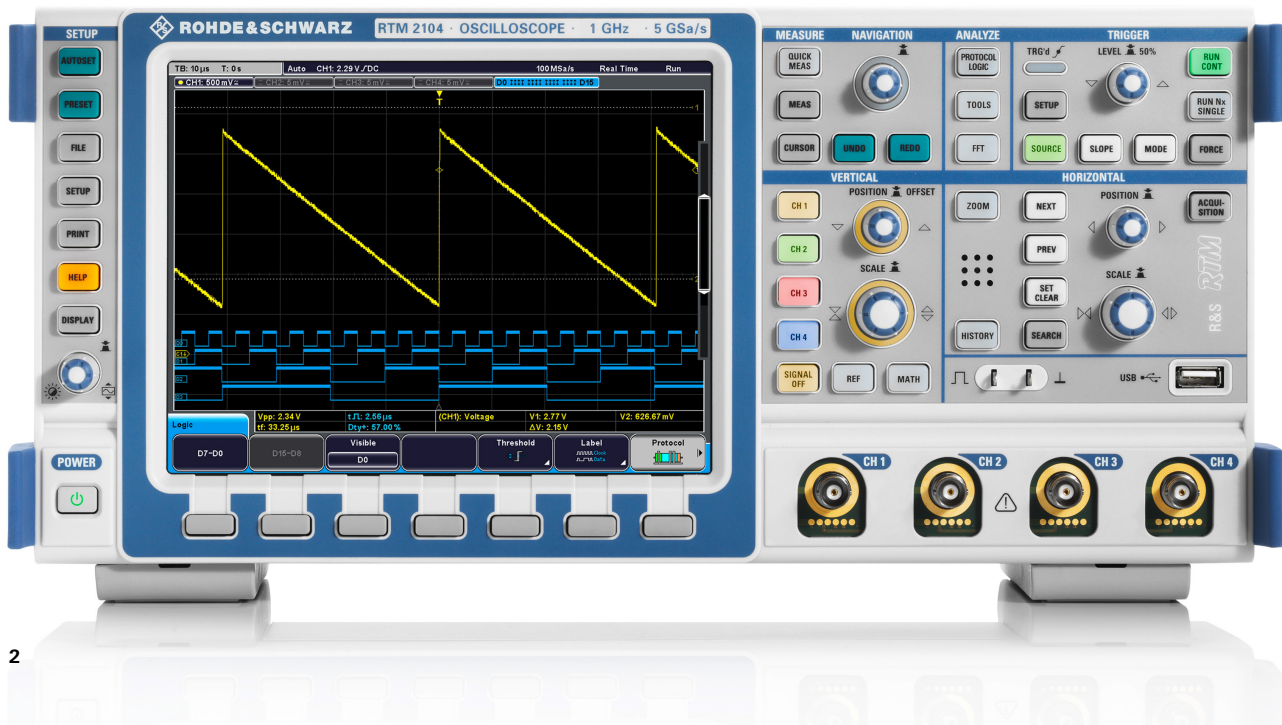# R&S®RTM
Digital Oscilloscope
At a glance

Ease of use combined with fast and reliable results is precisely what users get with the R&S®RTM bench oscilloscope. While other oscilloscopes are still booting up, the R&S®RTM is already displaying signals that would otherwise be lost in the noise, and evaluating results. All on one screen with two displays, with lightning fast functions.

The R&S®RTM models with 200 MHz, 350 MHz, 500 MHz or 1 GHz bandwidth offer a maximum sampling rate of 5 Gsample/s and a maximum memory depth of 20 Msample. As a result, they can display signals accurately, right down to the details, as well as provide high time resolution, even for long sequences.

Besides the common measurement and analysis tools, R&S®RTM oscilloscopes have special features that help users to achieve the desired results quickly during debugging and signal analysis. At the push of a button, the QuickMeas function graphically displays the key measurement values for the signal that is currently active and updates them continuously. Functions such as mask tests and video triggers are supplied as standard with the R&S®RTM.

As a true scope of the art, the R&S®RTM meets the increased demands on bench oscilloscopes for the development, production and servicing of embedded hardware, providing time, frequency, protocol and logic analysis, plus a digital voltmeter in a single box:

❙ Time analysis: high sensitivity of 1 mV/div to detect signals that would otherwise be lost in the noise
❙ Frequency analysis: reliable fault detection with integrated FFT and spectrum analysis with spectrogram option
❙ Logic analysis: 20 Msample with 5 Gsample/s for detailed analysis of digital signals
❙ Protocol analysis: simple triggering and decoding of serial buses
❙ Digital voltmeter/frequency counter: key signal parameters at a glance

R&S®RTM Digital Oscilloscope
Benefits and key features

Results-oriented: fast and precise
▪ Fast time to results: turn on, measure and done
▪ Signal details at the push of a button: QuickMeas
▪ Settings in seconds: mask test
▪ Focus on details: search and navigation
▪ Integrated: FFT analysis
▪ In focus: digital voltmeter and frequency counter

Accurate: down to the mV
▪ 1 mV/div: full measurement bandwidth
▪ Frontends: low noise and low crosstalk
▪ Deep memory: long sequences at high resolutions
▪ To the point: comprehensive triggering capabilities

Usability: smart concepts
▪ Easy orientation: color-coded controls
▪ Two displays instead of one: VirtualScreen
▪ Error-tolerant: undo/redo function
▪ Remote control, data exchange: diverse interfaces
▪ Multilingual: choice of nine languages

Extensible: more application power
▪ Logic analysis: fast and precise testing of embedded designs
▪ Serial protocols: easy triggering and decoding
▪ Segmented memory: 460 Msample with history function
▪ Power analysis: current and voltage in detail
▪ Spectrum analysis: quickly identifying interactions between time and frequency

Probes: excellent contacting

Accessories: for rack installation and transport

Models						
Base unit	**Bandwidth**	**Channels**		**Max. sampling rate**	**Max. acquisition memory**	**Mixed signal option (MSO; with R&S®RTM-B1 option)**
		analog	digital (with R&S®RTM-B1)			
R&S®RTM2022	200 MHz	2	16	5 Gsample/s	20 Msample, 460 Msample segmented memory (optional)	400 MHz, 5 Gsample/s (max.), 20 Msample (max.)
R&S®RTM2024	200 MHz	4				
R&S®RTM2032	350 MHz	2				
R&S®RTM2034	350 MHz	4				
R&S®RTM2052	500 MHz	2				
R&S®RTM2054	500 MHz	4				
R&S®RTM2102	1 GHz	2				
R&S®RTM2104	1 GHz	4				

Results-oriented: fast and precise

R&S®RTM oscilloscopes provide a decisive edge when performing everyday measurement tasks, delivering more comprehensive results, faster. Measurement tools such as QuickMeas, mask test and math functions are supplied as standard.

Fast time to results: turn on, measure and done
Optimized for fast results, the R&S®RTM starts up within only a few seconds. The most important measurement results for an active signal can be obtained at the push of a button (QuickMeas function), enabling fast signal characterization.

Signal details at the push of a button: QuickMeas
The QuickMeas function offered by the R&S®RTM oscilloscopes is unique. At the push of a button, it displays the key measurement values for a currently active signal (see table). The signal is also graphically displayed with continuously updated auxiliary lines and markers.

In addition to the QuickMeas results, the oscilloscopes also provide customary automatic measurement functions such as measurement of peak-to-peak voltage and signal frequency. The results are presented in tabular form, with statistical evaluation if desired.

QuickMeas: key results at the push of a button		
Measurement value		**Display**
Vp_+	positive peak voltage	graphic display directly on the waveform
Vp_-	negative peak voltage	
tr	rise time	
tf	fall time	
Mean	mean voltage	
V_{pp}	peak-to-peak voltage	tabular display on the bottom right of the screen
RMS	RMS value	
T	time	
f	frequency	
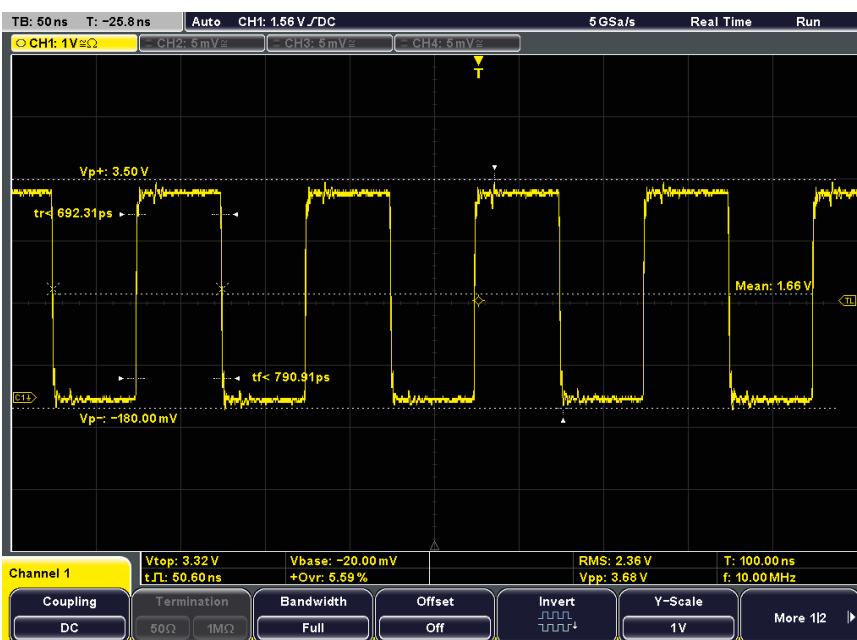
QuickMeas: automatic measurement and graphical display at the push of a button.

Measurement results in detail: cursor functions

The R&S®RTM offers additional functions beyond the standard horizontal and vertical cursor measurements. Users can easily apply measurements such as mean voltage, RMS value and a pulse counter to a specific section of the signal. At the push of a button, the "Set to Wave" function automatically assigns the cursors to the corresponding signals, eliminating the need for manual positioning.

Settings in seconds: mask test

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.

The mask test function is a standard feature in R&S®RTM oscilloscopes. It is easy to use and can be flexibly configured. A new mask can be created from a reference signal with just a few keystrokes. Existing masks can be loaded from the internal memory or from a USB flash drive. If an active mask is violated, various actions can be taken to ensure the optimum response.
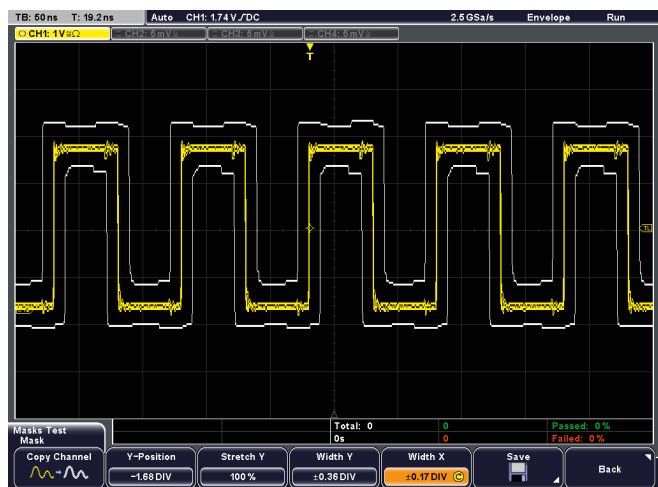
Mask test: mask definition from a reference signal.

Mask test functions	
Evaluation	total number of acquired waveforms
	number of successful and faulty sweeps (absolute/percentage)
	total test duration
Actions	acoustic signal
	stop acquisition
	screenshot
	print
	save waveform
	output pulse
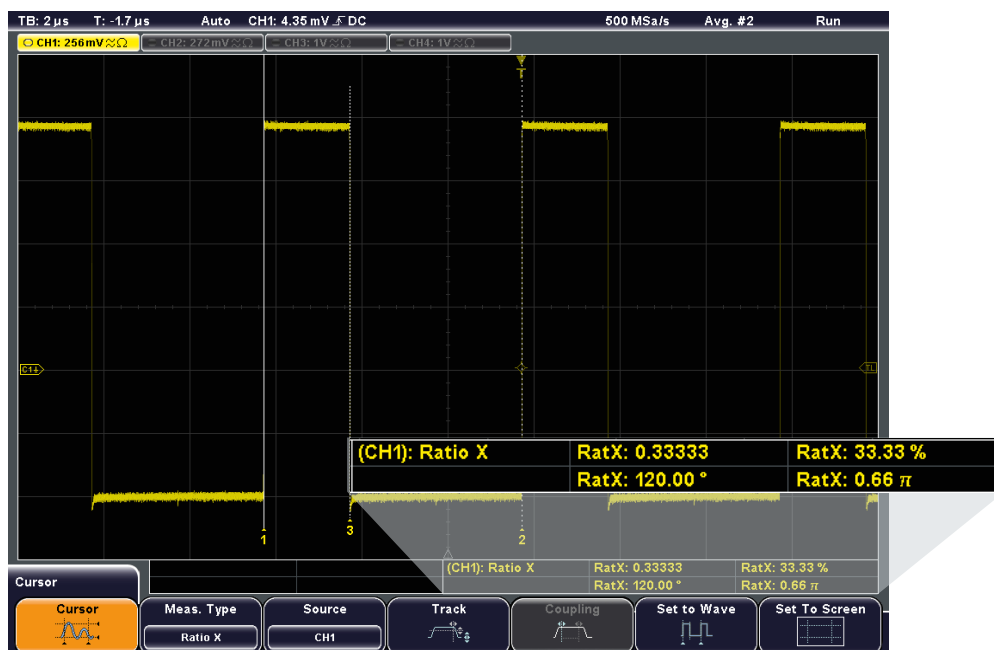
Special cursor measurement: using three cursors to determine the duty cycle of a pulsed signal.

Focus on details: search and navigation

The sampling rate of up to 5 Gsample/s enables R&S®RTM oscilloscopes to achieve a high time resolution. The memory depth of up to 20 Msample makes it possible to acquire long signal sequences, e.g. 4 ms at a sampling rate of 5 Gsample/s.

The search and navigation function helps users to manage even long records, enabling them to detect and mark events within seconds. Users can search for simple signal characteristics such as edge and pulse width, complex bit sequences and decoded serial buses. A table lists the matching events and can be used to navigate from one event to another. Separate from the search function, users can set eight event markers on the signal and easily navigate through them using the Next and Prev buttons on the R&S®RTM oscilloscopes. For detailed analysis, the zoom function can be used to enlarge the signal up to 200 000:1.

Integrated: FFT analysis

The FFT function has a dedicated button and enables users to detect and analyze faults within a signal's spectrum. R&S®RTM oscilloscopes simultaneously provide a spectral display of the signal and a time domain window for checking the sampling interval. The Autoset button is extremely convenient: when it is pressed, the instrument automatically selects the amplitude and frequency scaling that optimally matches the measured signal.

Search and navigation	
Types	edge
	pulse width
	peak
	rise time
	fall time
	runt
	clock data
	pattern
	protocol contents
Display	diagram, table
Markers	up to 32
Navigation	marker quick-select button
	rotary knob in table
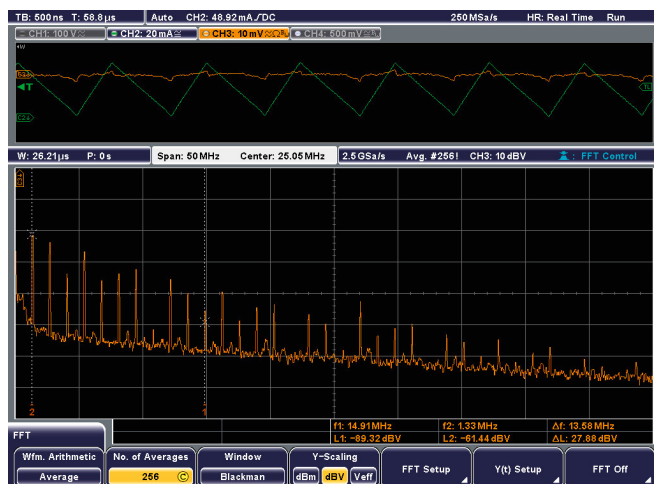
FFT analysis: fast identification of harmonics at the output voltage of a DC/DC converter.

In focus: digital voltmeter and frequency counter

With the R&S®RTM-K32 option, any channel can be used as a three-digit digital voltmeter (DVM) and as a seven-digit frequency counter. The measurement is performed regardless of the oscilloscope status, i.e. it will update even if the acquisition was stopped.

### More than a calculator: math functions

Math functions tailored to everyday problems help solve measurement problems quickly. For example, with just a few keystrokes users can square the voltage waveform and divide it by the resistance in order to directly display power over time. In addition to basic arithmetic operations, advanced functions such as derivatives and digital filters are available. The results can also be used as arguments for other math functions.

Easy comparisons: four reference waveforms

When analyzing faults, it is useful to compare the waveforms against a reference. The R&S®RTM provides up to four reference waveforms that can be generated at the press of a button. The waveforms can be scaled, stored internally or externally and reloaded.

Digital voltmeter modes
AC RMS
DC
AC + DC RMS
Crest factor
Peak+
Peak-
Peak-to-peak
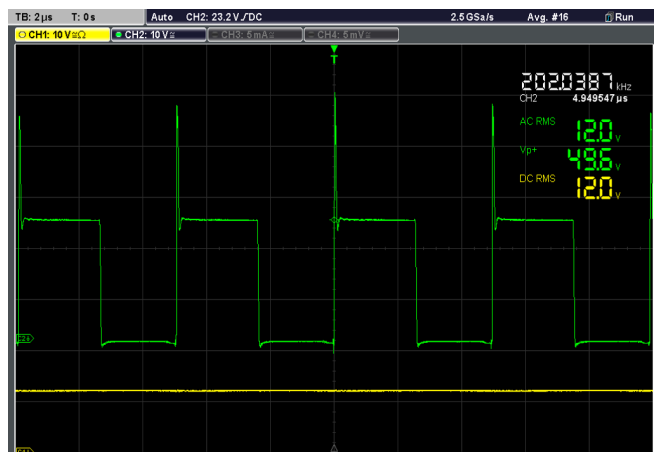
Digital voltmeter and frequency counter.

Math functions	
Functions	+, −, *, /
	max./min.
	square (^{2}), square root ($\sqrt{}$)
	absolute value
	pos./neg. waveform
	inversion
	reciprocal
	log10, ln
	derivation, integration
	cycle, frequency
	pos./neg. duty cycle
	pos./neg. pulse width
Digital filters	lowpass/highpass

Accurate: down to the mV

Rohde & Schwarz has many years of experience developing precision test and measurement equipment and has brought this expertise to bear in the R&S®RTM oscilloscopes. Users benefit from top accuracy and excellent analysis capabilities thanks to deep memory and a powerful trigger system.

1 mV/div: full measurement bandwidth

With their input sensitivity of up to 1 mV/div, R&S®RTM 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®RTM shows a signal's real sampling points over the full measurement bandwidth, even at 1 mV/div. This high measurement accuracy is particularly beneficial when measuring small signal amplitudes.

Frontends: low noise and low crosstalk

The accuracy of a signal displayed on the screen greatly depends on the oscilloscope's inherent noise. R&S®RTM oscilloscopes have low-noise frontends and A/D converters, enabling them to measure precisely, even at the smallest vertical resolutions.

This precision is retained even when additional channels are used. The R&S®RTM has an excellent channel-to-channel isolation of > 50 dB up to 500 MHz, which ensures that the signal from one channel has the lowest possible influence on signals from the other channels.

Acquisition period as a function of sampling rate and memory depth				
	10 ksample	**1 Msample**	**10 Msample**	**20 Msample**
5 Gsample/s	2 µs	200 µs	2000 µs	4000 µs
2.5 Gsample/s	4 µs	400 µs	4000 µs	8000 µs
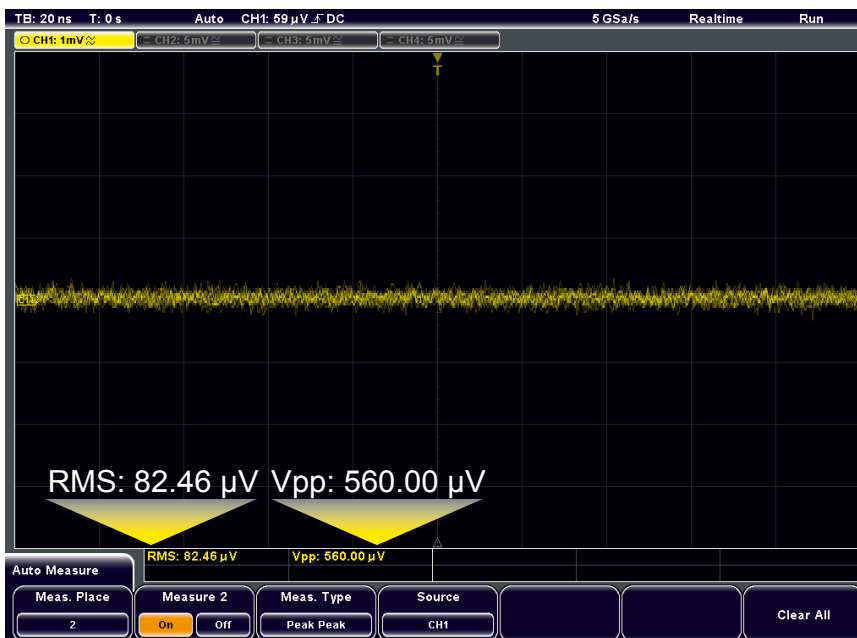
Extremely low inherent noise, even for a vertical input sensitivity of 1 mV/div at full bandwidth and full resolution.

## Deep memory: long sequences at high resolutions

The more details an oscilloscope can show, the higher the probability of detecting signal faults and important events. The oscilloscope must have a high time resolution, i.e. a high sampling rate. In addition, many applications require long acquisition periods, for instance for analyzing transients or serial protocols. This is where R&S®RTM oscilloscopes excel. They offer a deep memory of 20 Msample at a time resolution of up to 200 ps (5 Gsample/s sampling rate). When combined with the R&S®RTM-K15 history and segmented memory option, the memory is expanded to 460 Msample.

To the point: comprehensive triggering capabilities

Precise triggering ensures a stable signal display on the screen and fast isolation of signal events of interest. R&S®RTM oscilloscopes offer many standard trigger capabilities, including pulse width, runt and video triggers. Capabilities include complex trigger conditions with logical linking of analog and digital channels. Serial protocol triggers are optionally available.

Dedicated buttons allow fast switching between the Auto and Normal triggers as well as selection of the trigger edge and source. The rotary knob for trigger level offers additional operating convenience: a single press sets the trigger level to 50% of the signal amplitude.

Trigger types	
Edge	rising, falling, both
	LF, RF suppression, lowpass
	hysteresis: automatic, small, medium, large
Pulse	time: >, <, =, ≠
	interval: inside, outside
	polarity: positive, negative
Rise time	polarity: rising, falling, both
	level: upper, lower
	time: >, <, =, ≠
Runt	level: upper, lower
	polarity: positive, negative
Video	PAL, PAL-M, NTSC, SECAM, SDTV 576i, HDTV 720p, HDTV 1080p, HDTV 1080i
	signal: positive, negative
	lines
	frames: odd, even, all
Logic	pattern over analog and digital channels
	duration: >, <, =, ≠
	interval: inside, outside, timeout
Protocol (optional)	content
	error
B trigger	edge
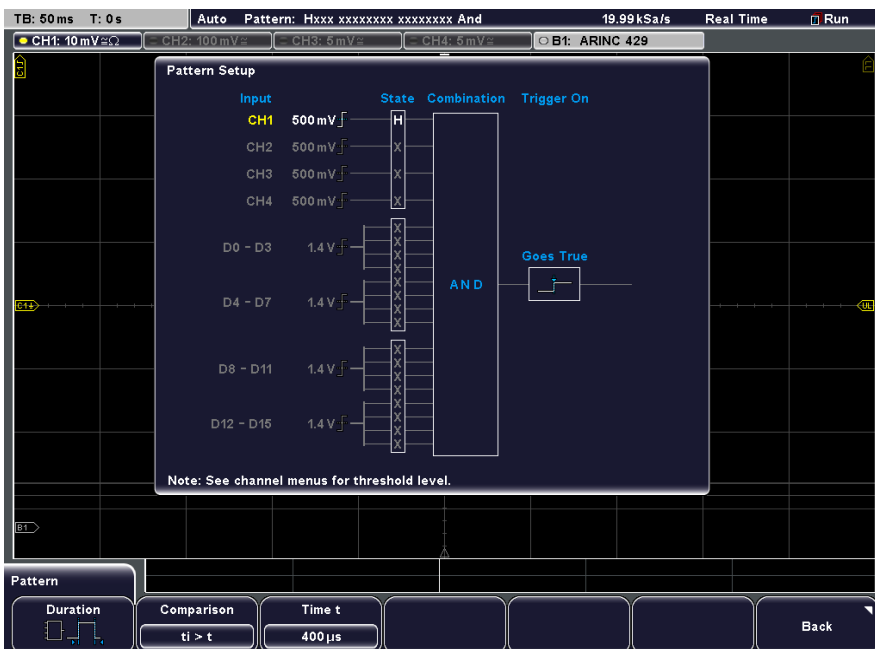
Complex sequences are found quickly using the pattern trigger.

Rohde & Schwarz R&S®RTM Digital Oscilloscope **9**

Overview of the R&S®RTM oscilloscope

Control elements

LAN interface for remote control or for accessing the instrument via a web browser comes as standard. A GPIB interface is available as an option. The DVI output controls a monitor or a data projector.

Extensive cursor-based measurement functions

All instruments can be extended to 1 GHz

Preset to return to default

Brilliant 8.4" XGA color display

One-touch documentation: easily save screenshots and measurements

Help: context-sensitive and always available

Knob for setting the intensity of the waveforms

❚ Menus with flat structure for fast access
❚ Fluent in different languages such as German, English, French, Spanish, Russian, simplified and traditional Chinese, Korean and Japanese
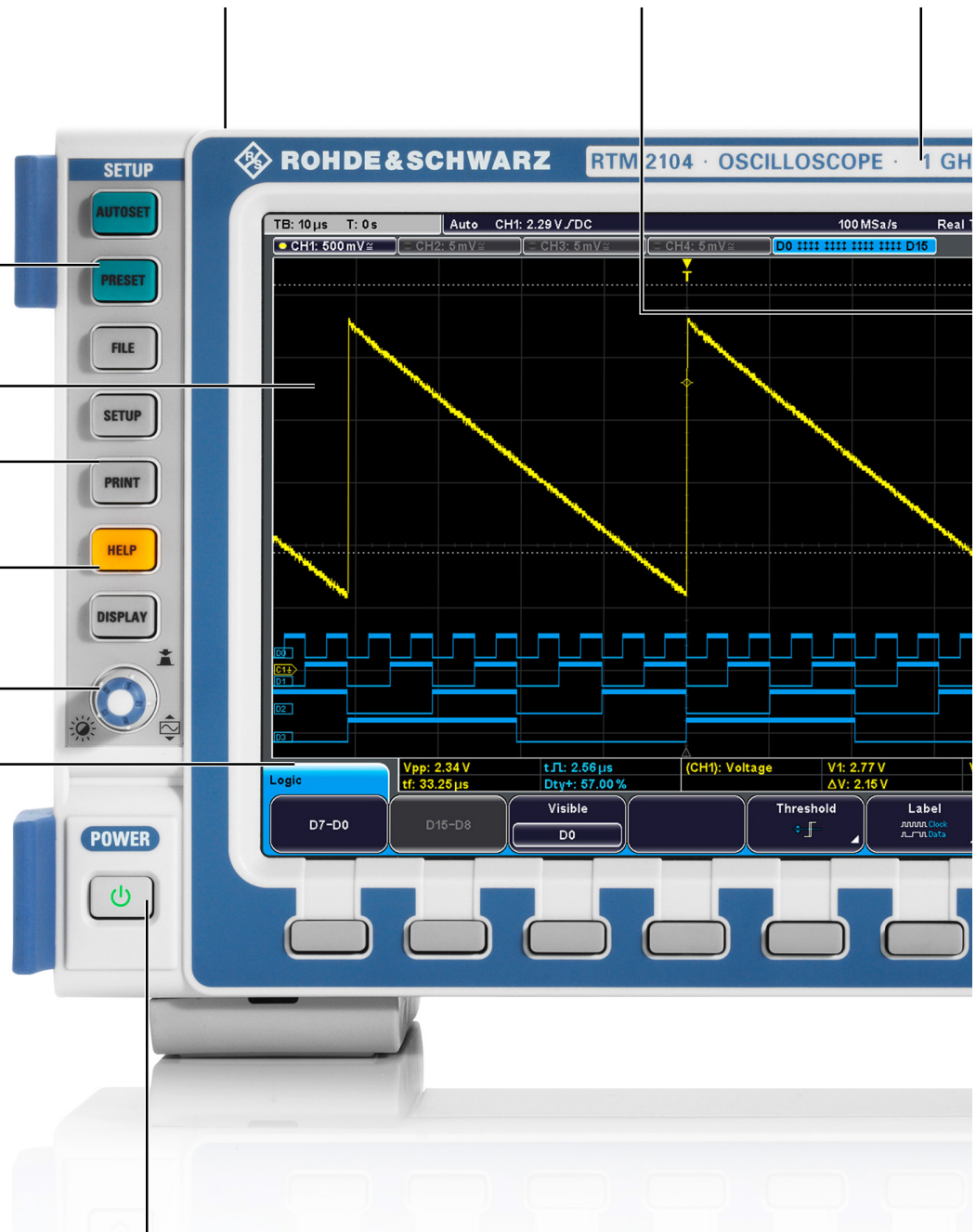
Quickly ready for use thanks to fast booting

Key measurement results
at the push of a button

Multilevel undo/redo function
to easily restore previous
settings

Fast access to logic and
protocol analysis

Direct access to frequently
required analysis functions

Easy search and navigation
between signal events

▌ USB port for data ex-
change, documentation
or firmware updates
▌ Additional device and
USB host ports on the
rear side

Color-coded controls
indicate the currently
selected channel

▌ Scrollable screen content
▌ VirtualScreen extends screen
to 20 divisions for straightfor-
ward display of all signals

History function for analysis
of 460 Msample deep
segmented memory

▌ Probe interface supports all Rohde & Schwarz probes
▌ Digital voltmeter and frequency counter can be activated
on every channel
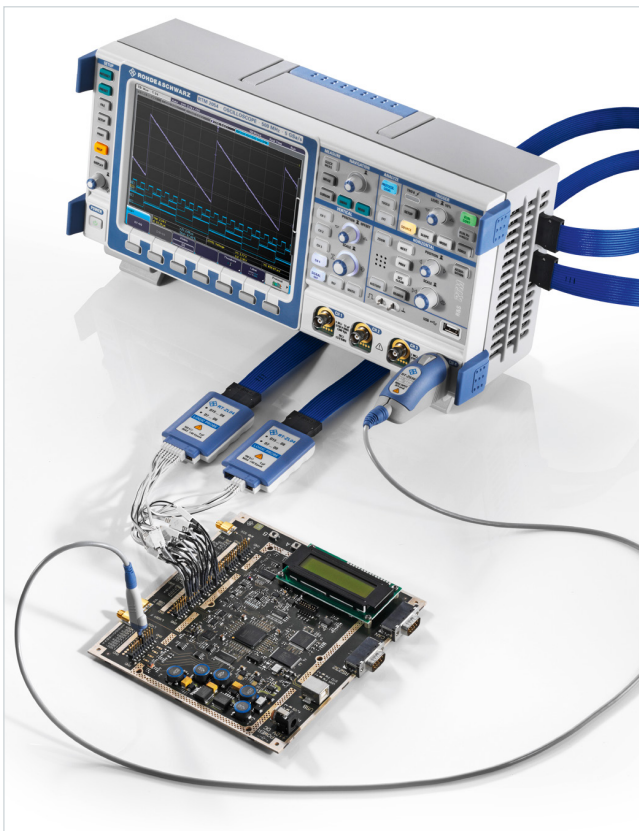▌ Spectrum analysis and spectrogram on every channel
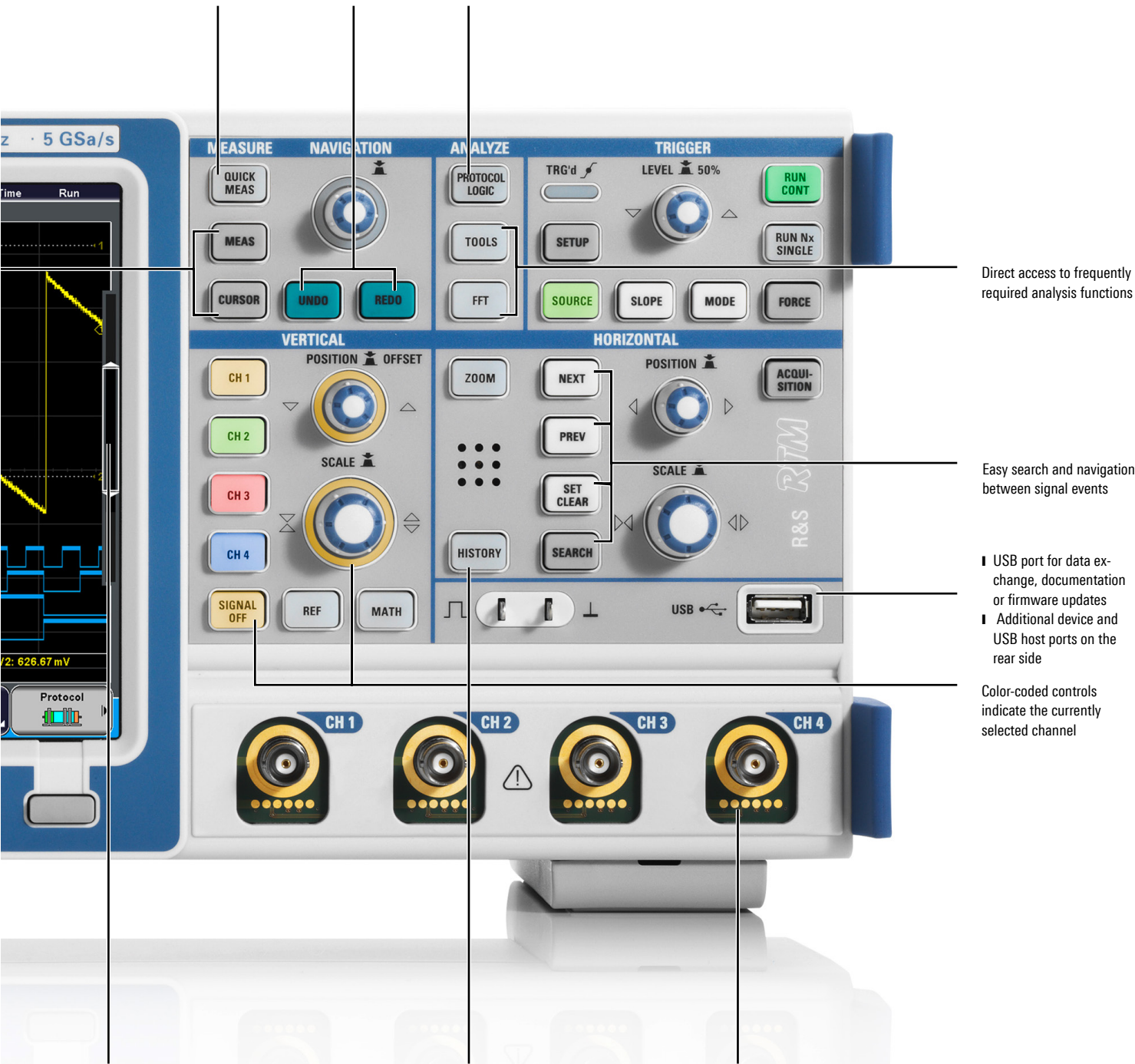
Extensible: more application power

Investments in test and measurement equipment are subject to one all-important rule: the equipment must be capable of growing with user requirements. Rohde & Schwarz has optimized the R&S®RTM to meet this demand.

Availability without interruption: adaptable hardware

With R&S®RTM oscilloscopes, there is no need to return instruments for upgrades. Hardware options can be enabled with a keycode (e.g. logic analysis) or simply installed on site (e.g. GPIB interface), yielding the following benefits:

❚ Quick and easy installation of new options
❚ Instrument immediately ready for continued use
❚ No additional installation costs
❚ No additional expense for alignment or recalibration after installation of options

Adaptable: software options on demand

The base unit includes the complete functionality of an advanced oscilloscope but is extensible in steps. For example, analysis options are available for serial buses and power electronics. The R&S®RTM keeps pace with the challenges that are sure to arise in any company.

Simple and free of charge: firmware updates

The instrument firmware is updated using a USB storage device. Free updates can be downloaded from the Internet at www.rohde-schwarz.com.

Higher bandwidth: upgrade including calibration

All R&S®RTM oscilloscope models can be upgraded to higher bandwidths as needed. The upgrade option includes complete testing and calibration of the instrument by Rohde & Schwarz at one of its service centers.

Secure erase

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

R&S®RTM oscilloscopes: prepared for logic analysis. Installation is a simple on-site process without shipping back the instrument.

Options		
Bandwidth upgrade	200 MHz to 350 MHz	R&S®RTM-B201
	200 MHz to 500 MHz	R&S®RTM-B202
	200 MHz to 1 GHz	R&S®RTM-B203
	350 MHz to 500 MHz	R&S®RTM-B200
	350 MHz to 1 GHz	R&S®RTM-B204
	500 MHz to 1 GHz	R&S®RTM-B205
Logic analysis (MSO)		R&S®RTM-B1
GPIB Interface		R&S®RTM-B10
Serial triggering and decoding	I²C/SPI	R&S®RTM-K1
	UART/RS-232/RS-422/RS-485	R&S®RTM-K2
	CAN/LIN	R&S®RTM-K3
	I²S/LJ/RJ/TDM	R&S®RTM-K5
	MIL-STD-1553	R&S®RTM-K6
	ARINC 429	R&S®RTM-K7
History and segmented memory		R&S®RTM-K15
Power analysis		R&S®RTM-K31
Digital voltmeter (DVM)		R&S®RTM-K32

Logic analysis: fast and precise testing of embedded designs

The R&S®RTM-B1 option turns the R&S®RTM into an easy-to-use mixed signal oscilloscope (MSO) with 16 digital channels.

Precision measurement: up to 5 Gsample/s sampling rate

The R&S®RTM oscilloscopes' sampling rate of up to 5 Gsample/s makes it possible to accurately measure the timing of logic signals. Since the signals can be precisely time-referenced to one another, timing and clock errors can be detected with greater ease, e.g. on serial or parallel bus signals. R&S®RTM oscilloscopes use the high sampling rate over the entire acquisition time, ensuring high time resolution even for long acquisition periods.

Deep memory: acquire long signal sequences

Logic signals are stored in the R&S®RTM with up to 20 Msample, or even up to 460 Msample when combined with the R&S®RTM-K15 option. This long acquisition periods in combination with the high sampling rate makes it easy to detect timing errors even far from the trigger point. The different memory depths for the digital and analog channels eliminate the need to restrict the acquisition periods for digital channels.

Better overview: VirtualScreen

Superimposed displays of logic and analog signals are hard to read and make analysis more difficult. The VirtualScreen of the R&S®RTM oscilloscopes uses a different approach. It doubles the usable screen area for clear display of the channels with no overlapping. Math, reference and logic signals can be displayed above or below the analog channels.

Everything at a glance: activity display

The R&S®RTM oscilloscopes' activity display provides a clear overview of the current status of all logic channels (high, low, toggle), regardless of the trigger settings. Users can see the status of all logic signals at a glance.

Logic analysis features	
Channels	16 divided over two logic probes
Acquisition memory	10 Msample with two logic probes; 20 Msample with one logic probe
Sampling rate	2.5 Gsample/s with two logic probes; 5 Gsample with one logic probe
Input impedance	100 kΩ ± 2 % $\|\| \approx 4$ pF (meas.) at the probe tip
Max. input frequency	400 MHz (meas.)
Max. input voltage	±40 V (V_p)
Min. input signal deviation	500 mV (V_{pp}) (meas.)

Activity display: status information for the digital signals independent of acquisition and instrument settings.

Serial protocols: easy triggering and decoding

l **Hardware-implemented decoding for finding errors fast**
l **Direct triggering on protocol contents and error states**
l **Simultaneous decoding and display of up to four protocols**
l **Deep memory of up to 460 Msample (R&S®RTM-K15)**
l **Display as a color-coded message or in table format (ASCII, binary, octal, decimal, hexadecimal)**
l **Powerful search and navigation over the entire memory**
l **Easy configuration using adaptive wizards**

Tools for protocol analysis: triggering and decoding options

Serial bus signals include control, address and clock information in addition to the user data. 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®RTM provides versatile tools for protocol-specific triggering and decoding of serial interfaces. Extensive trigger capabilities help acquire relevant events. Because decoding is hardware-implemented, the R&S®RTM enables smooth operation while quickly isolating faults.
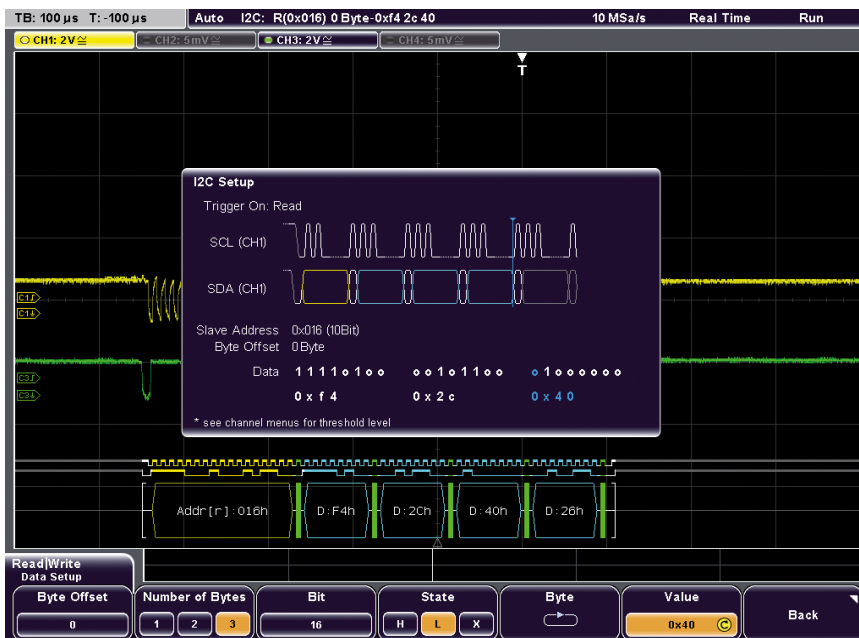
Decoded hexadecimal I²C message.

Everything at a glance: clear display

Decoded protocols can be displayed in all conventional formats, including hex and ASCII. The different sections of the message (address, data, start, etc.) are color-coded to make analysis easier. Label lists can be loaded to simplify and speed up interpretation. IDs and addresses in the data stream are designated with easily understood aliases such as "Engine Speed" instead of in hex format. A tabular listing of the decoded data is provided in addition to the usual honeycomb diagram.

Complete communications instead of snippets: deep memory

The deep memory of the R&S®RTM makes it possible to acquire meaningful communications segments and helps users quickly understand the DUT behavior in context. The detailed display of the decoding is adjusted automatically depending on the zoom factor. The decoded data can also be displayed in tabular form, keeping everything clear.

Intuitive: search and navigation

The different tools for protocol analysis are tightly integrated. The search function can be used to quickly find protocol-specific content segments, making navigation between segments possible. For example, when a row in the decoding table is selected, the corresponding data is also highlighted on the displayed waveform.

Multiple protocols in parallel: not a problem

Errors often result from the interaction of multiple influencing factors. The R&S®RTM decodes and displays up to four buses in parallel, making it possible to immediately identify unwanted interactions. The R&S®RTM VirtualScreen provides a clear overview at all times.

Options for triggering and decoding		
Application	**Serial standard**	**Option**
Embedded	I²C/SPI	R&S®RTM-K1
	UART/RS-232/RS-422/RS-485	R&S®RTM-K2
Automotive	CAN/LIN	R&S®RTM-K3
Audio	I²S/LJ/RJ/TDM	R&S®RTM-K5
Aerospace and defense	MIL-STD-1553	R&S®RTM-K6
	ARINC 429	R&S®RTM-K7
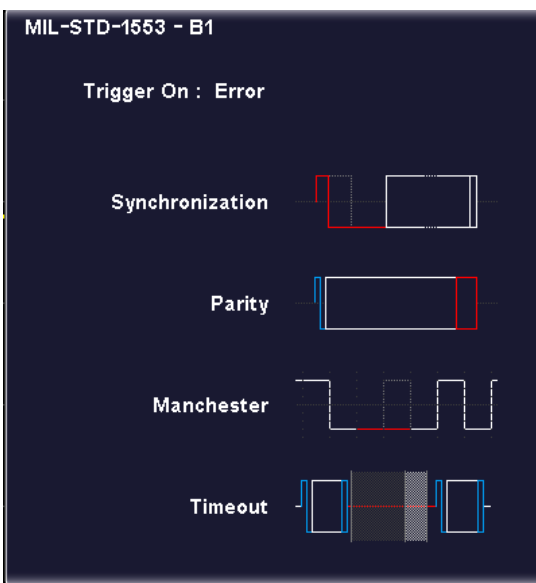
Communicative popup windows: intuitive display of setting options for error states in the MIL-STD-1553 protocol.
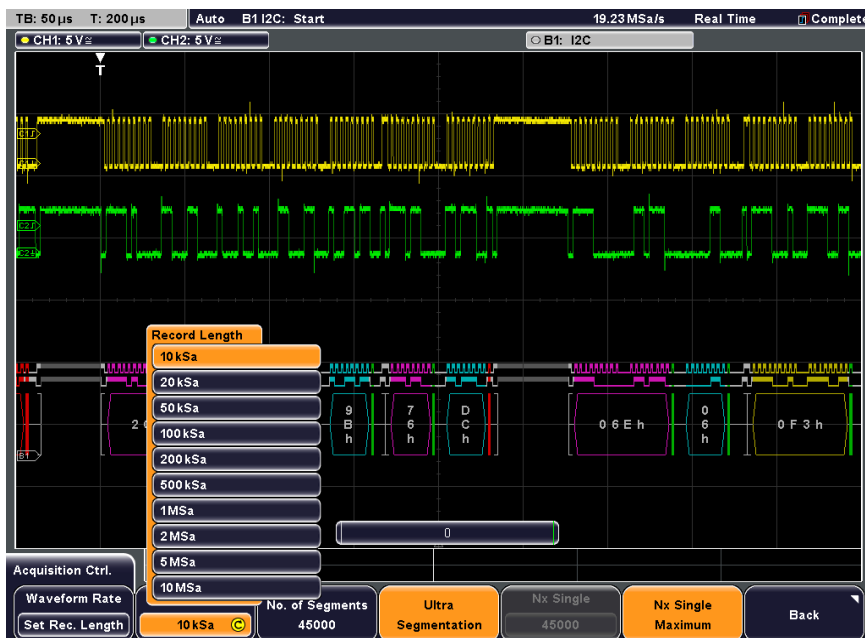
Segmented memory:
460 Msample with history function

ı **460 Msample segmented acquisition memory**
ı **Acquisition of up to 45 000 individual segments**
ı **Short blind time: < 5 µs**
ı **Acquisition of both analog and digital signals as well as serial bus protocols in the segmented memory**
ı **Access to all analysis tools (e.g. mask test or QuickMeas)**
ı **Exact timestamp for all acquisitions**

Long acquisition periods with 460 Msample memory

The deep, segmented memory provided by the R&S®RTM-K15 option can be used for analyzing signal sequences over a long observation period with no signal-free gaps. For example, protocol-based signals such as I^2C or SPI in embedded designs can be acquired over several seconds or minutes. Thanks to the variable segment size from 10 ksample to 20 Msample, the 460 Msample memory is optimally utilized; up to 45 000 cohesive individual recordings are possible.

This feature will be appreciated by physics researchers who are monitoring pulsed lasers as well as developers of pulsed radar systems. When combined with the mixed signal option or serial bus analysis options, the R&S®RTM-K15 option is ideal for debugging embedded designs.

Easy selection of segment length.

Apply all oscilloscope functions to past events

By pressing the History key, all previous acquisitions up to the maximum segmented memory depth of 460 Msample are available for further analysis.

All analysis tools are available in history mode, including mask test, QuickMeas function and FFT analysis. The history function can also be used with the digital channels of the MSO option, and be combined with all serial bus analysis options.

No detail missed thanks to minimum blind time

In the ultra-segmented mode, the minimum blind time is less than 5 µs. Serial protocol and pulse sequences can be recorded practically without interruptions. In history mode, users can easily navigate – either manually or automatically – through all recorded segments, and reconstruct the history thanks to very exact timestamps.

A segmented memory of 460 Msample makes it possible to record and analyze burst signals with up to 45 000 segments.

Power analysis: current and voltage in detail

Specialized measurement functions for characterizing power electronics

Analysis tools support verification and debugging during the development of current and voltage supply circuits. The R&S®RTM-K31 power analysis option facilitates the 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 any loss.

ɪ **Analysis of input and output as well as the transfer function of switched-mode power supplies**
ɪ **Measurement wizard for fast results**
ɪ **Simple and fast documentation**
ɪ **Analysis of harmonic current in line with conventional EN, MIL and RTCA standards**

Measurement functions of the R&S®RTM-K31 option		
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	
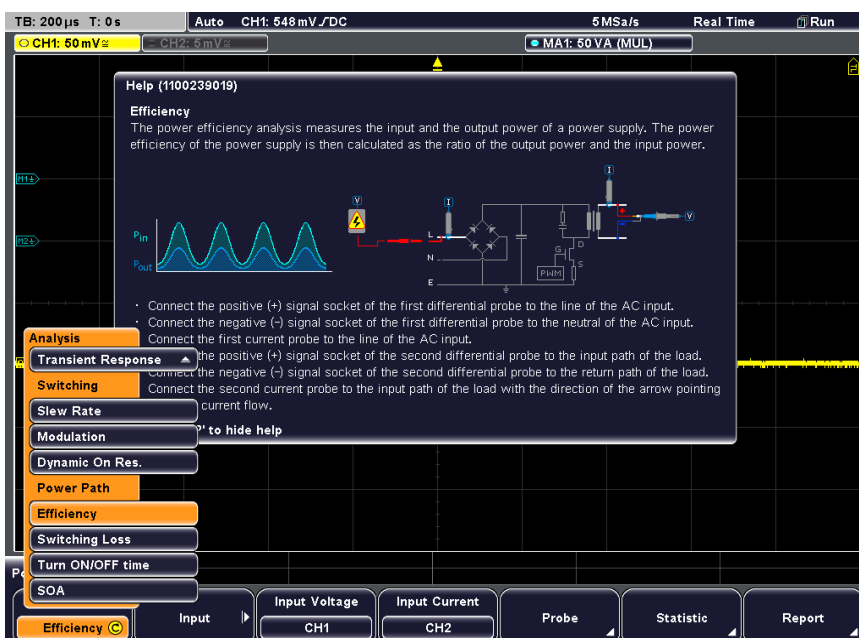
The online help facilitates quick and easy testing.

Graphical support for error-free operation

When users select a measurement function, graphics guide them through the test setup. Detailed illustrations show the correct contacting of probes and current probes. The oscilloscope configures itself automatically based on the selected measurement function and delivers quick results. For a detailed analysis or for documentation purposes, the measurement results are available in .csv file format.

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®RTM-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.

Easy, clear documentation of power analysis

Each result can be added to the test report simply by pressing a button. The test report documents the current setup and configuration. The R&S®Oscilloscope Report Creator – available free of charge on the Rohde & Schwarz website – is used to generate a report. Users can define the level of detail for the report and customize the layout, for example, by adding a company logo. The output format is .pdf.

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®RTM-K31 power analysis option automatically deskews the current probe and voltage probe signals at the push of a button.
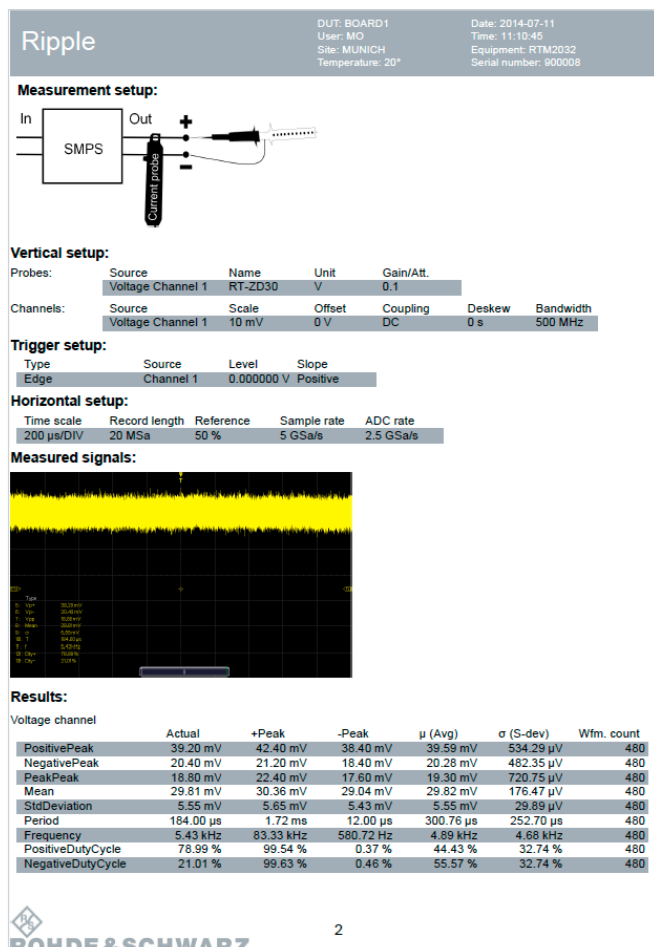
Extensive result documentation.

Spectrum analysis: quickly identifying interactions between time and frequency

ı **From DC to the instrument bandwidth**
ı **Independent, simultaneous time and frequency analysis**
ı **High sensitivity and wide dynamic range for reliable detection of interference**
ı **Development over time in spectrogram**
ı **Can be combined with history function and 460 Msample segmented memory**
ı **Automatic and manual peak markers**
ı **Trace types: normal, mean value, max. hold and min. hold**

Fast and independent: separate signal paths for time and frequency

Difficult-to-find faults often result from the interaction between time and frequency signals. The analysis range is from DC to the instrument bandwidth (max. 1 GHz). Implementation in separate signal paths allows independent setting of time and frequency parameters. Like a spectrum analyzer, parameters such as center frequency and resolution bandwidth can be adapted to the specific measurement task at hand and the optimum time domain settings can be selected. The hardware-implemented digital downconverter (DDC) reduces the spectrum to the components relevant for analysis, ensuring optimum performance and the fastest multi-domain analysis in this oscilloscope class.

Parallel operation: correlation between frequency and time

Advanced electronics is based on the seamless interaction between protocol-based interfaces, digital, analog and frequency components. The broadband spectrum is obtained from a single recording using fast Fourier transformation (FFT). Time, frequency and protocol information originates from the same recording, and time references can be quickly recognized. Measurement windows help users select specific areas of the recording, simplifying the acquisition of frequency switching operations, for example.

Spectrogram: display of frequency over time

A spectrogram displays the frequency over time in addition to the current spectrum. The magnitude can be color-coded for easy interpretation. Thanks to the high FFT rate, even fast frequency changes can be displayed. Together with the R&S®RTM-K15 history and segmented memory option, the spectrogram marker shows the time of the acquisition and makes it possible to load the corresponding time and frequency waveforms onto the screen. All R&S®RTM tools are available for analyzing the loaded waveforms.

Markers: down to the µs

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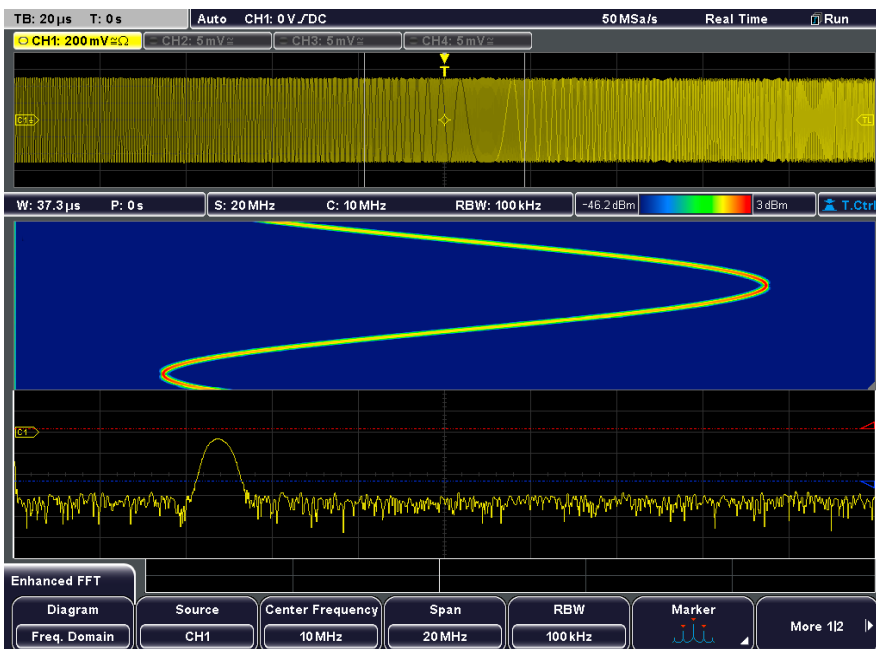
Test signal from three different perspectives: time domain (top), spectrogram (center) and frequency domain (bottom).

Probes: excellent contacting

High-quality active and passive probes complete the R&S®RTM 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 cables are included as standard accessories.

The R&S®RTM probe family

Passive probes are suited for general measurements on low-frequency signals with less stringent accuracy requirements. The R&S®RTM comes with one R&S®RTM-ZP10 passive probe (500 MHz bandwidth) 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. For these applications, Rohde & Schwarz has a family of high-quality active probes. Due to their bandwidth, the R&S®RT-ZS10E and R&S®RT-ZS10 single-ended probes are suitable for R&S®RTM oscilloscopes. The two differ only in the functions they provide. The R&S®RT-ZS10E offers solid basic functionality and an attractive price/performance ratio, while the R&S®RT-ZS10 has more extensive accessories as well as some useful extras such as an integrated voltmeter and a micro button on the probe tip for instrument control.

The R&S®RT-ZD10 und R&S®RT-ZD20 probes are ideal for differential measurements; they also integrate a voltmeter and a micro button for instrument control. For differential high-voltage measurements (up to 100 MHz), the R&S®RT-ZD01 probe is the best choice.

Two current probes with external power supply, the R&S®RT-ZC10 up to 150 A (RMS) and the R&S®RT-ZC20 up to 30 A (RMS) as well as the R&S®RT-ZC20B current probe that receives power directly from the oscilloscope are available for current measurements.

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 because the probes' offset and gain errors are nearly independent of temperature (e.g. zero drift < 90 µV/°C for the R&S®RT-ZS10/-Z10E probes).

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

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. The micro button on the active probes from Rohde & Schwarz eliminates this problem. 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.
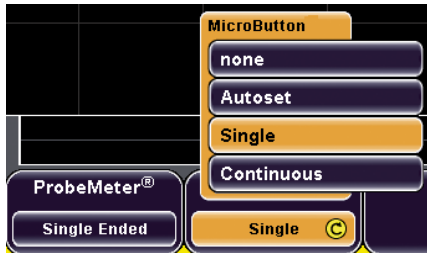
Menu for configuring the micro button.

R&S®ProbeMeter: high DC measurement accuracy regardless of instrument settings.

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 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
❙ Significantly higher DC measurement accuracy compared to a traditional oscilloscope channel
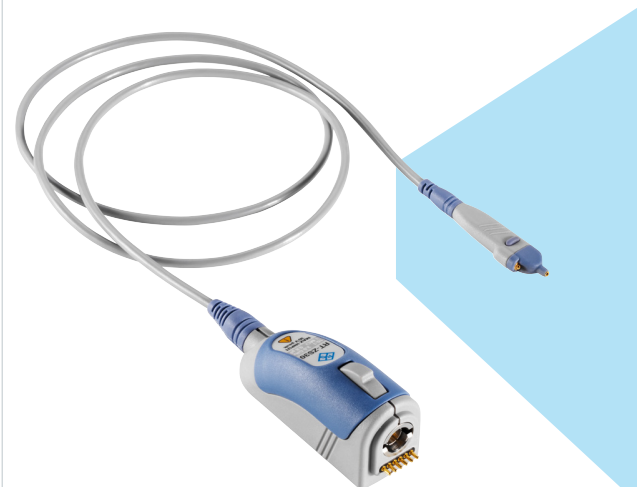❙ DC common mode and differential voltage on the R&S®RT-ZD10

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)).

Rohde & Schwarz active probes.

R&S®RT-ZS10.

R&S®RT-ZD10/20.

Probe	Bandwidth	Attenuation factor	Input impedance	Input capacitance	Dynamic range	Extras
Passive probes						
R&S®RTM-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]
Differential						
R&S®RT-ZD10	1.0 GHz	10:1/100:1	1 MΩ	0.6 pF/1.3 pF	±5 V/60 V DC, 42.4 V AC (peak)	[1]
R&S®RT-ZD20	1.5 GHz	10:1	1 MΩ	0.6 pF	±5 V	[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						[2]
R&S®RT-ZC20	100 MHz	30 A/±50 A	3.5 ns	±1% up to 30 A (RMS)	300 V (CAT I)	[3]
R&S®RT-ZC20B	100 MHz	30 A/±50 A	3.5 ns	±1% up to 30 A (RMS)	300 V (CAT I)	[2]
EMC near-field probes						
R&S®HZ-14	9 kHz to 1 GHz	–	–	–	–	[4]
R&S®HZ-15	30 MHz to 3 GHz	–	–	–	–	[5]

[2] Rohde & Schwarz 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 EMC debugging.
[5] E and H near-field probe for EMC debugging, 20 dB gain with R&S®HZ-16.

Accessories: for rack installation and transport

Safely stowed away

Thanks to an extensive selection of storage and transportation accessories, the R&S®RTM is always fully protected and easy to transport. The R&S®RTM-Z3 soft carrying bag provides ample space for the oscilloscope, probes and cables.

Easy integration

The R&S®ZZA-RTM rackmount kit permits easy installation in only four height units, e.g. for testing directly on the production line.

Accessories	
Front cover	R&S®RTM-Z1
Soft carrying bag	R&S®RTM-Z3
Transit case	R&S®RTM-Z4
Rackmount kit	R&S®ZZA-RTM

Universal: numerous functions for many applications

A bench oscilloscope should be fast and easy to use and deliver reliable results. It should handle diverse applications from time analysis to FFT, from logic analysis to protocol analysis. This is where the R&S®RTM excels.

Electronics development

Oscilloscopes are used for a variety of tasks in the development of embedded designs, ranging from putting hardware into operation to QM acceptance testing, certification and servicing. All these tasks require an oscilloscope with intelligent measurement functions that can deliver precise results based on intuitive operation. The R&S®RTM oscilloscopes were developed to perform these tasks and fulfill the related requirements. For example, the QuickMeas function yields first results only a few seconds after power-on. Logic and protocol analysis enable more in-depth signal analysis for debugging embedded designs.

Production

Quality testing of electrical signals should be based on a tolerance test with pass/fail results. The mask test is the tool of choice for this application. The tester only needs to connect the device under test to the oscilloscope and record the measurement result. Since the mask test is integrated into the R&S®RTM, no additional costs are incurred.

Education

To successfully teach students the theoretical and practical aspects of working with oscilloscopes, an ease-of-use concept combined with state-of-the-art technology is highly beneficial. The R&S®RTM oscilloscopes are perfect for everyday use at universities and colleges due to the diverse manual settings and rugged design. The password-protected education mode can be used to disable automatic functions such as Autoset. Data and programming interfaces are already included, for instance for seamless MATLAB® integration. In addition, a complete portfolio of software and hardware options and probes is available for measuring signals in research labs.

Service

Service technicians must rapidly identify faulty modules. The R&S®RTM oscilloscopes support them with comprehensive measurement functions and straightforward operation. Their lightweight, compact design facilitates work at customer sites, for instance in a switching cabinet.

R&S®RTM oscilloscopes: suitable for all tests and measurements.

Specifications in brief

Specifications in brief		
Vertical system		
Number of channels	R&S®RTM2022/2032/2052/2102	2
	R&S®RTM2024/2034/2054/2104	4
Bandwidth (–3 dB) at 50 Ω	R&S®RTM2022/2024, R&S®RTM2032/2034, R&S®RTM2052/2054, R&S®RTM2102/2104	200 MHz, 350 MHz, 500 MHz, 1 GHz
Rise time (calculated)	R&S®RTM2032/2034, R&S®RTM2022/2024, R&S®RTM2052/2054, R&S®RTM2102/2104	1 ns, 1,75 ns, 700 ps, 350 ps
Input impedance		50 Ω ± 1.5%, 1 MΩ ± 1%
input sensitivity	max. bandwidth in all ranges	50 Ω: 1 mV/div to 2 V/div, 1 MΩ: 1 mV/div to 10 V/div
DC gain accuracy	offset and position = 0, maximum operating temperature change of ±5°C after self-alignment	
	input sensitivity	> 5 mV/div ±1.5%
	input sensitivity	≤ 5 mV/div ±2%
Resolution		8 bit, up to 16 bit with high resolution decimation
Acquisition system		
Maximum realtime sampling rate		2.5 Gsample/s; 5 Gsample/s, interleaved
Acquisition memory		10 Msample; 20 Msample, interleaved; with R&S®RTM-K15 option: 460 Msample segmented memory
Decimation algorithms	combination of decimation mode and waveform arithmetics possible	sample, peak detect, high resolution
Waveform arithmetics		off, envelope, average, smooth, filter
Horizontal system		
Timebase range	R&S®RTM202x/RTM203x/RTM205x	selectable between 1 ns/div and 500 s/div
	R&S®RTM210x	selectable between 0.5 ns/div and 500 s/div
Timebase accuracy		±3.5 ppm
Channel deskew		±100 ns
Trigger system		
Trigger types		edge, width, video (PAL, SECAM, PAL-M, SDTV, HDTV), pattern, runt, slew rate, B trigger; optional: I²C, SPI, UART/RS-232/RS-422/RS-485, CAN/LIN, MIL-STD-1553, ARINC 429
Trigger level		±10 div from center of screen
Analysis and measurement functions		
QuickMeas	at the push of a button, internal measurement values are written directly onto the waveform and updated continuously	peak-to-peak voltage, pos. peak, neg. peak, rise time, fall time, mean value, RMS value, time, frequency
Automated measurements		31 measurement functions
Cursor measurements		14 measurement functions
Waveform mathematics		20 measurement functions
MSO option		
Digital channels		16 (2 logic probes)
Input impedance		100 kΩ ‖ 4 pF
Sampling rate	2 logic probes connected, 1 logic probe connected	2.5 Gsample/s per channel, 5 Gsample/s per channel
Acquisition memory	2 logic probes connected, 1 logic probe connected	10 Msample per channel, 20 Msample per channel
General data		
Dimensions	W × H × D	403 mm × 189 mm × 142 mm (15.87 in × 7.44 in × 5.59 in)
Weight		4.1 kg (9.04 lb)
Screen		8.4" XGA TFT color display (1024 × 768 pixel)
Interfaces		2 × USB host, USB device, LAN, GPIB (optional), DVI-D for external monitor

For data sheet, see PD 3606.8066.22 and www.rohde-schwarz.com.

Ordering information

Designation	Type	Order No
Base unit (including standard accessories: per channel: 500 MHz passive probe (10:1), compact manual, CD-ROM (with operating and service manual), power cord)		
Digital Oscilloscope		
Digital Oscilloscope, 200 MHz, 2 channels	R&S®RTM2022	5710.0999.22
Digital Oscilloscope, 200 MHz, 4 channels	R&S®RTM2024	5710.0999.24
Digital Oscilloscope, 350 MHz, 2 channels	R&S®RTM2032	5710.0999.32
Digital Oscilloscope, 350 MHz, 4 channels	R&S®RTM2034	5710.0999.34
Digital Oscilloscope, 500 MHz, 2 channels	R&S®RTM2052	5710.0999.52
Digital Oscilloscope, 500 MHz, 4 channels	R&S®RTM2054	5710.0999.54
Digital Oscilloscope, 1 GHz, 2 channels	R&S®RTM2102	5710.0999.02
Digital Oscilloscope, 1 GHz, 4 channels	R&S®RTM2104	5710.0999.04
Hardware options		
Mixed Signal Option, 400 MHz	R&S®RTM-B1	5710.0901.02
GPIB Interface	R&S®RTM-B10	1305.0014.02
Bandwidth upgrade [1]		
Bandwidth Upgrade from 200 MHz to 350 MHz	R&S®RTM-B201	1326.0665.02
Bandwidth Upgrade from 200 MHz to 500 MHz	R&S®RTM-B202	1326.0671.02
Bandwidth Upgrade from 350 MHz to 500 MHz	R&S®RTM-B200	5710.0918.02
Bandwidth Upgrade from 200 MHz to 1 GHz	R&S®RTM-B203	1326.0688.02
Bandwidth Upgrade from 350 MHz to 1 GHz	R&S®RTM-B204	1326.0694.02
Bandwidth Upgrade from 500 MHz to 1 GHz	R&S®RTM-B205	1326.0707.02
Software options		
Application Package (-K1, -K2, -K3, -K5, -K6, -K7, -K15, -K31, -K32)	R&S®RTM-PK1	1326.2745.02
I²C/SPI Serial Triggering and Decoding	R&S®RTM-K1	5710.1443.02
UART/RS-232/RS-422/RS-485 Serial Triggering and Decoding	R&S®RTM-K2	5710.1450.02
CAN/LIN Serial Triggering and Decoding	R&S®RTM-K3	5710.1466.02
I²S/LJ/RJ/TDM Serial Triggering and Decoding	R&S®RTM-K5	5710.0882.02
MIL-STD-1553 Serial Triggering and Decoding	R&S®RTM-K6	1317.6835.02
ARINC 429 Serial Triggering and Decoding	R&S®RTM-K7	1317.6841.02
History and Segmented Memory	R&S®RTM-K15	5710.0899.02
Power Analysis	R&S®RTM-K31	1317.5745.02
Digital Voltmeter (DVM)	R&S®RTM-K32	1326.0907.02
Probes		
500 MHz, passive, 10:1, 10 MΩ ‖ 9.5 pF, max. 400 V	R&S®RTM-ZP10	1409.7708.02
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, including 10:1 external attenuator, 1.3 pF, 60 V DC, 42.4 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), 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)	R&S®RT-ZC05B	1409.8204.02
10 MHz, current, AC/DC, 0.01 V/A, 150 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC10B	1409.8210.02
50 MHz, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC15B	1409.8227.02
100 MHz, current, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC20B	1409.8233.02

Designation	Type	Order No
Probe Set for E and H Near-Field Measurements, 9 kHz to 1 GHz	R&S®HZ-14	1026.7744.03
Compact Probe Set for E and H Near-Field Measurements, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02
Probe accessories		
Accessory Set for R&S®RTM-ZP10 passive probe	R&S®RT-ZA1	1409.7566.02
Spare Accessory Set for R&S®RT-ZS10/10E	R&S®RT-ZA2	1416.0405.02
Pin Set for R&S®RT-ZS10/10E	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-ZD20	R&S®RT-ZA7	1417.0609.02
N-Type Adapter for R&S®RT-Zxx oscilloscope probes	R&S®RT-ZA9	1417.0909.02
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
Deskew Fixture for power measurements	R&S®RT-ZF20	1800.0004.02
3 GHz, 20 dB Preamplifier, 100 V to 230 V Power Adapter, for R&S®HZ-15	R&S®HZ-16	1147.2720.02
Accessories		
Front Cover	R&S®RTM-Z1	1305.0272.02
Soft Carrying Bag for R&S®RTM oscilloscopes and accessories	R&S®RTM-Z3	1305.0289.02
Transit Case	R&S®RTM-Z4	1317.4210.02
Rackmount Kit	R&S®ZZA-RTM	1304.8292.00

[1] The bandwidth upgrade is performed at a Rohde & Schwarz service center, where the oscilloscope will also be calibrated.
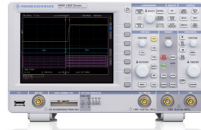
Warranty		
Base unit		3 years
All other items		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	

Your local Rohde & Schwarz expert will help you determine the optimum solution for your requirements.
To find your nearest Rohde & Schwarz representative, visit
www.sales.rohde-schwarz.com

Oscilloscope portfolio

R&S® family	RTH1000	HMO1002	HMO1202	HMO Compact	HMO3000
Vertical					
Bandwidth	60/100/200/350/500 MHz (upgradeable)	50/70/100 MHz (upgradeable)	100/200/300 MHz (upgradeable)	70/100/150/200 MHz	300/400/500 MHz (upgradeable)
Number of channels	2 plus DMM/4	2		4	2/4
V/div 1 MΩ	2 mV to 100 V	1 mV to 10 V		1 mV to 10 V	1 mV to 5 V
V/div 50 Ω	–	–	1 mV to 10 V	1 mV to 10 V (150 MHz and 200 MHz)	1 mV to 5 V
Horizontal					
Sampling rate	1.25 Gsample/s per channel (4-channel model); 2.5 Gsample/s per channel (2-channel model); 5 Gsample/s (all channels cascaded)	500 Msample/s per channel 1 Gsample/s (2 channels cascaded)	1 Gsample/s per channel 2 Gsample/s (2 channels cascaded)	1 Gsample/s per channel; 2 Gsample/s (2 channels cascaded)	2 Gsample/s per channel; 4 Gsample/s (2 channels cascaded)
Max. memory (per channel/1 channel active)	125 ksample (4-channel model); 250 ksample (2-channel model); 500 ksample	500 ksample; 1 Msample	1 Msample; 2 Msample	1 Msample; 2 Msample	4 Msample; 8 Msample
Segmented memory	option	–		–	option
Acquisition rate	50 000 waveforms/s	10 000 waveforms/s		2000 waveforms/s	5000 waveforms/s (200 000 waveforms/s in segmented memory mode [1])
Trigger					
Options	advanced, digital trigger (14 trigger types) [1]	elementary (five trigger types)		basic (six trigger types)	basic (nine trigger types)
Mixed signal option					
No. of digital channels [1]	8				16
Sampling rate of digital channels	1.25 Gsample/s	500 Msample/s	1 Gsample/s	1 Gsample/s	1 Gsample/s
Max. memory of digital channels	125 ksample	500 ksample	1 Msample	1 Msample	2 Msample
Analysis					
Cursor meas. types	3	11		13	12
Stand. meas. functions	33	31			
Mask test	elementary (tolerance mask around the signal)				
Mathematics	elementary			basic (math on math)	
Serial protocols triggering and decoding [1]	I²C, SPI, UART/RS-232/RS-422/ RS-485, CAN/LIN	I²C, SPI, UART/RS-232, CAN/LIN			
Display functions	data logger	–		–	–
Applications [1]	999 count DVM (4-channel model); 10 000 count DMM (2-channel model)	–		–	–
Compliance testing [1]	–	–		–	–
Display and operation					
Size and resolution	7", color, 800 × 480 pixel	6.5", color, 640 × 480 pixel		6.5", color, 640 × 480 pixel	6.5", color, 640 × 480 pixel
Operation	optimized for touchscreen operation, parallel button operation	optimized for fast button operation			
General data					
Size (W × H × D)	201 mm × 293 mm × 74 mm (15.87 in × 7.44 in × 5.59 in)	285 mm × 175 mm × 140 mm (15.87 in × 7.44 in × 5.59 in)		285 mm × 175 mm × 140 mm (15.87 in × 7.44 in × 5.59 in)	285 mm × 175 mm × 220 mm (15.87 in × 7.44 in × 5.59 in)
Weight	2.4 kg (5.3 lb)	2.5 kg (5.5 lb)		2.5 kg (5.5 lb)	3.6 kg (7.9 lb)
Battery	lithium-ion, > 4 h	–		–	–

[1] Requires an option.

	RTM2000	RTE1000	RTO2000
	200/350/500 MHz/1 GHz (upgradeable)	200/350/500 MHz/1/1.5/2 GHz (upgradeable)	600 MHz/1/2/3/4 GHz (upgradeable)
	2/4	2/4	2/4 (only 4 channels in 4 GHz model)
	1 mV to 10 V	500 µV to 10 V	1 mV to 10 V (500 µV to 10 V in HD mode [1])
	1 mV to 2 V	500 µV to 5 V	1 mV to 5 V (500 µV to 5 V in HD mode [1])
	2.5 Gsample/s per channel; 5 Gsample/s (2 channels cascaded)	5 Gsample/s per channel	10 Gsample/s per channel; 20 Gsample/s (2 channels cascaded in 4 GHz model)
	10 Msample; 20 Msample (460 Msample in segmented memory mode [1])	standard: 10 Msample/40 Msample; max. upgrade: 50 Msample/200 Msample	standard: 50 Msample/200 Msample; max. upgrade: 1 Gsample/2 Gsample
	option	standard	standard
	12 500 waveforms/s (200 000 waveforms/s in segmented memory mode [1])	1 000 000 waveforms/s (2 000 000 waveforms/s in ultra-segmented memory mode)	1 000 000 waveforms/s (3 000 000 waveforms/s in ultra-segmented memory mode)
	basic (seven trigger types)	advanced, digital trigger (13 trigger types)	advanced, digital trigger (14 trigger types), zone trigger [1]
	16	16	16
	2.5 Gsample/s	5 Gsample/s	5 Gsample/s
	10 Msample; 20 Msample	100 Msample	200 Msample
	14	3	3
	31	47	47
	elementary (tolerance mask around the signal)	advanced (freely configurable, hardware-based)	
	basic (math on math)	advanced (formula editor)	advanced (formula editor)
	I²C, SPI, UART/RS-232, CAN/LIN, I²S, MIL-STD-1553, ARINC 429	I²C, SPI, UART/RS-232, CAN/LIN, I²S, MIL-STD-1553, ARINC 429, FlexRay™, CAN FD, USB 2.0/HSIC, Ethernet, Manchester, NRZ, SENT, SpaceWire	I²C, SPI, UART/RS-232, CAN/LIN, I²S, MIL-STD-1553, ARINC 429, FlexRay™, CAN FD, MIPI RFFE, USB 2.0/HSIC, MDIO, 8b 10b, Ethernet, Manchester, NRZ, SENT, MIPI D-PHY, MIPI M-PHY, SpaceWire
	track [1]	histogram, trend, track [1]	histogram, trend, track [1]
	power, digital voltmeter (DVM), spectrum analysis and spectrogram	power, 16-bit high definition	power, 16-bit high definition, jitter, clock data recovery, I/Q data, RF analysis
	–	–	USB 2.0, 10/100/1000BASE-T Ethernet, 10GBASE-T Ethernet, Broad-R Reach® Ethernet, MIPI D-PHY, eMMC
	8.4", color, 1024 × 768 pixel	10.4", color, 1024 × 768 pixel	12.1", color, 1280 × 800 pixel
	optimized for fast button operation	optimized for touchscreen operation, parallel button operation	
	403 mm × 189 mm × 142 mm (15.87 in × 7.44 in × 5.59 in)	427 mm × 249 mm × 204 mm (16.81 in × 9.8 in × 8.03 in)	427 mm × 249 mm × 204 mm (16.81 in × 9.8 in × 8.03 in)
	4.9 kg (10.8 lb)	8.6 kg (19.0 lb)	9.6 kg (21.2 lb)
	–	–	–

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