# R&S®RTO6 OSCILLOSCOPE SERIES

## Instant insight meets in-depth information


Product Brochure
Version 07.00

**Oscilloscope innovation. Measurement confidence.**
www.rohde-schwarz.com/product/RTO6

ROHDE&SCHWARZ
Make ideas real

# THE OSCILLOSCOPE YOU CAN TRUST

## R&S®RTO6 OSCILLOSCOPE SERIES

The R&S®RTO6 is the oscilloscope you can trust. Engineered to deliver reliable results, it is a sophisticated laboratory companion to solve measurement problems fast and keep things on schedule. R&S®RTO6 oscilloscopes leverage engineering expertise and improve measurement confidence with deep insights whenever needed.

R&S®RTO6 oscilloscopes provide superior signals for insight into your applications. The large 15.6" touchscreen and streamlined GUI, combined with high waveform update rate, excellent signal fidelity, digital trigger and deep responsive memory serve as a fully integrated test solution for frequency, protocol and logic analysis. The rich measurement toolset for R&S®RTO6 oscilloscopes and streamlined user interface help quickly solve circuit issues, from simple to complex.

A high input sensitivity and very low inherent noise mean that R&S®RTO6 oscilloscopes are optimized to perform precise measurements. High-definition (HD) mode enables easy visualization and triggering on signals with up to 16 bit resolution. R&S®RTO6 oscilloscopes detect and display sporadic signal faults with an industry-leading update rate of up to 1 million waveforms/s.

Today's designs cross multiple measurement domains: time, frequency and protocol. R&S®RTO6 oscilloscopes simplify debugging of systems with different signal types by providing a flexible user interface that allows these domains to be viewed simultaneously. The Rohde&Schwarz digital trigger architecture also enables triggering on complex signal details. This unique trigger system even lets you specify “where” to trigger in the time or frequency domain simply by drawing a special zone directly on the waveform screen.

R&S®RTO6 oscilloscopes are extremely easy to use. The touchscreen-optimized GUI has gesture operations and the R&S®SmartGrid function for complex screen layouts. Setting up intricate measurement tasks is only a matter of dragging waveforms to where they work best for you. The app cockpit provides a one-tap location to access all of the available oscilloscope applications.

# CONTENTS

## FEATURES AND BENEFITS



## APPLICATIONS



## COMPACT AND CONFIGURABLE

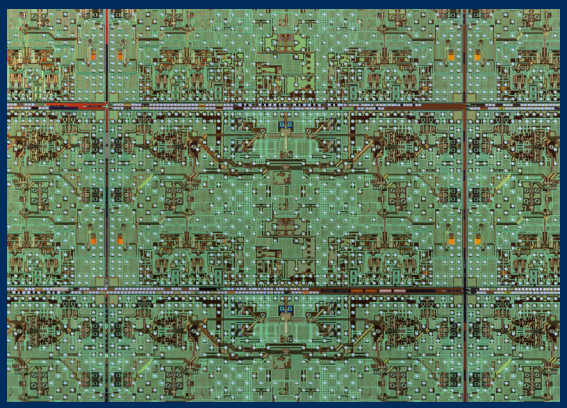


- 6 GHz maximum bandwidth
- 1 million waveforms/s
- 9.4 effective number of bits (ENOB) for ultimate signal integrity
- 2 Gpoints maximum memory
- Exclusive frequency zone trigger

# PROVIDING SUPERIOR MEASUREMENTS

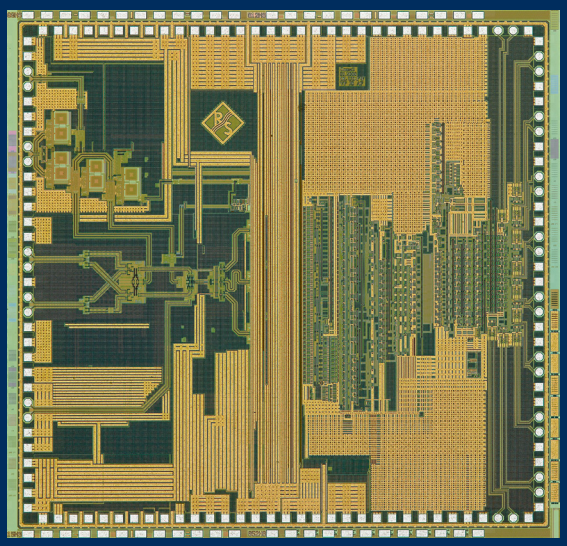
## ENABLING TECHNOLOGIES

Rohde&Schwarz oscilloscopes utilize leading-edge technologies to achieve trustworthy and replicable results. Unique components and innovative features are the key for Rohde&Schwarz oscilloscope users to boost the understanding of their circuit behaviors and quickly advance from signal to insight.



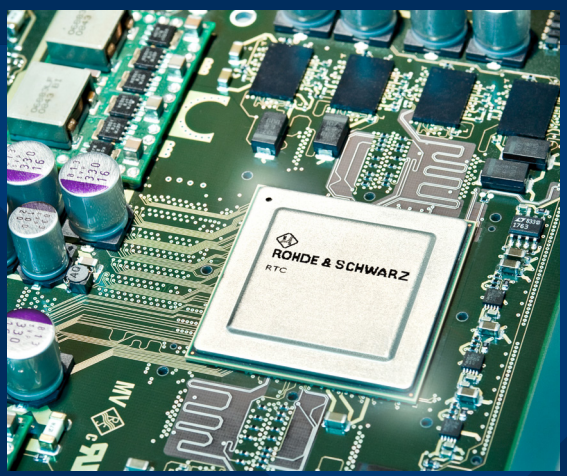
### Superior low-noise components

Measurement accuracy is highly dependent on components in a signal path, such as amplifiers, samplers and A/D converters. Rohde&Schwarz has the in-house expertise to design the best analog circuits. Precise measurements benefit from low noise, high measurement dynamic range and extremely stable results.



### Outstanding A/D converter

Rohde&Schwarz developed a highly capable A/D converter for R&S®RTO6 oscilloscopes. The sophisticated architecture of this chip minimizes signal distortion and has outstanding vertical resolution and excellent spurious-free dynamic range. The minimized signal distortion is an excellent foundation for precise signal analysis in the optional high-definition (HD) mode. This unique mode further reduces noise, enabling acquisitions and triggers with up to 16 bit resolution.




### Fastest throughput ASIC

Every oscilloscope from the R&S®RTO6 series contains an application-specific integrated circuit (ASIC) designed specifically for intensive parallel processing. It processes in real-time during acquisition and quickly prepares a display on the large 15.6" touchscreen. R&S®RTO6 oscilloscopes acquire, analyze and display waveforms with extremely high acquisition rates even while performing measurement and analysis tasks. As a result, these instruments help you find faults significantly faster and more reliably.

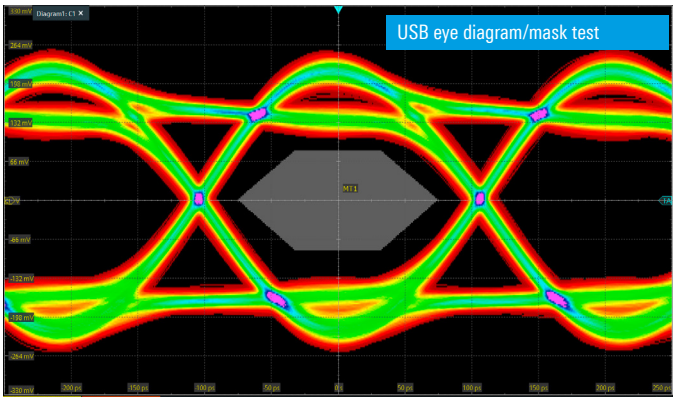
# FINDING SIGNAL ANOMALIES QUICKLY
## WITH UNPARALLELED UPDATE RATES

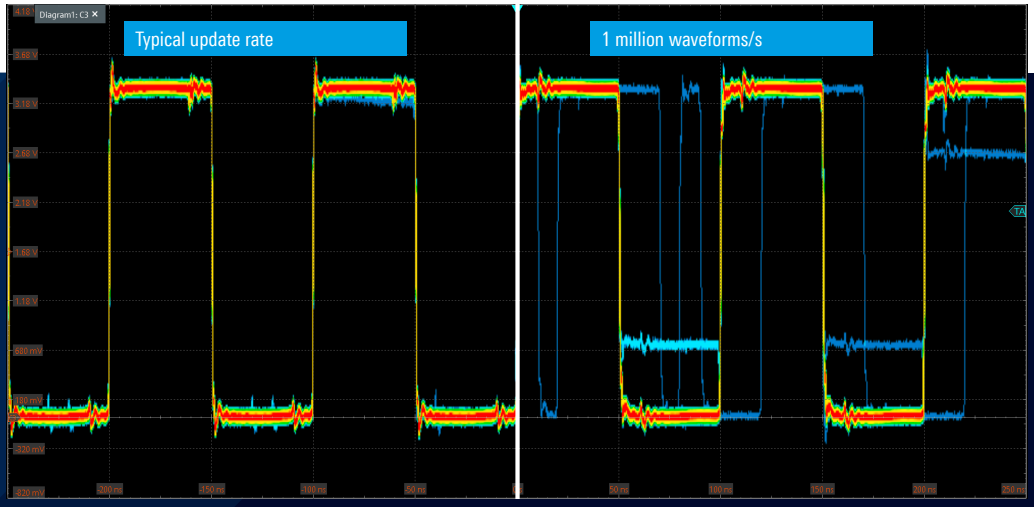
### 1 000 000 waveforms/s
The R&S®RTO6 oscilloscope processing path implements a dedicated ASIC. With optimized signal processing, R&S®RTO6 oscilloscopes reach an exceptional update rate. The unique architecture allows the R&S®RTO6 to acquire, process and display up to 1 million waveforms/s.

### Available with active histograms, masks or cursor measurements
R&S®RTO6 oscilloscopes have a high update rate even when histograms, masks or cursor measurements are active. Also when performing analysis with deep memory acquisitions, the ASIC-based signal processing paths ensure smooth workflows.

### Quickly and reliably detect sporadic signal faults
The statistical confidence in results is higher the more waveforms are acquired. A high update rate increases the likelihood of detecting and displaying signal faults and including them in analysis. The high update rate enables the R&S®RTO6 to generate trustworthy statistical results based on a high number of waveforms in a short time. This is crucial for quickly understanding electronic circuits.

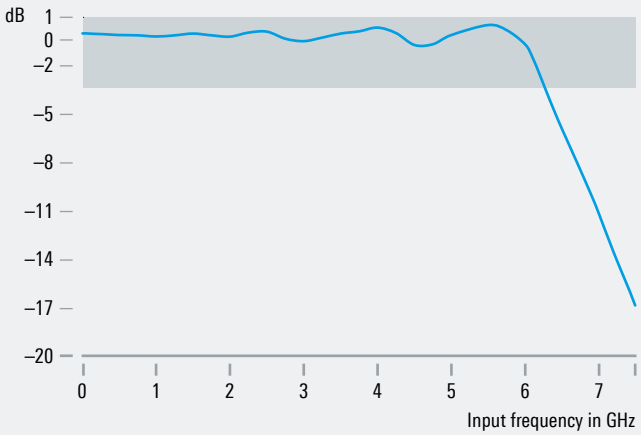
### Mask testing: quick configuration and fast results
Mask tests quickly reveal whether a specific signal lies within defined tolerance limits, providing pass/fail evaluations for assessing the quality and stability of a device under test (DUT). Signal anomalies and unexpected results are easy to identify. Defining masks is easy and flexible with the R&S®RTO6: just a few touchscreen or mouse gestures, generate a mask from a reference signal or define masks consisting of up to eight segments.



# CAPTURING ALL SIGNAL DETAILS
## WITH EXCELLENT SIGNAL INTEGRITY

**Measured frequency response of the R&S®RTO6**




### Flat frequency response
For accurate signal acquisition, R&S®RTO6 oscilloscopes have a flat frequency response over the entire specified bandwidth, ensuring accurate measurement results regardless of the signal frequency components. The Gaussian falloff in frequency response leads to low overshoot and precise acquisition of signal edges.

### Low-noise frontends and minimized crosstalk
All aspects to minimize noise were considered for both 50 Ω and 1 MΩ input paths, from balanced BNC-compatible inputs with 18 GHz bandwidth to extremely low-inherent-noise frontends. The superb channel-to-channel isolation of > 60 dB up to 2 GHz for R&S®RTO6 oscilloscopes ensures that measurement signals from one channel have the least possible influence on signals in the neighboring channel.

### Excellent long-term stability
A reference oven-controlled crystal oscillator (OCXO) optimizes R&S®RTO6 oscilloscopes for long-term stability.

### Outstanding A/D converter with ultra-wide SFDR
R&S®RTO6 oscilloscopes incorporate exceptional custom A/D converters with extremely small linearity errors, resulting in an ultrawide spurious-free dynamic range (SFDR) of 65 dBc. This both provides the foundation for excellent signal integrity, while also enabling further noise reduction with HD filtering of R&S®RTO6 oscilloscopes as well as an outstanding 9.4 ENOB.

Excellent shielding to ensure low crosstalk even with high-frequency signals

# SEEING MORE
## WITH UP TO 16 bit RESOLUTION

### 16 bit resolution for measuring small signal amplitudes

The high-definition (HD) mode increases the vertical resolution of R&S®RTO6 oscilloscopes up to 16 bit with digital filtering. The increased resolution results in sharper waveforms and reveals more signal details that might be masked by noise. For 16 bit vertical resolution, the signal is lowpass filtered after the A/D converter. Adjusting the lowpass filter bandwidth from 10 kHz to 2 GHz enables matching of the applied signal characteristics: The lower the filter bandwidth, the higher the resolution.

**Resolution as a function of the filter bandwidth**

| Filter | Resolution |
|---|---|
| Inactive | 8 bit |
| 2 GHz [1)] | 10 bit |
| 500 MHz | 12 bit |
| 300 MHz | 12 bit |
| 200 MHz | 13 bit |
| 100 MHz | 14 bit |
| 50 MHz to 10 kHz | 16 bit |

1) 2 GHz for 20 Gsample/s, 1 GHz for 10 Gsample/s.

### High acquisition rate and full functionality

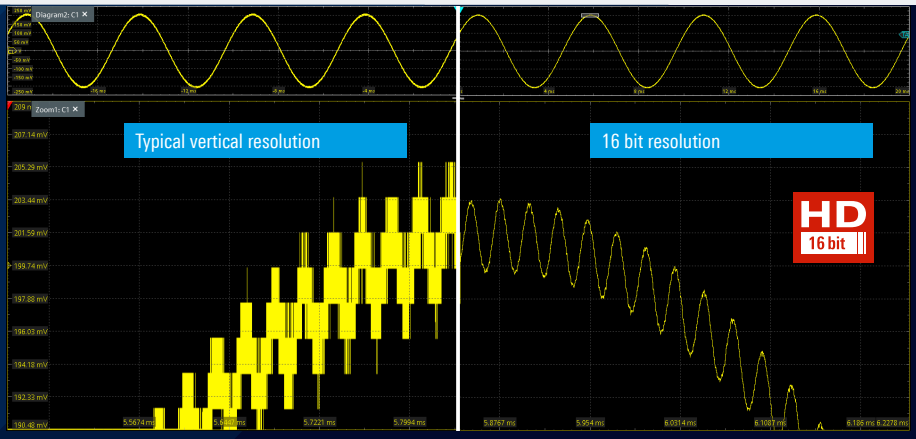
On R&S®RTO6 oscilloscopes, activating the high definition mode does not compromise measurement speed or function. The ASIC signal processing implements lowpass filtering in real-time to maintain high acquisition and processing rates. Oscilloscope operation remains smooth and measurement results are available quickly. All analysis tools are available in HD mode, including automatic measurements and FFT.

### Full sample rate: no aliasing

The HD mode offers significant advantages over traditional high-resolution decimation. It increases vertical resolution without reducing sampling rates. Since the HD mode does not decimate data it ensures the best time resolution and does not cause unexpected aliasing effects. It also conveys exactly which signal bandwidth is available thanks to explicit lowpass filtering.

### User-selectable filtering: reduced noise, increased ENOB

The HD mode filter reduces the noise in real-time, increasing the signal-to-noise ratio (SNR). The user can choose between Gaussian or brick wall filter characteristics to optimize the oscilloscope step response or noise level. An exceptionally low noise level of 10 µV (1 mV/div, 10 MHz filter bandwidth) is possible as well as outstanding 9.4 ENOB (50 mV/div, 50 MHz filter bandwidth, 30 MHz input frequency) – both at the full sample rate.



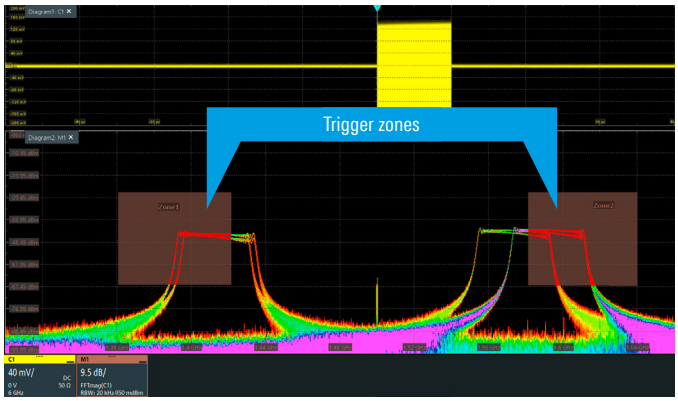
# FINDING COMPLEX SIGNAL DETAILS
## WITH ADVANCED TRIGGER CAPABILITIES

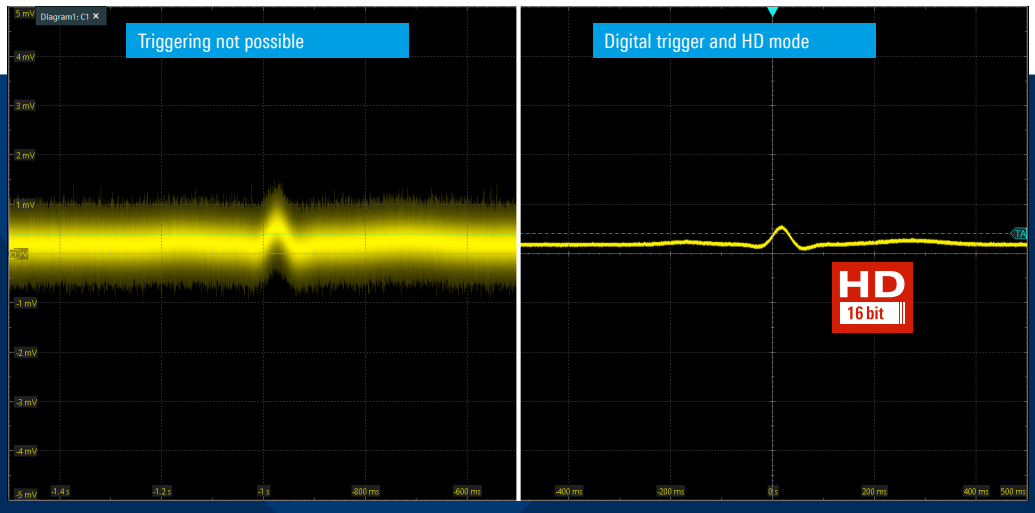
### Unique trigger system
The patented digital trigger system uses A/D converter sampling points in the acquisition path, so that input data of the trigger system is identical to the displayed signal. The digital trigger validates every acquired sample against the trigger definition. R&S®RTO6 oscilloscopes trigger even on the smallest signal amplitudes.

### High trigger sensitivity at full bandwidth
For stable triggering regardless of signal noise levels, the user can set the trigger hysteresis for the oscilloscopes. Due to the low noise frontends, the oscilloscopes can also trigger on signals with high vertical input sensitivities at full measurement bandwidth.

### Isolate smallest signal details
R&S®RTO6 oscilloscopes can trigger on even the smallest signal amplitudes and isolate relevant signal events. This capability is possible even when combining the digital trigger and the HD mode, which increases the oscilloscope's vertical resolution up to 16 bit. The digital trigger system checks each of the 16 bit samples against the trigger condition in real-time and can initiate a trigger. This means that R&S®RTO6 oscilloscopes have the best trigger sensitivity in the industry.

### Zone trigger in time and frequency domain
Draw shapes on a waveform to have R&S®RTO6 oscilloscopes zone trigger graphically separate events in both the time and frequency domains. Define up to eight zones and logically combine them over multiple channels or math functions. Zones activate a trigger signal when a signal either intersects or does not intersect the zone which can be a real-time waveform or a spectrum plot. For example, this powerful, yet easy-to-use feature makes it possible to separate read/write sequences from a DUT memory system.



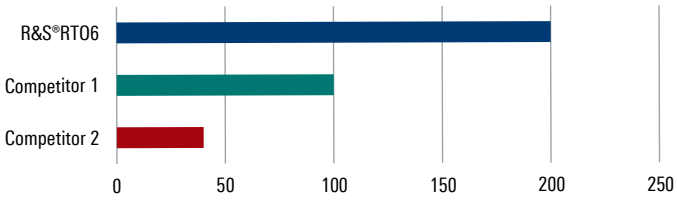



# MEASURING MORE
## WITH DEEP AND RESPONSIVE MEMORY

### Maximized memory: 200 Mpoints standard, 2 Gpoints optional

The basic configuration of R&S®RTO6 oscilloscopes offer 200 Mpoints acquisition memory per channel. Applications such as seamless acquisition of long pulse or protocol sequences often require even deeper memory. The R&S®RTO6 oscilloscope acquisition memory can be extended up to 2 Gpoints. Even with deep memory acquisitions, ASIC signal processing ensures a smooth workflow.

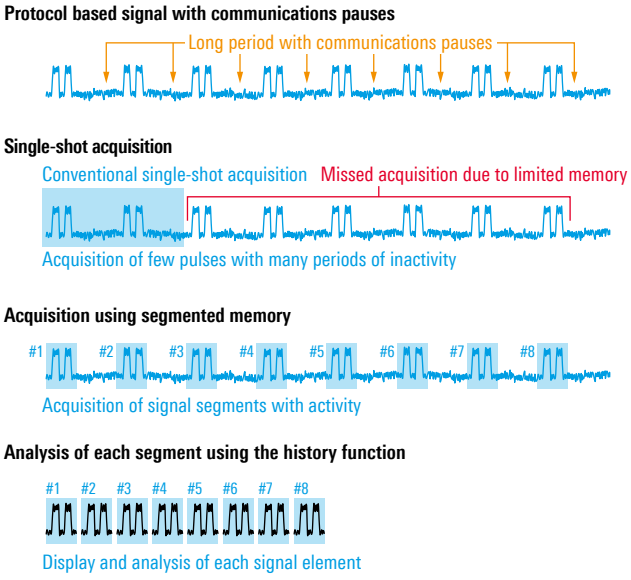
### Acquisition time in ms (at 10 Gsample/s)




### Segmented memory to capture distant trigger events

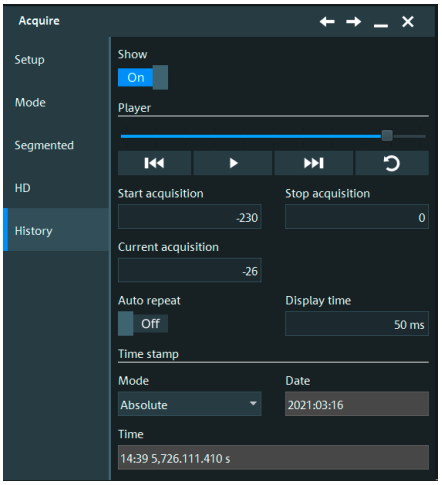
Standard segmented memory analyzes signal sequences over a long observation period, capturing protocol-based signals with communications gaps such as I²C and SPI over extended periods without wasting storage on idle time. Thanks to a variable segment size, the deep memory is optimally utilized and numerous consecutive individual segments are possible. The segmented memory of the R&S®RTO6 lets you capture more than 100 000 timestamped acquisitions.

### Single-shot versus segmented acquisition




### History mode to analyze previous trigger events

The always-on history function of R&S®RTO6 oscilloscopes ensures access to waveforms previously stored in the memory. A trigger timestamp enables straightforward time correlation. You can view and analyze all captured signals with the zoom, measurement, math and spectrum analysis functions.



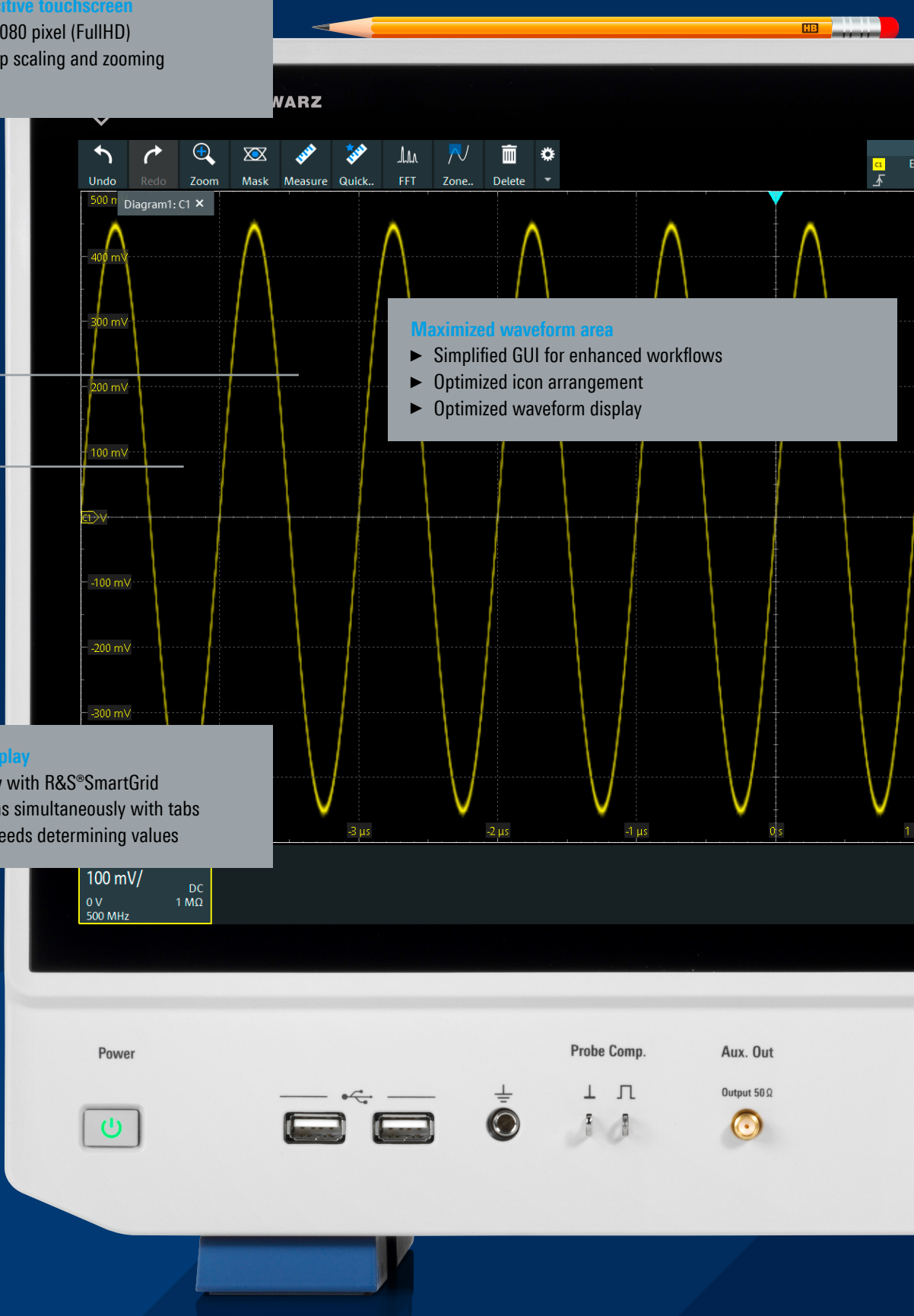

### Search and navigation: find faults fast

Comprehensive search functions simplify the analysis of long signal sequences. Search for waveforms based on different criteria, such as signal fault, signal pattern and protocol contents. Search on analog or digital channels, on reference or math waveforms and on serial, protocol-based buses as needed for your specific applications. An easy-to-read table shows all detected events with timestamps. Examine the individual events in a zoom window and navigate between them. View details such as the number of glitch errors in a table and have each individual glitch in the waveform correlated with other signals.

# ENHANCED USABILITY

### 15.6" high-resolution capacitive touchscreen

- High resolution: 1920 × 1080 pixel (FullHD)
- Gesture support speeds up scaling and zooming
- Easy to see signal detail




### Maximized waveform area

- Simplified GUI for enhanced workflows
- Optimized icon arrangement
- Optimized waveform display

### Customizable waveform display

- Quickly arrange your view with R&S®SmartGrid
- Manage multiple diagrams simultaneously with tabs
- Axis scales annotation speeds determining values

## Intuitive front panel increases user productivity

- Fast, direct access to primary instrument settings
- Quickly adjust settings with knobs and buttons
- Sectional layout makes finding the right button easy

## Clear orientation with color-coded LEDs

- Color-coded buttons and knobs enable fast association with sources
- Indication of currently selected channel
- Speed setting changes with fine/course pushable adjustment

## Active probe interface

- Supports over 30 Rohde&Schwarz current and voltage probes
- 50 Ω and 1 MΩ path enable support of an even wider range of passive and active probes, including ones from third parties

# SUPERIOR USER EXPERIENCE

## ADVANCED USABILITY, EASY DOCUMENTATION, FAST REMOTE CONTROL

### Quick access to important tools

The toolbar 1 enables quick access to important tools. Here you can directly set the most common parameters in a simple overlay menu, including FFT start/stop, span and RBW 2. Choose from 28 different tools for maximum flexibility. The upper menu also displays trigger, horizontal and acquisition settings 3.

### Advanced setup with compact menu structure

An advanced setup 4 is available for tools where detailed parameters can be defined, such as FFT window type and span/RBW coupling. The compact menu structure allows you to directly see the impact of measurement modifications.


### Signal bar and preview icons

Activated signals appear in the flexible R&S®SmartGrid 5, along with the fundamental signal parameters displayed in the signal bar 6. From here, drag&drop into the R&S®SmartGrid for an individual waveform layout. A signal preview is also available in the signal bar for minimized signals 7.

### Signal activators and main menu

Signals activators 8 turn on different signals with just one touch/click (analog channels, math, FFT, serial protocols, signal generator), making possible the straightforward configuration of your measurement setup. The main menu provides access to all instruments settings.

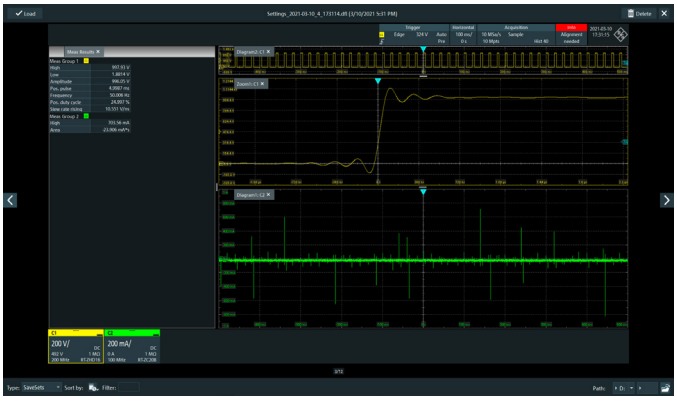
## Save results fast

Save waveforms in various file formats or download them via Ethernet for later analysis with MATLAB® or Excel. Continuous acquisition, analysis and transmission to a PC via Ethernet is possible with 100 waveforms/s. You can also save screen content or print it directly from the oscilloscope.

## Documentation at the press of a button

Document your measurements quickly:

- Screenshots include waveforms and results
- Reports include screenshots and instrument setup
- Clear grid annotations make for easy-to-read signal characteristics
- Color-coded labels highlight anomalies in the diagram
- Save waveforms, histograms and measurement results in binary, XML or CSV formats are available for signal analysis on a PC



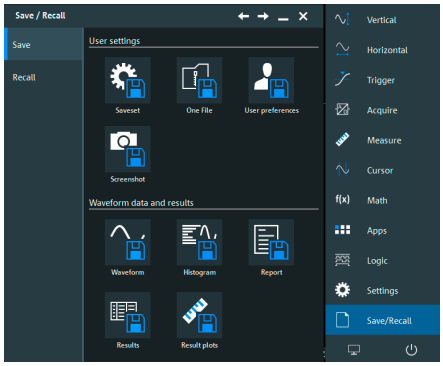
## Remote control access: anytime, anywhere

Remotely control the oscilloscope and view the display on a PC or mobile device. View the same user interface on the oscilloscope. All oscilloscope functions are also available remotely via Ethernet, GPIB or the USB interface.

| Storage options | | |
|---|---|---|
| **Onefile** | complete | stores waveform, setup, math channels, reference waveforms in one zip file |
| **Contents** | waveform | complete |
| | | selection (zoom, cursor, gate, manual) |
| | | number of acquisitions |
| | | history memory |
| **Evaluation** | | histograms |
| | | measurement results |
| | | long-term trend |
| **Format** | measurement data | binary, XML, CSV, 1 to 4 channels |
| | graphics | PNG, JPG, BMP, TIF, PDF |
| | reports | PDF, HTML, DOC |
| **Drivers** | | VXi, LabView, LabWindows, .NET |

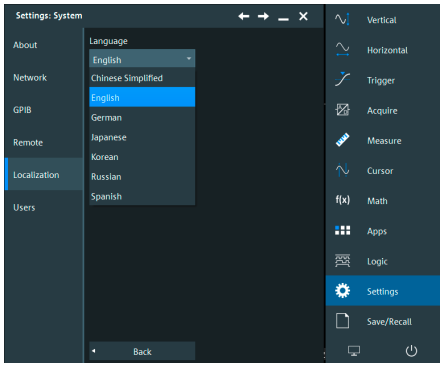
## Easy selection of instrument setup

Each save set is stored along with an instrument setup including a screenshot of the most recent oscilloscope display. To open a specific instrument setup later, simply scroll through the screenshots to find the right configuration.




## Language selection

The R&S®RTO6 oscilloscope user interface supports multiple languages. Just a few seconds are needed to switch languages while the instrument is running, making the oscilloscope truly international.



# TACKLING NOVEL, COMPLEX ISSUES

## COMPREHENSIVE TOOLS FOR FAST AND ACCURATE RESULTS

- **Hardware-accelerated measurement functions and math operations**
- **Wide range of basic analysis functions**
- **Multi-instrument capabilities**
- **Industry-leading zone trigger and mask testing**
- **Application-specific software options**

### Time-correlated analysis of multiple signal types

R&S®RTO6 oscilloscopes address various test requirements for highly integrated devices. They combine multiple test instrument capabilities in a single box:

- The analog channels offer superior signal fidelity and fast measurements, with limit tests and histograms as well as hardware-accelerated mask testing.
- General purpose resources, such as the standard enabled digital channels (MSO) or the arbitrary waveform generator, allow logic analysis and/or protocol-based testing of serial buses, including symbolic decoding and advanced bus analysis.
- The R&S®RTO6 provides comprehensive tools for fast and detailed signal analysis in the frequency domain and shows correlation with the time domain.

### R&S®RTO6 oscilloscope offers multiple test instruments in one

**Analog**
- Voltage and time measurements
- Current measurements

**Logic**
- Data verification
- Timing verification
- Bus decoding

**Protocol**
- Protocol decoding
- Protocol triggering
- Symbol mapping

**Frequency**
- Spectrum analysis
- Signal analysis
- EMI debugging
- Current measurements

**Power**
- Power consumption
- Power sequencing
- Power integrity

**Generator**
- Reference clock
- Arbitrary waveforms
- Modulated signals
- Protocol pattern

**Pulse source**
- Input characterization
- Deskew
- TDR/TDT

## Rich debugging toolset

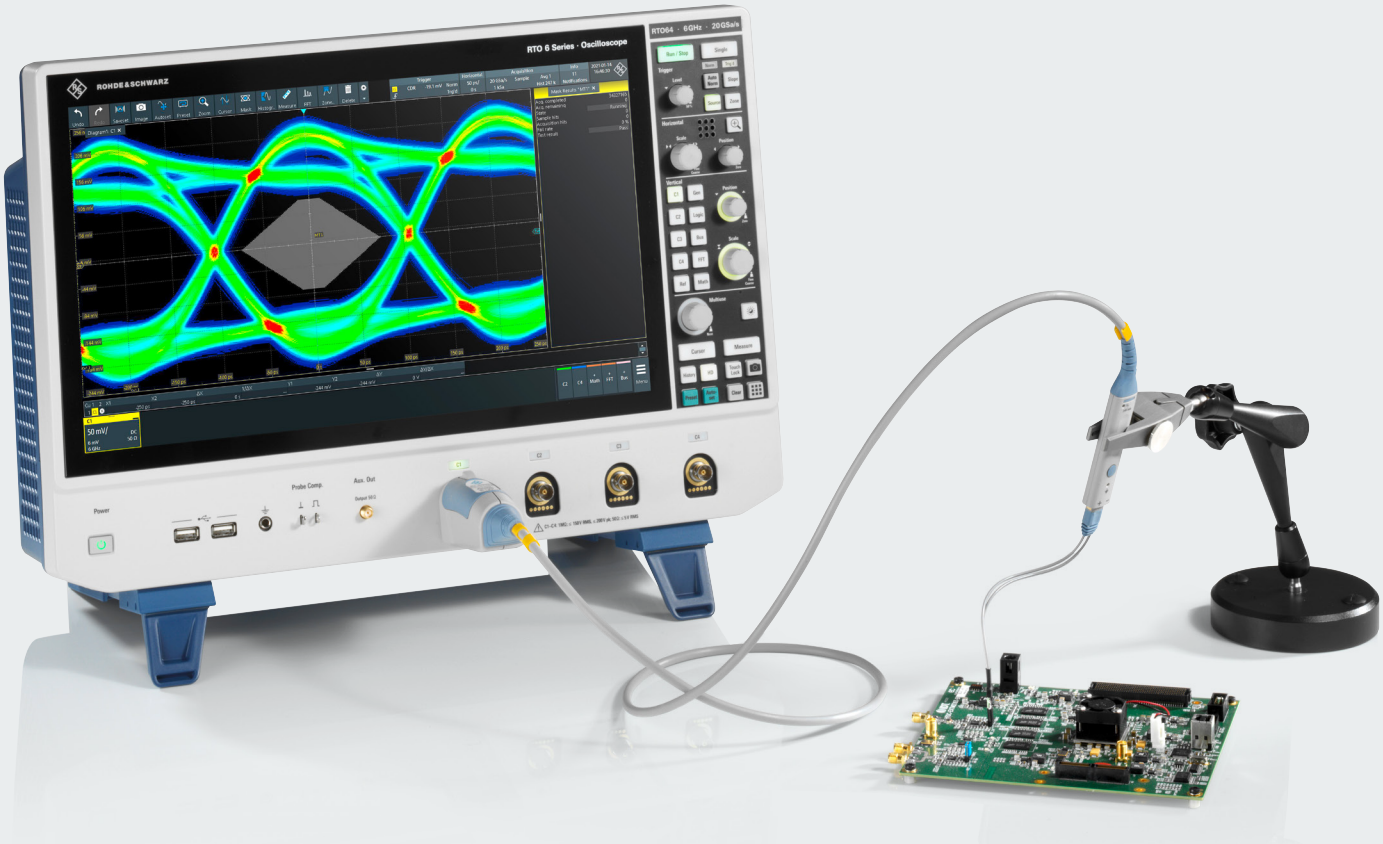
Every R&S®RTO6 oscilloscope has over 90 measurement functions. They are organized by type into amplitude, time, jitter, eye, histogram and spectral measurements. Statistics, histograms, trend and track functions facilitate detailed analysis of measurement results. These results can also be used in math functions.

| Available signal analysis options | |
|---|---|
| **Statistics** | display of average value, minimum/maximum value and standard deviation |
| **Histogram** | graphic display of events as histogram; definition of measurement range and resolution for histogram (manual or automatic) |
| **Trend** | long-term trend function for analyzing slowly developing variations in measurement results (easy identification of thermal dependencies within measurement results) |
| **Track** | analysis of rapidly changing measurement results in time periods; display results over entire acquisition period |
| **Gating** | restriction of the measurement range to a specific signal range (manually defined or linked to existing cursor or zoom ranges) |
| **Reference lines** | definition of reference lines (manual, automatic or averaged); optional display in the waveform |
| **Waveform** | graphic display of results on waveform, e.g. for documentation |
| **Multiple measurements** | definition of the maximum number of measurements per waveform |

## Application-specific software for your technology

R&S®RTO6 oscilloscopes have a multitude of application-specific software options to tailor your oscilloscope to your application needs and provide in-depth capabilities for all your different tasks, ranging from general signal and spectrum analysis to more complex assignments such as jitter decomposition and TDR/TDT analysis. The software options are also available after purchase with a simple keycode upgrade.

| Analysis options | |
|---|---|
| I/Q interface | R&S®RTO6-K11 |
| Clock data recovery | R&S®RTO6-K13 |
| Power analysis | R&S®RTO6-K31 |
| Spectrum analysis | R&S®RTO6-K37 |
| Deembedding | R&S®RTO6-K121 |
| TDR/TDT analysis | R&S®RTO6-K130 |
| Jitter analysis | R&S®RTO6-K12 |
| Advanced jitter | R&S®RTO6-K133 |
| Advanced noise | R&S®RTO6-K134 |



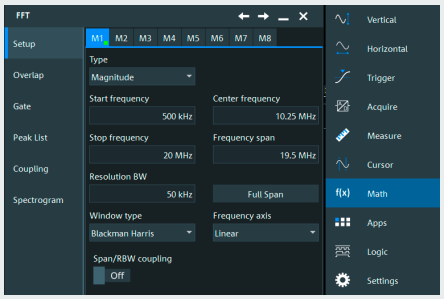
# SPECTRUM ANALYSIS

## RF knowledge in an oscilloscope

- **Multichannel spectrum analysis (up to eight in parallel)**
- **Zone trigger for time and frequency domain**
- **Gated FFT for easy frequency and time correlation**
- **Spectrogram displays changes in spectrum over time**
- **Better and faster insights: logarithmic display and peak list**

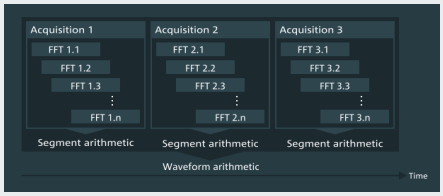
### Set up as a spectrum analyzer

Operate the R&S®RTO6 frequency analysis function 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 application requirements.




### Overlap FFT

The R&S®RTO6 oscilloscope's overlap FFT splits the captured time-domain signal into overlapping segments and calculates an individual spectrum for each segment. These spectra are then compiled and combined to a complete spectrum with color-coding that corresponds to the frequency of occurrence. The complete spectrum provides a very good overview of the type and recurrence of different frequency emissions. Even sporadic signals are visible.

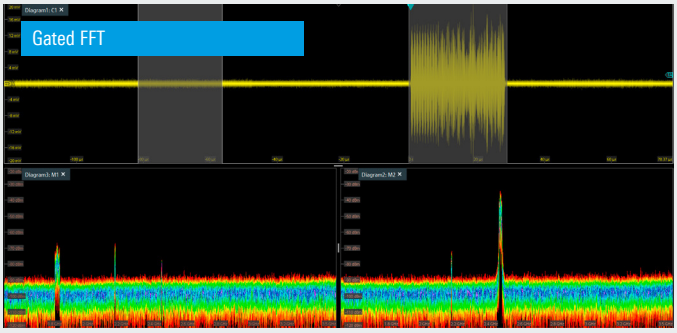



### Multiple FFTs with outstanding RF performance

R&S®RTO6 oscilloscopes support powerful multichannel spectrum analysis for up to eight signals in parallel. Their high dynamic range and input sensitivity of 1 mV/div at full measurement bandwidth make it possible to detect even weak emissions. The powerful FFT implementation is ideal for 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.

## Gated FFT: frequency and time correlation

The R&S®RTO6 oscilloscope gated FFT function applies FFT analysis only to user-defined regions of the acquired time domain signal. Users can move the time window across the entire waveform to determine which segments of the time domain signal correlate to certain events in the spectrum. This makes it possible to correlate unwanted emissions from switched-mode power supplies with overshoots from the switching transistor.




## Spectrogram: display changes in power and frequency over time

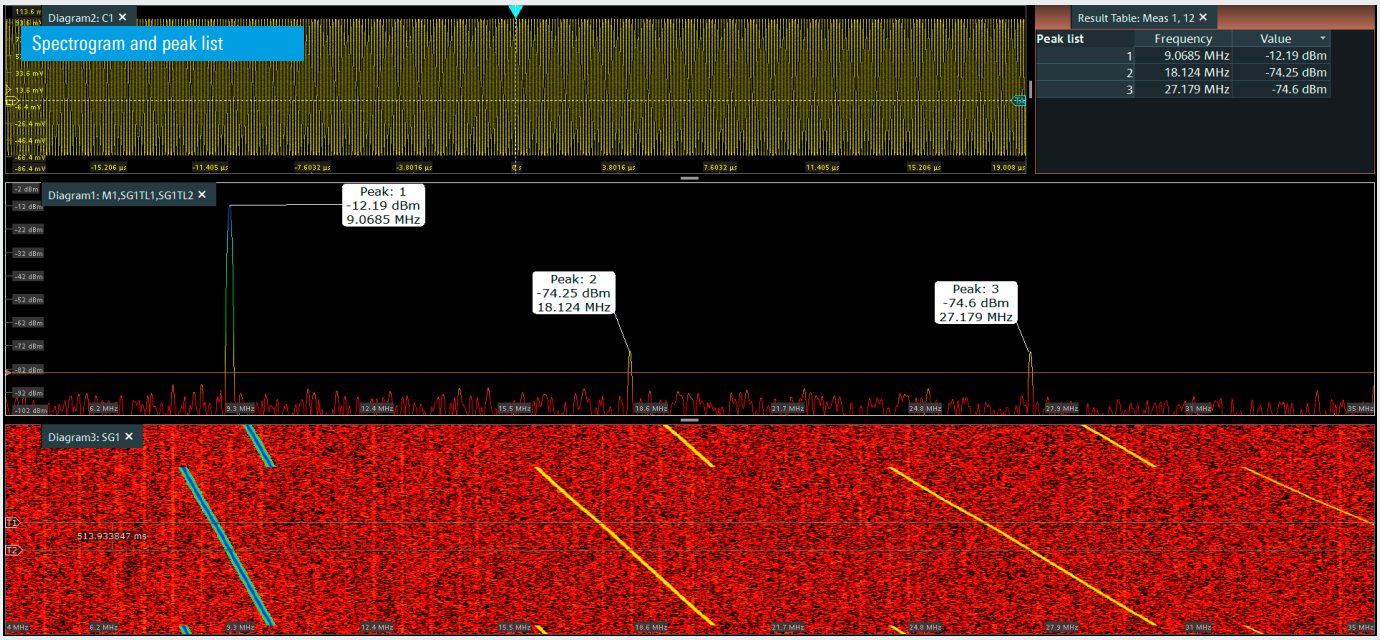
The R&S®RTO6 spectrum analysis option is ideal for analyzing time varying signals in the frequency domain. Its spectrogram is a color-coded frequency-timing diagram that displays the spectral power over time. It indicates how the spectrum varies over time in a two-dimensional intensity diagram. R&S®RTO6 oscilloscopes allow you to quickly analyze voice and AM/FM modulated signals as well as signals from radar and frequency-hopping systems.

## Frequency analysis with logarithmic display

The R&S®RTO6 oscilloscope spectrum analysis option enables logarithmic frequency scaling for spectrum and spectrogram displays.

## Fast results with automatic peak list measurement

The peak list measurement automatically detects peaks in the FFT spectrum and indicates their magnitude and frequency in the spectrum graph and in a result table.



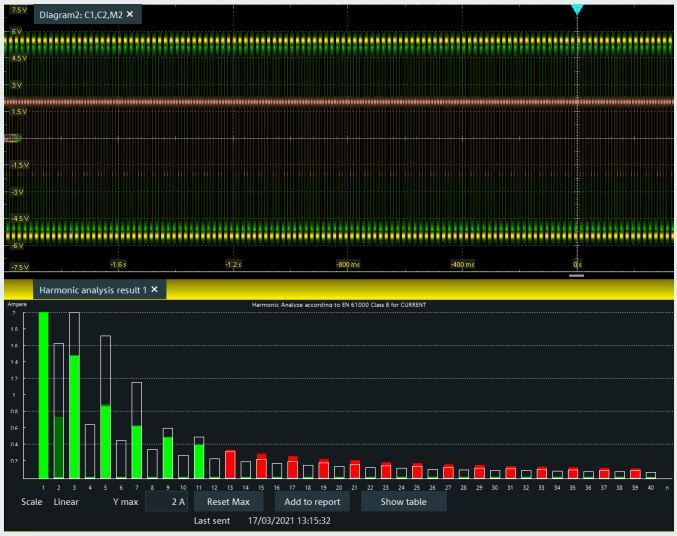
# POWER ANALYSIS AND EMI DEBUGGING

## Engineered for power and EMI measurements

- **See power signal details with up to 16 bit resolution**
- **Maintain fast sampling rates with deep memory**
- **Visualize sporadic emissions**
- **Specialized measurement functions: fast and accurate results**
- **Extensive probe portfolio: high voltage and current probes**

### See power signal details with up to 16 bit resolution

Even the smallest signal details of a high dynamic signal matter in power measurements, for example when verifying $RDS_{on}$ of a MOSFET. The HD mode of R&S®RTO6 oscilloscopes increases the vertical resolution to up to 16 bit, so that previously unseen signal details become visible and measurable.




### Specialized measurement functions and harmonic current analysis

Characterize power electronics with the R&S®RTO6 oscilloscope power analysis option. Automated measurement functions analyze the turn on/off behavior, the internal transfer function, the safe operating area (SOA), the output signal quality and switching losses. You can also test all common international standards.

### Maintaining fast sampling rates with deep memory

Analyzing start-up, shut-down or transients of power supplies requires a high sample rate and long recording times. With up to 1 Gpoints memory, R&S®RTO6 oscilloscopes enable recording of lengthy sequences while maintaining high sampling rates of up to 20 Gsample/s.

| Power measurement functions | |
|---|---|
| Input | quality, inrush current, harmonics (precompliance checking for IEC 61000-3-2 (A, B, C, D), RTCA DO-160, MIL-STD-1399) |
| Switching/control loop | slew rate, modulation, dynamic on-resistance |
| Power path | efficiency, loss, safe operating area (SOA), turn on/off |
| Output | ripple, spectrum (double-logarithmic scale), transient response |
| Deskew | automated |

### Detect weak emissions with high dynamic range and input sensitivity

The high dynamic range and input sensitivity of 1 mV/div at full measurement bandwidth make it possible to detect even weak emissions with R&S®RTO6 oscilloscopes. The powerful FFT capabilities are ideal for EMI analysis in the frequency domain thanks to their easy operation, high acquisition rate and manifold functions, such as color coding of the spectral display according to frequency of occurrence.

### Extensive analysis for EMI debugging

The mask trigger in the frequency domain is ideal for detecting sporadic emission frequencies. The stop-on-violation condition halts acquisition if the spectrum violates the frequency mask. The gated FFT capability provides better insight by displaying the time and frequency domain correlation over a user-defined window.

### Probes for high voltage, current and near-field measurements

The Rohde&Schwarz oscilloscope probe portfolio includes specific probes for power measurements and EMI debugging. The portfolio covers high voltage probes and differential probes for voltages up to 6000 V (peak) with exceptional common mode rejection ratios over a broad frequency range, as well as current probes for accurate, non-intrusive measurements of DC and AC currents in the range of 1 mA to 2000 A with a maximum bandwidth of up to 120 MHz. E and H near-field probes are available for the frequency range from 9 kHz to 3 GHz with optional preamplifier for EMI debugging.

# POWER INTEGRITY

## Debugging and validating power rails

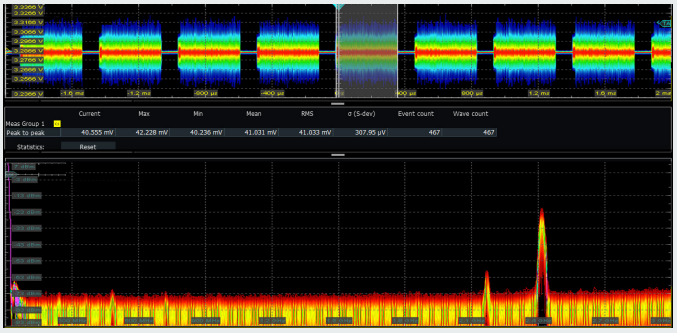
- **Accurately measure power ripple and PARD**
- **Find coupled sources with fast FFT**
- **Power rail characterization with high-fidelity probes**
- **Large DC offsets and integrated high precision DC voltmeter**

### Accurately measure ripple and PARD

As power rail tolerance levels decrease, accurately measuring power ripple becomes increasingly difficult. The inherent low noise of R&S®RTO6 oscilloscopes enables accurate power integrity measurements at the millivolt level. The fast update rate of the oscilloscopes allows you to quickly see infrequent and worst case ripple as well as periodic and random disturbance (PARD) anomalies.

### Measuring small voltages riding on large DC offsets

With the ±60 V offset compensation range, the R&S®RT-ZPR power rail probes allow you to focus on small ripples in the power rail DC voltage. Whether you need to zoom in on a 1 V or much higher DC level, the probe provides the required offset while maintaining the highest vertical resolution.



### Find coupled sources

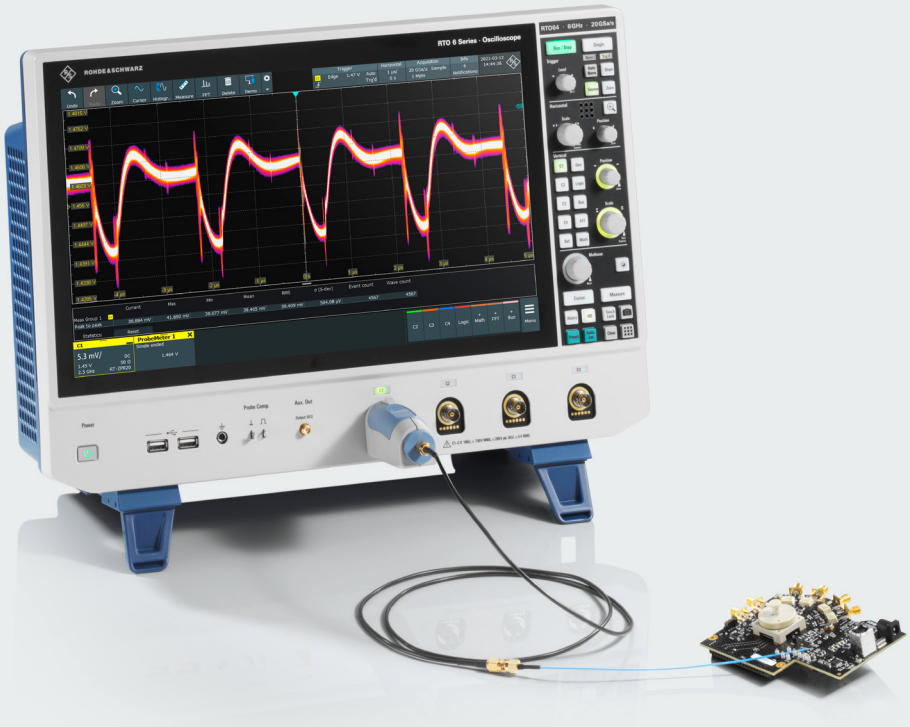
The most capable FFT in the industry lets you can see switching characteristics or quickly scan for sources coupled with the power rail. The FFT algorithm allows you to analyze the spectrum independently of the time domain settings. This provides a quick and comprehensive picture of your power rails.

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

The R&S®ProbeMeter lets you see the oscilloscope waveform and DC value regardless of other instrument settings, just like a highly accurate voltmeter. All voltage probes with Rohde&Schwarz probe interfaces support the R&S®ProbeMeter.

### Power rail characterization with high fidelity probes

High bandwidth, high sensitivity, very low noise and an extra-large offset compensation make the R&S®RT-ZPR an excellent probe for characterizing power rails. With a bandwidth of up to 4 GHz, excellent sensitivity thanks to the 1:1 attenuation ratio and low noise, the R&S®RT-ZPR is ideal for precise ripple measurements. Coupled with the powerful frequency analysis capabilities of the oscilloscope, R&S®RT-ZPR probes can be used to isolate PARD. An integrated high-precision DC voltmeter provides an instantaneous DC voltage readout in parallel.



# SERIAL BUS ANALYSIS

## Easy triggering, decoding and protocol analysis

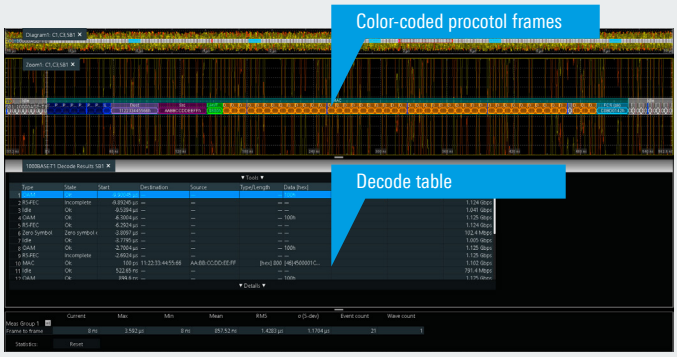
- **Hardware-based triggering and decoding for fast analysis**
- **Decoding of up to four serial buses simultaneously**
- **Advanced bus measurements for in-depth analysis**
- **Search functions for easier analysis of long and complex signals**

### Isolate protocol specific events

The R&S®RTO6 makes tracking down protocol errors or specific parts of a frame straightforward with a protocol aware trigger. The oscilloscope offers hardware-based triggering on specific protocol content, such as addresses, data and protocol errors.

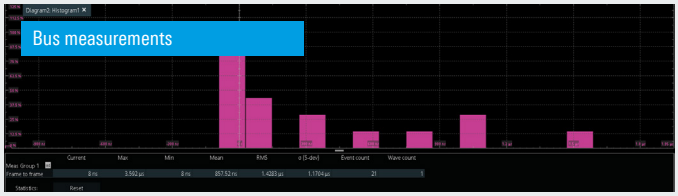
### High acquisition rate for finding errors quickly

Data errors on serial interfaces are frequently the result of sporadic signal faults from borderline timing of logic components. The high acquisition rate of R&S®RTO6 oscilloscopes is ideal for finding such signal faults because they decode the protocol-specific trigger results very quickly. So, errors are swiftly found and immediately displayed.




### Advanced bus measurements

R&S®RTO6-K500 bus measurement option enables in-depth analysis of decoded data. For example, you can quickly determine the stability of a bus by detecting the frame error rate including consecutive frame errors. Analyze bus timing by measuring the delay between frames or between any trigger event and the bus frame.




### Fast and efficient data search

Comprehensive search and filter functions simplify analysis of long signal sequences. They permit users to quickly track down specific data types, content and errors. All detected events are shown in a table with timestamps. The user can then examine the individual events in a zoom window with associated timing correlation and navigate between events.

### Segmented memory for long time capture

Standard segmented memory is ideal for serial protocols. It allows you to capture only the relevant packets and ignore the long idle time in between packets. The R&S®RTO6 can capture more than 100 000 timestamped packets.

| Trigger and decode packages | | Included protocols |
|---|---|---|
| R&S®RTO6-K500 | bus analysis | |
| R&S®RTO6-K510 | low speed serial buses | I²C/SPI/RS-232/UART/I²S/LJ/RJ/TDM/Manchester/NRZ |
| R&S®RTO6-K520 | automotive protocols | CAN/LIN incl. CAN-dbc file import/CAN FD, FlexRay™ incl. Fibex file import/SENT/CXPI |
| R&S®RTO6-K530 | aerospace protocols | MIL-STD-1553/ARINC 429/SpaceWire |
| R&S®RTO6-K540 | Ethernet protocols | 10BASE-T/100BASE-TX/MDIO |
| R&S®RTO6-K550 | MIPI RFFE | MIPI RFFE |
| R&S®RTO6-K560 | automotive Ethernet | IEEE 100BASE-T1/IEEE 1000BASE-T1 |
| R&S®RTO6-K570 | USB protocols | USB 1.0/1.1/USB 2.0/HSIC/USB 3.1 Gen 1, USB Power Delivery (USB-PD)/USB SSIC |
| R&S®RTO6-K580 | MIPI M-PHY, D-PHY | MIPI D-PHY/M-PHY/UniPro/decoding for DSI und CSI-2 |
| R&S®RTO6-K590 | PCI Express | 8b10b (up to 6.25 Gbit/s)/ PCI Express Revision 1.x/2.x |
| R&S®RTO6-TDBDL | trigger and decode bundle | R&S®RTO6-K500/-K510/-K520/-K530/-K540/-K550/-K560/-K570/ -K580/-K590 |

# AUTOMATED COMPLIANCE TESTS

## Validate your design

- **Easy configuration and automatic control**
- **Flexible test execution**
- **Straightforward, configurable reports**

### Easy configuration and automatic control

R&S®ScopeSuite is a generic compliance test software that runs on the R&S®RTO6 oscilloscope or separate PC. It controls the measurement settings and test sequences on the oscilloscope and guides you through all the selected tests based on the test setup. Detailed instructions make it easy to correctly connect the oscilloscope and probes to the test fixture and DUT. User data, the test setup settings and measurement report definitions are easy to configure. The limit editor lets you individually adjust standard-specific test limits.

### Straightforward, configurable reports

Documenting the measurement results is essential to compliance tests. R&S®ScopeSuite offers an extensive range of documentation functions. You can add measurement details and screenshots to the pass/fail results. Available output formats are PDF, DOC and HTML.

**High Speed USB Device Test Report**

**High Speed Signal Quality - EL_4**

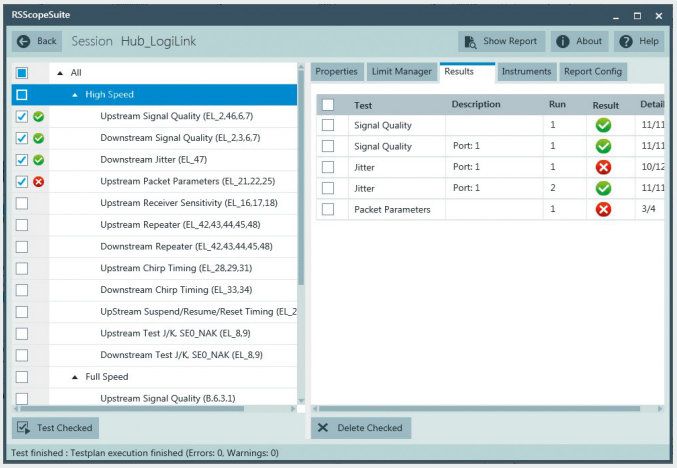
| | |
|---|---|
| Description | Template 1 transform waveform at TP3 |
| Run | 1 |
| Result | Pass |
| Time | 11/07/2012 11:22:16 |

**Additional Information**

| Measurement | Value | Limits |
|---|---|---|
| Signal Eye | Pass | Meet Tpl 1 Tx Wfm Rqmt |
| Consecutive Jitter RMS | 27,2 ps | |
| Paired JK Jitter RMS | 23,971 ps | |
| Paired KJ Jitter RMS | 27,589 ps | |

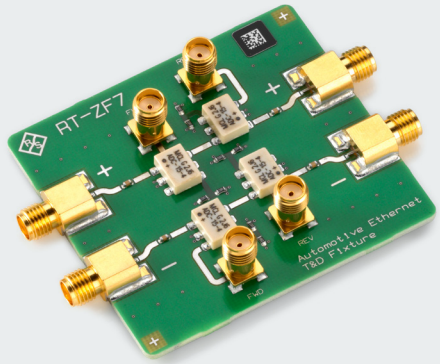
### Flexible test execution

For debugging during development or stability tests, you can repeat single tests or a sequence of tests as often as required. Between single tests, you can change limit lines or other parameters for every test and compare their impact on the results. For documentation, R&S®ScopeSuite generates a test report from the selected test results.




### Test fixture sets from Rohde&Schwarz

Rohde&Schwarz offers test fixture sets in line with the different interface standards to connect the measuring equipment and the DUT.




| Compliance option | Included protocol |
|---|---|
| R&S®RTO6-K21 | USB2.0 |
| R&S®RTO6-K22 | 10M/100M/1G-BASE-T/EE Ethernet |
| R&S®RTO6-K23 | 2.5/5/10G-BASE-T Ethernet |
| R&S®RTO6-K24 | 100BASE-T1 Ethernet |
| R&S®RTO6-K26 | MIPI D-PHY |
| R&S®RTO6-K27 | MIPI D-PHY 2.5 |
| R&S®RTO6-K81 | PCIe 1.1/2.0 (up to 2.5 GT/s) |
| R&S®RTO6-K87 | 1000BASE-T1 Ethernet |
| R&S®RTO6-K88 | MGBASE-T1 |
| R&S®RTO6-K89 | 10BASE-T1 Ethernet |
| R&S®RTO6-K91 | DDR3/DDR3L/LPDDR3 |
| R&S®RTO6-K92 | eMMC |

# SERIAL INTEGRITY ANALYSIS

## Extensive debugging and analysis capabilities

- **Powerful basic jitter analysis**
- **Deep system insights with jitter and noise decomposition**
- **Clock data recovery for analyzing embedded clock signals in real time**
- **Serial pattern trigger**

### Powerful basic jitter analysis functions

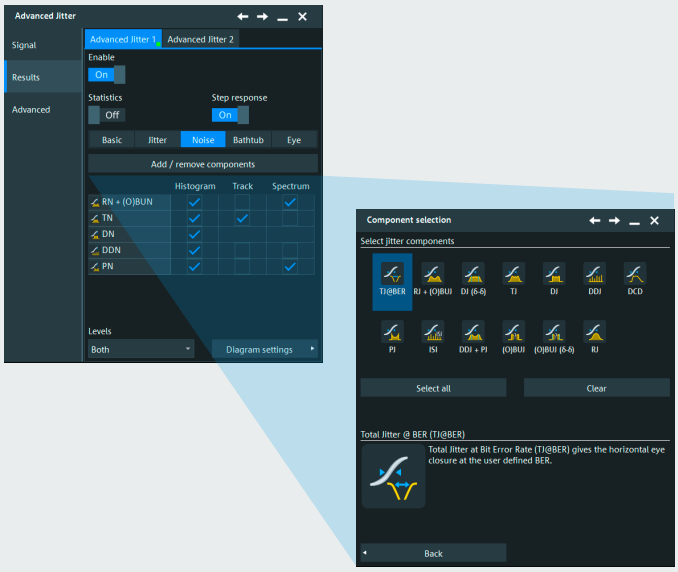
Get your jitter analysis of clock and data signals on track with automated jitter measurements for cycle-to-cycle jitter and time interval errors (TIE) and other tools like track, long-term trend and FFT. Frequency interference can be determined by applying FFT analysis to the cycle-to-cycle TIE jitter measurement track for example.

### Jitter and noise measurement functions

| R&S®RTO-K134 option | | | |
|---|---|---|---|
| R&S®RTO-K133 option | | TJ (meas.) | TN (meas.) |
| R&S®RTO-K12 option | | TJ (at BER) | EH (at BER) |
| **Standard functions** | cycle-to-cycle jitter | RJ | RN RN + OBUN |
| Period | N-cycle jitter | RJ + OBUJ | DN |
| Frequency | cycle-to-cycle width | DJ | DDN |
| Setup | cycle-cycle duty | DJ (δδ) | ISIN |
| Setup/hold time | cycle | DDJ | LD |
| Setup/hold ratio | time interval error | ISI | PN |
| | data rate | DCD | DDN + PN |
| | unit interval | PJ | OBUN |
| | skew delay | DDJ + PJ | OBUN (δδ) |
| | skew phase | OBUJ | |
| | | OBUJ (δδ) | |

### Deep system insights with jitter and noise decomposition

Gain more insights into your transmitter interface by decomposing jitter and noise into random (RJ/RN) and deterministic components, such as data dependent (DDJ/DDN) and periodic (PJ/PN) or other bounded uncorrelated components (OBUJ/OBUN). Calculating step responses that fully characterize the deterministic behavior of a transmission system enable ccurate measurement results even for relatively short signal sequences. In addition, synthetic eye diagrams and BER bathtub curves provide deeper insight into overall system behavior, individual jitter. Noise components can be displayed in histogram, track and spectrum view.

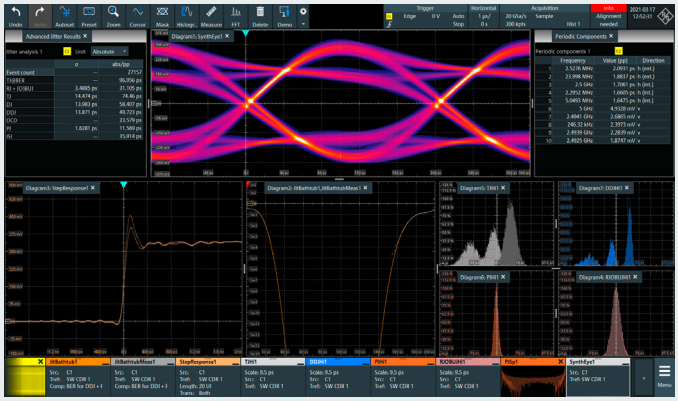



### Serial pattern trigger

Combine the R&S®RTO6 with optional hardware-based clock data recovery or parallel clock signal to trigger on any serial interface data pattern of up to 16 byte with bit rates between 100 kbps and 2.5 Gbps. All analysis options are available.

### Clock data recovery for analyzing embedded clock signals in real time

R&S®RTO6 oscilloscopes enable real-time clock data recovery of embedded clocks from serial interfaces thanks to their unique digital trigger architecture. As a result, eye and histogram measurements run continuously over a long period of time without any postprocessing. The hardware-based clock data recovery operates at the full acquisition rate without restricting oscilloscope functions. Furthermore, all automated jitter measurements can be performed on the recovered clock signal.



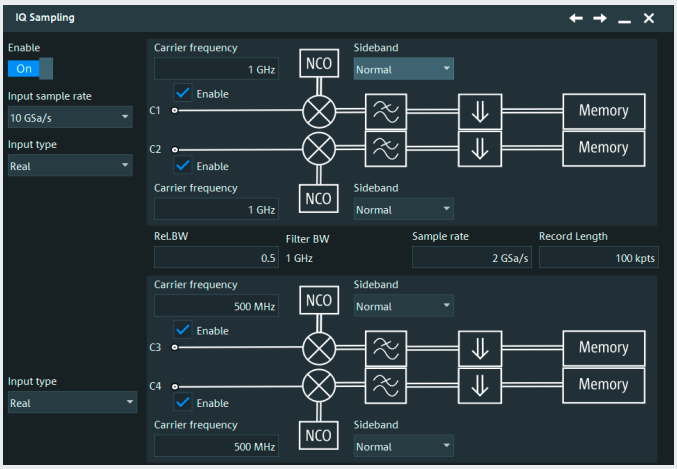
# WIDEBAND RF AND SIGNAL ANALYSIS

## Analyze I/Q data

- **Real-time conversion of modulated signals to I/Q data**
- **Precise wideband RF signal analysis**
- **Advanced signal analysis**

### Real-time conversion of modulated signals to I/Q data

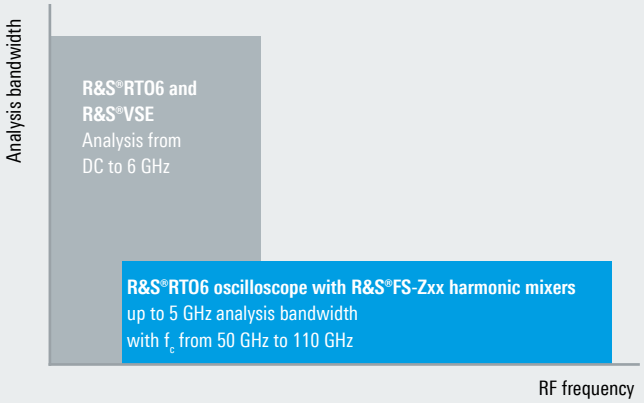
The I/Q interface of R&S®RTO6 oscilloscopes simplifies analysis of modulated signals by converting to I/Q data in real-time. The dedicated R&S®VSE vector signal explorer software or third-party tools such as MATLAB® support further I/Q data processing.




### Multichannel RF signal analysis

R&S®RTO6 oscilloscopes enable multichannel wideband RF measurements up to 6 GHz. When combined with R&S®FS-Zxx harmonic mixers, RF carrier frequencies between 50 GHz and 110 GHz are supported with an analysis bandwidth of 5 GHz. With outstanding RF characteristics of –159 dBm (1 Hz) and 112 dB SNR, the R&S®RTO6 is qualified to accurately analyze RF signals.

### RF analysis




### Advanced signal analysis

The R&S®RTO6 lets you analyze complex signals such as OFDM, radar and 5G MIMO signals with the help of R&S®VSE vector signal explorer software. The software offers a wide range of analysis tools for a large variety of modulated signals, ranging from pulsed and analog modulated signals to generic I/Q signals along with wireless and mobile communications standards such as LTE, 5G NR and WLAN.

### Advanced RF analysis capabilities with the R&S®RTO6 oscilloscope

# LOGIC ANALYSIS

## Enhance your mixed-signal analysis capabilities

- **Mixed-signal option for logic analysis**
- **Additional 16 digital channels with no reduction of analog channels**
- **More signal details thanks to high time resolution over the entire memory depth**
- **Precise triggering on signal events**
- **Low test point loading from active probing**

### Enhanced analysis capabilities with mixed-signal option

The unique R&S®RTO6 plug & play concept makes upgrading easy. The R&S®RTO6-B1 mixed-signal option (MSO) option adds 16 digital channels and is quick to install on site without opening the oscilloscope. Simply insert it into the slot on the rear panel and use all 16 digital channels of the MSO without losing any of the 4 analog input channels.

### Straightforward display of digital signals

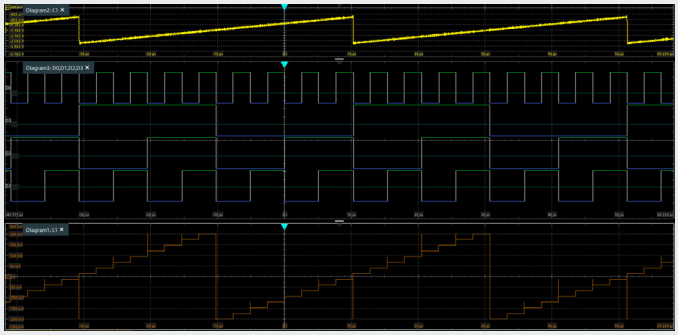
The R&S®RTO-B1 option supports 16 digital channels and simultaneous decoding of up to four parallel buses. Each bus is represented by an icon on the edge of the screen. The R&S®SmartGrid function lets you simply drag & drop icons onto the screen. The icons clearly show the current status of all activated logic channels (high, low, toggle) regardless of other oscilloscope settings.

**Specifications: R&S®RTO6-B1 MSO option**

- 16 digital channels (2 logic probes with 8 channels each)
- Max. 400 MHz signal frequency
- Max. 5 Gsample/s per channel sampling rate
- Max. 200 Msample per channel acquisition memory
- High input impedance: 100 kΩ
- Low input capacitance: 4 pF

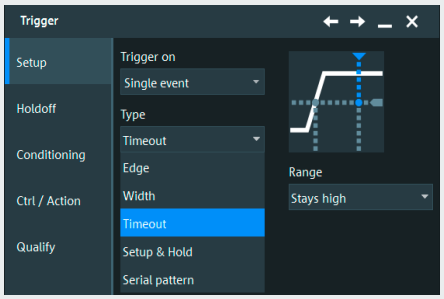
### High time resolution over the entire memory depth

With a sampling rate of 5 Gsample/s, the R&S®RTO6-B1 mixed signal option (MSO) provides a maximum time resolution of 200 ps for all digital channels. This sampling rate is available over the entire memory depth of 200 Msample per channel. As a result, the MSO option can detect critical events such as narrow or widely separated glitches.



### Precise triggering on signal events

The R&S®RTO6-B1 option offers numerous triggers for debugging and analysis, such as edge, width, pattern and serial pattern. These triggers can be combined with holdoff conditions. Choose either individual digital channels or bus signals as trigger sources. The digital channel resolution of 200 ps makes these channels a precise trigger source.




### Analysis of parallel and serial protocols with digital channels

Use digital channels to decode parallel buses. They are displayed in a digital bus format or as an analog waveform. For clocked parallel buses, the decoded contents can also be displayed in a table. You can also use the digital channels of the R&S®RTO-B1 option to decode serial interface protocols such as SPI and I²C.

# SPECIALIZED SIGNAL ANALYSIS

## Measurement options for in-depth measurements

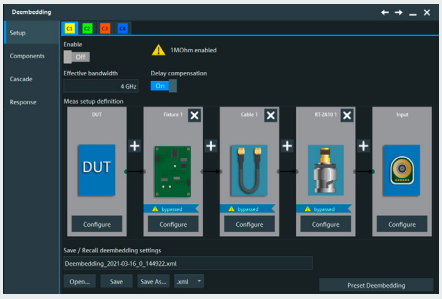
- **Realtime math for differential signals**
- **Deembedding for waveform correction**
- **Characterization and debugging of signal paths**
- **Differential pulse signal with configurable parameters**

### Realtime math for differential signals

The R&S®RTO6 features a math module directly before the trigger system. It supports add, subtract and common mode calculation for two input channels. This enables fast analysis of differential signals, including triggering on the differential or common mode voltage. The math module also allows inversion of input signals.

### Deembedding

Transmission losses caused by the signal path can be corrected by activating the deembedding option. A cascade of signal path blocks can be defined here. The individual blocks are described by S-parameters that can be derived from simulation or measured with a vector network analyzer. The deembedding software automatically calculates the correction filter for the overall system response.




### Differential pulse source with configurable parameters

The R&S®RTO6-B7 pulse source provides a highly symmetrical differential pulse signal with a steep rise time of 22 ps. The key pulse source parameters are user adjustable. The output level ranges from –50 mV to –200 mV and can be set in 10 mV steps. The pulse repetition rate and the duty cycle are programmable in the range of 5 Hz to 250 MHz and 10% to 90%. The pulse source can be locked to the R&S®RTO6 reference clock or set to free running mode to avoid deterministic conditions for certain test applications.

### Time-domain reflection/transmission (TDR/TDT)

The TDR/TDT option of R&S®RTO6 oscilloscopes combines the R&S®RTO6-B7 pulse source and the analog input channels to obtain a time-domain reflection (TDR) and transmission (TDT) analysis system. It supports the characterization and debugging of signal paths, including PCB traces, cables and connectors with single-ended measurements. A setup wizard guides the user through setup, calibration and analysis. The resulting waveforms are displayed as impedance or reflection coefficients versus time or distance. In addition, all oscilloscope analysis tools such as cursor and automated measurements can be used.

| Differential pulse source | Value range |
|---|---|
| Analog bandwidth, rise time | > 16.5 GHz, 22 ps |
| Skew | < 0.5 ps |
| Output low level | –200 mV to –50 mV, 10 mV steps |
| Repetition rate | |
| Locked | 5/10/20/50/100/200/500 Hz, 1/5/10/25/50/100/250 MHz |
| Free running | 5/10/20/50/100/200/500 Hz, 1/5/10/25/50 MHz |
| Duty cycle | |
| Repetition rate < 5 MHz | 10% to 90%, 10% steps |
| Repetition rate > 5 MHz | 50% (const.) |
| Clock mode | locked, unlocked/free running |

### Application as DUT stimulus or deskewing

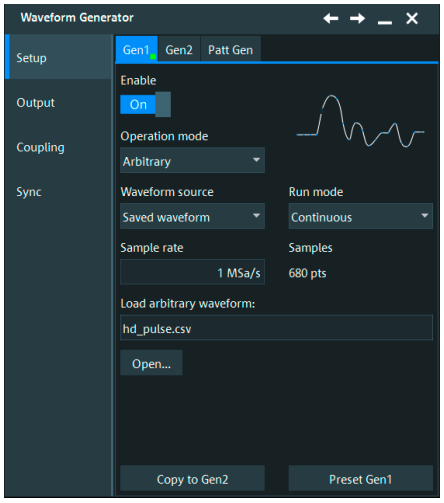
The R&S®RTO6-B7 can be easily set up as a stimulus for a DUT. For example, as a precise clock or as a pulse input with a fast rise time for testing receiver characteristics with TDR/TDT measurements. With an output skew of < 0.5 ps, the R&S®RTO6-B7 also provides an accurate source for deskewing measurement setups with multiple channels. Thanks to its differential nature, the R&S®RTO6-B7 is ideal for deskewing cables and probes for differential measurements.

# COMPACT AND CONFIGURABLE
## WAVEFORM GENERATION

- **Comes with a two-channel 100 MHz arbitrary waveform generator**
- **Single-ended and differential interface stimulation**
- **Test your device with native signals**

### 100 MHz arbitrary waveform generator

The R&S®RTO6 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 can be used for education purposes 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.




### Single-ended and differential interface stimulation

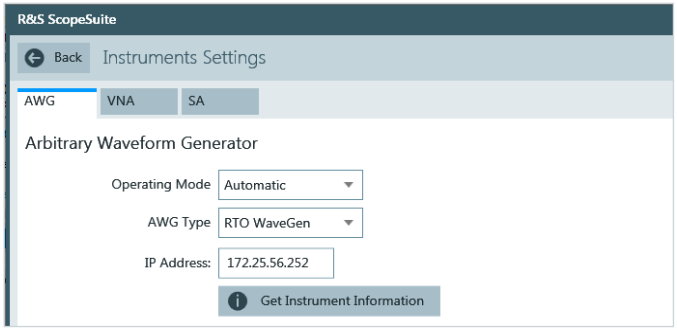
The generators can be coupled and offset from each other when testing differential devices. With the ability to offset amplitude and phase in coupled mode, you can simulate both ideal and non-ideal conditions. Differential devices, such as differential amplifiers or I/Q mixers, can be tested against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

### Test your device with native signals

Testing your device with real-world signals opens up a new method for testing the limits of your design. The R&S®RTO6-B6 arbitrary waveform generator lets you play back waveforms 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.

### Fully automated compliance tests

Compliance tests can be fully automated with the R&S®RTO6-B6 arbitrary waveform generator, eliminating the need for an external signal source. R&S®ScopeSuite can control the waveform generator and provide the disturbing signal needed for Ethernet compliance testing, making the R&S®RTO6 the most compact compliance test solution on the market.




**Specifications: R&S®RTO-B6 option**

- 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

# ACCESSORIES

## Safe transport and easy rack mounting

An extensive selection of storage and transportation accessories means R&S®RTO6 oscilloscopes are 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®RTO6 for easy accessibility.

| Accessories | |
|---|---|
| Front cover | R&S®RTO6-Z1 |
| Soft carrying case | R&S®RTO6-Z3 |
| Transit case, with trolley function | R&S®RTO6-Z4 |
| 19" rackmount kit | R&S®ZZA-RTO6 |

# EXTENSIVE PROBE PORTFOLIO

## THE RIGHT PROBE FOR THE BEST MEASUREMENT

- **Extensive probe range for all measurement tasks**
- **Micro button for convenient instrument control**
- **R&S®ProbeMeter: integrated voltmeter with 0.1 % measurement uncertainty for precise DC measurements**
- **Comprehensive accessories for maximum flexibility during contacting**

### Extensive probe range for all measurement tasks

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

### Multi-channel power probes

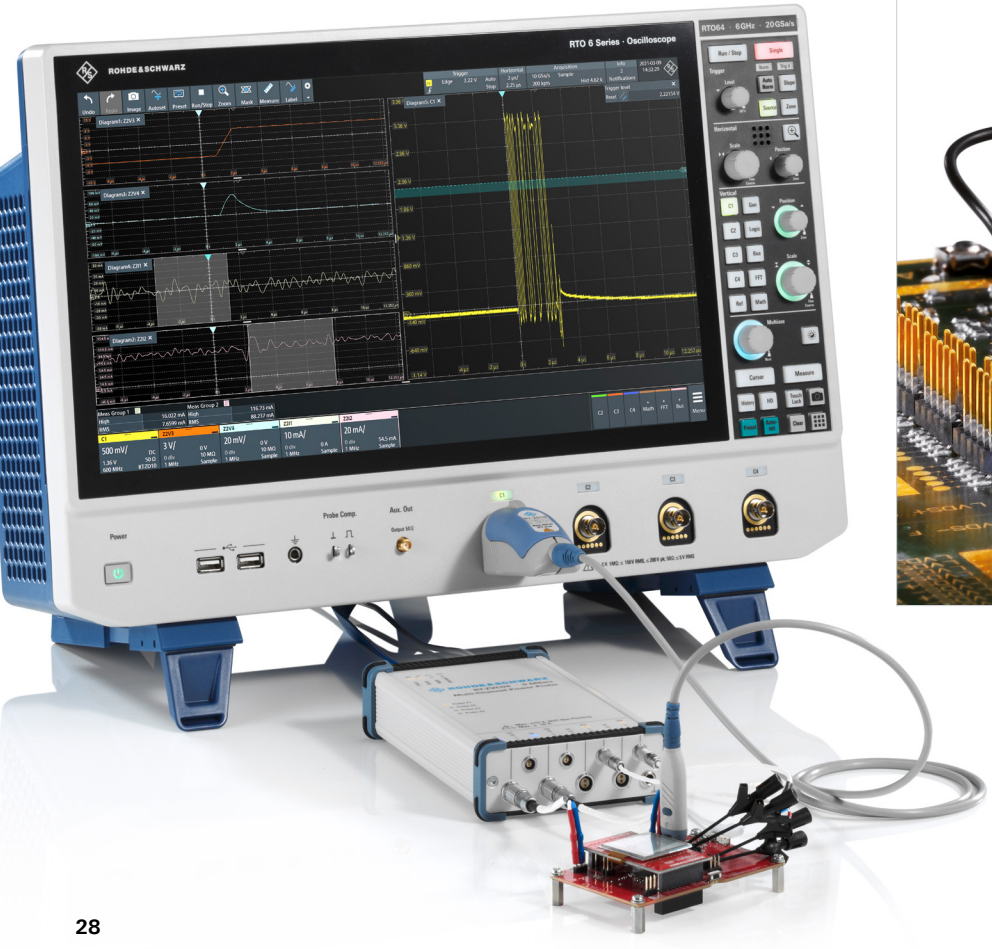
The R&S®RT-ZVC multi-channel power probe offers up to four voltage and four current channels with 18 bit resolution for high dynamic range measurements. With up to two R&S®RT-ZVC probes supported by an R&S®RTO6 oscilloscope, you can analyze eight high dynamic range voltage and eight high dynamic range current signals synchronized with signals captured by the oscilloscope inputs.

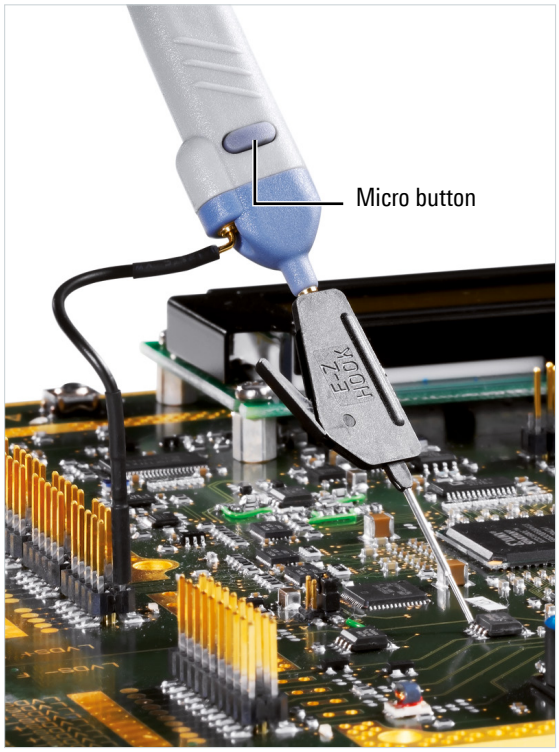
### Micro button for convenient instrument control

The situation is all too familiar: you have carefully positioned the probe on the DUT and want to start measurements but no free hand. The micro button on Rohde&Schwarz active probes solves the problem. It is conveniently situated on the probe tip, and you can assign it different functions, such as run/stop, autoset and adjust offset.

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

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



## Rohde&Schwarz offers a comprehensive probe portfolio meet every probing need.

### Standard passive probes
**38 MHz to 500 MHz**

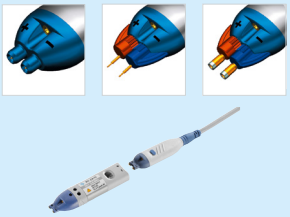
R&S®RT-ZP10, R&S®RT-ZP1x, R&S®RT-ZP03S

Passive probes are standard accessories for Rohde&Schwarz oscilloscopes. They are low-cost, general purpose probing solutions for a broad range of applications.

### Single ended broadband probes
**1 GHz to 6 GHz**

R&S®RT-ZS10L, R&S®RT-ZS10E, R&S®RT-ZS10, R&S®RT-ZS20, R&S®RT-ZS30, R&S®RT-ZS60

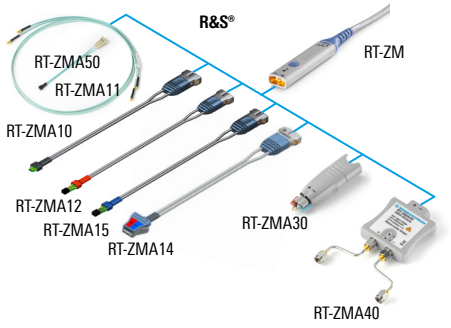
A particularly wide dynamic range, exceptionally low offset and gain errors and the right accessories make these probes the ideal accessory for Rohde&Schwarz oscilloscopes.



### Differential broadband probes
**200 MHz to 4.5 GHz**

R&S®RT-ZD10, R&S®RT-ZD20, R&S®RT-ZD30, R&S®RT-ZD40

A flat frequency response and a high input impedance with low input capacitance permit precise measurements on differential signals while keeping the DUT load low. The high common mode rejection over the entire probe bandwidth ensures high immunity to interference. Special browser adapters allow flexible contacting with high signal fidelity.




### Modular broadband probes
**1.5 GHz to 16 GHz**

R&S®RT-ZM15, R&S®RT-ZM30, R&S®RT-ZM60, R&S®RT-ZM90, R&S®RT-ZM130, R&S®RT-ZM160

The R&S®RT-ZM modular probe system delivers high performance in combination with flexible and configurable connectivity. The system includes probe tip modules for various measurement tasks and conditions.

### Power rail probes
**2 GHz and 4 GHz**

R&S®RT-ZPR20, R&S®RT-ZPR40

High bandwidth, high sensitivity, very low noise and extra-large offset compensation make the R&S®RT-ZPR power rail probes an excellent tool for characterizing power rails. An integrated high accuracy DC voltmeter provides instantaneous DC voltage readout.

### High voltage probes
**25 MHz to 400 MHz;**
**±700 V to ±6000 V**

R&S®RT-ZH03, R&S®RT-ZH10, R&S®RT-ZH11, R&S®RT-ZHD07, R&S®RT-ZHD15, R&S®RT-ZHD16, R&S®RT-ZHD60

The Rohde&Schwarz portfolio of high voltage probes includes passive single-ended and active differential probes for voltages up to 6000 V (peak). Different models allow measurements up to CAT IV environments. Differential probes provide an exceptional common mode rejection ratio over a broad frequency range.

### Current probes
**20 kHz to 120 MHz**

R&S®RT-ZC02, R&S®RT-ZC03, R&S®RT-ZC05B, R&S®RT-ZC10, R&S®RT-ZC10B, R&S®RT-ZC15B, R&S®RT-ZC20, R&S®RT-ZC20B, R&S®RT-ZC30, R&S®RT-ZC31

Rohde&Schwarz current probes enable accurate, non-intrusive measurement of DC and AC currents. Different models are available to measure currents in the range of 1 mA to 2000 A with a maximum bandwidth of up to 120 MHz. Current probes are available with Rohde&Schwarz probe interface or BNC with external power supply

### Multi-channel power probes
**1 MHz**

R&S®RT-ZVC02, R&S®RT-ZVC04

Multi-channel power probe with 2 (or 4) voltage and 2 (or 4) current channels with 18 bit resolution. Up to two R&S®RT-ZVC probes are supported on an R&S®RTO6 oscilloscope. Capture eight voltage and eight current signals synchronized with the four oscilloscope channels.

### EMC near-field probes
**2 GHz and 4 GHz**

R&S®HZ-15, R&S®HZ-17

Powerful E and H near-field probes for the frequency range from 9 kHz to 3 GHz with optional preamplifier expand the application range of the R&S®RTO6 oscilloscope series to include EMI debugging.

# FUTURE-PROOF YOUR INSTRUMENT

## AN OSCILLSCOPE THAT EVOLVES WITH YOUR NEEDS

- **After-purchase bandwidth upgrades**
- **Regular firmware improvements**
- **Software options that support future technologies**
- **No hidden subscription fees**
- **Flexible hardware options**

### Easy bandwidth upgrades for faster signals

Upgrading the bandwidth of an R&S®RTO6 oscilloscope to 1 GHz, 2 GHz or 3 GHz is possible without sending in the instrument to be serviced. Bandwidth upgrades to 4 GHz or 6 GHz benefit from a complete check of the instrument and calibration at a Rohde&Schwarz service center.

### Firmware updates

Regular firmware updates consistently add new basic functions to R&S®RTO6 oscilloscopes. Download the latest firmware version at www.rohde-schwarz.com and use a USB storage device or LAN connection for installation. Your R&S®RTO6 oscilloscope is always up-to-date.

### Application-specific software options

Unlocking comprehensive software options on R&S®RTO6 oscilloscopes enables the highly-specialized measurements required by state-of-the-art technologies. The constantly growing portfolio of new software options can cover your future test needs – even after purchasing the instrument:

- Triggering and decoding of serial protocols
- Automatic compliance tests on fast interfaces
- Detailed options for jitter analysis and power analysis
- Spectrum, power and signal analysis

### On-site configuration of hardware options

The plug&play hardware concept enables R&S®RTO6 oscilloscopes to easily adapt to new requirements. Quick installation without opening the instrument is supported for all hardware options, such as digital channels for logic analysis or the waveform generator. This approach has many advantages:

- Straightforward extensibility for future tasks
- On-site installation of options in minutes
- No need to align or recalibrate after installing options

### Exchangeable solid-state disk

No tools are needed to exchange the R&S®RTO6 solid-state drive, keeping confidential data protected at all times.

Rear view

# SPECIFICATIONS OF BASE UNIT

| Vertical system | | |
|---|---|---|
| Input channels | | 4 channels |
| Input impedance | | 50 Ω ± 2.5%<br>50 Ω ± 1.5% (typ.),<br>1 MΩ ± 1% \|\| 15 pF (meas.) |
| Analog bandwidth (–3 dB) | at 50 Ω input impedance | |
| | R&S®RTO6-B90 option | ≥ 600 MHz |
| | R&S®RTO6-B91 option | ≥ 1 GHz |
| | R&S®RTO6-B92 option | ≥ 2 GHz |
| | R&S®RTO6-B93 option | ≥ 3 GHz |
| | R&S®RTO6-B94 option | ≥ 4 GHz |
| | R&S®RTO6-B96 option | ≥ 6 GHz on 2 channels,<br>≥ 4 GHz on 4 channels |
| | at 1 MΩ input impedance | ≥ 500 MHz (meas.) |
| Bandwidth limit filters | | brick wall (noise optimized),<br>Gaussian (step-response optimized) |
| Analog bandwidth limits | max. –1.5 dB, min. –4 dB | 200 MHz, 20 MHz |
| Rise time/fall time | 10% to 90% at 50 Ω, bandwidth limit Gaussian, except R&S®RTO6-B94 option brick wall (meas.) | |
| | R&S®RTO6-B90 option | 528 ps |
| | R&S®RTO6-B91 option | 319 ps |
| | R&S®RTO6-B92 option | 188 ps |
| | R&S®RTO6-B93 option | 135 ps |
| | R&S®RTO6-B94 option | 104 ps |
| | R&S®RTO6-B96 option | 77 ps |
| Input VSWR | input frequency | R&S®RTO6-B90, R&S®RTO6-B91, R&S®RTO6-B92, R&S®RTO6-B93, R&S®RTO6-B94 options |
| | ≤ 2 GHz | 1.25 (meas.) |
| | > 2 GHz | 1.4 (meas.) |
| | input frequency | R&S®RTO6-B96 option |
| | ≤ 2 GHz | 1.25 (meas.) |
| | > 2 GHz to ≤ 4 GHz | 1.6 (meas.) |
| | > 4 GHz | 2.0 (meas.) |
| Vertical resolution | | 16 bit system architecture |
| Effective number of bits (ENOB) at 50 Ω, 50 mV/div, 10 MHz input signal with 90% full scale (meas.) | | |
| Bandwidth | | ENOB |
| 50 MHz | | 9.4 |
| 100 MHz | | 9 |
| 200 MHz | | 8.6 |
| 300 MHz | | 8.2 |
| 500 MHz | | 8.1 |
| 1 GHz | | 7.7 |
| 2 GHz | | 7.1 |
| 4 GHz | | 6 |
| 6 GHz | | 6.1 |
| DC gain accuracy | offset and position set to 0 V, after self-alignment | |
| | at 50 Ω, input sensitivity > 5 mV/div | ±1.5% |
| | at 50 Ω, input sensitivity ≤ 5 mV/div | ±2% |
| | at 1 MΩ | ±2% |
| Input coupling | at 50 Ω | DC, GND |
| | at 1 MΩ | DC, AC (> 7 Hz), GND |
| Input sensitivity | at 50 Ω | 1 mV/div to 1 V/div, entire analog bandwidth supported for all input sensitivities |
| | at 1 MΩ | 1 mV/div to 10 V/div, entire analog bandwidth supported for all input sensitivities |

| Vertical system | | | |
|---|---|---|---|
| Maximum input voltage | at 50 Ω | 5 V (RMS) | |
| | at 1 MΩ | 150 V (RMS), 200 V ($V_p$), derates at 20 dB/decade to 5 V (RMS) above 250 kHz | |
| | at 1 MΩ with R&S®RT-ZP10 passive probe | 400 V (RMS), 1650 V ($V_p$), 300 V (RMS) CAT II for derating and details see data sheet R&S®RT-Zxx Standard Probes, PD 3607.3851.22 | |
| Position range | | ±5 div | |
| Offset range at 50 Ω | input sensitivity | | |
| | > 316 mV/div to ≤ 1 V/div | ±10 V | |
| | > 100 mV/div to ≤ 316 mV/div | ±3 V | |
| | 1 mV/div to ≤ 100 mV/div | ±1 V | |
| Offset range at 1 MΩ | input sensitivity | | |
| | > 3.16 V/div to ≤ 10 V/div | ±(115 V – input sensitivity × 5 div) | |
| | > 1 V/div to ≤ 3.16 V/div | ±100 V | |
| | > 316 mV/div to ≤ 1 V/div | ±(11.5 V – input sensitivity × 5 div) | |
| | > 100 mV/div to ≤ 316 mV/div | ±10 V | |
| | > 31.6 mV/div to ≤ 100 mV/div | ±(1.15 V – input sensitivity × 5 div) | |
| | 1 mV/div to ≤ 31.6 mV/div | ±1 V | |
| Offset accuracy | | ±(0.35% × \|net offset\| + 2.5 mV + 0.1 div × input sensitivity) (net offset = offset – position × input sensitivity) | |
| DC measurement accuracy | after adequate suppression of measurement noise using high-resolution sampling mode, waveform averaging or a combination of both | ±(DC gain accuracy × \|reading – net offset\| + offset accuracy) | |
| Channel-to-channel isolation (each channel at same input sensitivity) | input frequency within instrument bandwidth | | |
| | ≤ 2 GHz | > 60 dB | |
| | > 2 GHz to ≤ 4 GHz | > 50 dB | |
| | > 4 GHz to ≤ 6 GHz | > 40 dB | |
| RMS noise floor at instrument bandwidth at 50 Ω (typ.) (bandwidth limit brick wall) | input sensitivity | R&S®RTO6-B90 option | R&S®RTO6-B91 option |
| | 1 mV/div | 0.06 mV | 0.09 mV |
| | 2 mV/div | 0.07 mV | 0.09 mV |
| | 5 mV/div | 0.10 mV | 0.12 mV |
| | 10 mV/div | 0.17 mV | 0.20 mV |
| | 20 mV/div | 0.32 mV | 0.37 mV |
| | 50 mV/div | 0.86 mV | 0.93 mV |
| | 100 mV/div | 1.60 mV | 1.79 mV |
| | 200 mV/div | 2.87 mV | 3.53 mV |
| | 500 mV/div | 6.20 mV | 8.76 mV |
| | 1 V/div | 10.9 mV | 17.2 mV |
| | input sensitivity | R&S®RTO6-B92 option | R&S®RTO6-B93 option |
| | 1 mV/div | 0.13 mV | 0.18 mV |
| | 2 mV/div | 0.13 mV | 0.19 mV |
| | 5 mV/div | 0.16 mV | 0.21 mV |
| | 10 mV/div | 0.26 mV | 0.33 mV |
| | 20 mV/div | 0.49 mV | 0.60 mV |
| | 50 mV/div | 1.18 mV | 1.49 mV |
| | 100 mV/div | 2.37 mV | 2.89 mV |
| | 200 mV/div | 4.68 mV | 5.95 mV |
| | 500 mV/div | 12.1 mV | 15.3 mV |
| | 1 V/div | 24.1 mV | 29.7 mV |

## Vertical system

| | | | | |
|---|---|---|---|---|
| | input sensitivity | | R&S®RTO6-B94 option | R&S®RTO6-B96 option |
| | 1 mV/div | | 0.20 mV | 0.30 mV |
| | 2 mV/div | | 0.21 mV | 0.30 mV |
| | 5 mV/div | | 0.25 mV | 0.31 mV |
| | 10 mV/div | | 0.38 mV | 0.43 mV |
| | 20 mV/div | | 0.67 mV | 0.73 mV |
| | 50 mV/div | | 1.66 mV | 1.73 mV |
| | 100 mV/div | | 3.23 mV | 3.26 mV |
| | 200 mV/div | | 6.65 mV | 6.68 mV |
| | 500 mV/div | | 17.1 mV | 17.3 mV |
| | 1 V/div | | 34.2 mV | 34.5 mV |
| RMS noise floor at instrument bandwidth at 1 MΩ (meas.) | input sensitivity | | | |
| | 1 mV/div | | 0.13 mV | |
| | 2 mV/div | | 0.13 mV | |
| | 5 mV/div | | 0.17 mV | |
| | 10 mV/div | | 0.26 mV | |
| | 20 mV/div | | 0.47 mV | |
| | 50 mV/div | | 1.15 mV | |
| | 100 mV/div | | 2.30 mV | |
| | 200 mV/div | | 4.70 mV | |
| | 500 mV/div | | 11.5 mV | |
| | 1 V/div | | 23.0 mV | |
| | 2 V/div | | 46.0 mV | |
| | 5 V/div | | 115 mV | |
| | 10 V/div | | 230 mV | |
| RMS noise floor for HD mode at 50 Ω (meas.) | bandwidth | input sensitivity | | |
| | | 1 mV/div | 10 mV/div | 100 mV/div |
| | 10 MHz | 10 µV | 18 µV | 150 µV |
| | 100 MHz | 31 µV | 56 µV | 470 µV |
| | 500 MHz | 63 µV | 110 µV | 960 µV |
| | 1 GHz | 92 µV | 170 µV | 1.41 mV |
| | 2 GHz | 140 µV | 220 µV | 1.78 mV |

## Horizontal system

| | | |
|---|---|---|
| Timebase range | | selectable between 25 ps/div and 10 000 s/div, time per div settable to any value within range |
| Channel deskew | | ±100 ns |
| Reference position | | 0 % to 100 % of measurement display area |
| Trigger offset range | max. | +(memory depth/current sampling rate) |
| | min. | –10 000 s |
| Modes | | normal, roll |
| Channel-to-channel skew | | < 100 ps (meas.) |
| Timebase accuracy | after delivery/calibration, at +23 °C | ±10 ppb |
| | during calibration interval | ±100 ppb |
| | long-term stability (more than one year since calibration) | ±(50 + 50 × years since calibration) ppb |
| Delta time accuracy | corresponds to time error between two edges on same acquisition and channel;<br>signal amplitude greater than 5 divisions, measurement threshold set to 50 %, vertical gain 10 mV/div or greater;<br>rise time lower than four sample periods;<br>waveform acquired in realtime mode | ±(K/realtime sampling rate + timebase accuracy × \|reading\|) (peak) (meas.)<br>where<br>K = 0.15 (R&S®RTO6-B90 option)<br>K = 0.18 (R&S®RTO6-B91 option)<br>K = 0.25 (R&S®RTO6-B92 option)<br>K = 0.37 (R&S®RTO6-B93 option)<br>K = 0.43 (R&S®RTO6-B94 option)<br>K = 0.55 (R&S®RTO6-B96 option) |

## Acquisition system

| | | |
|---|---|---|
| Realtime sampling rate | R&S®RTO6-B90, R&S®RTO6-B91, R&S®RTO6-B92, R&S®RTO6-B93 options | max. 10 Gsample/s on each channel |
| | R&S®RTO6-B94, R&S®RTO6-B96 options | max. 10 Gsample/s on 4 channels,<br>max. 20 Gsample/s on 2 channels |
| Realtime waveform acquisition rate | max. | > 1 000 000 waveforms/s |
| Memory depth [1] | standard | 200 Mpoints on 4 channels,<br>400 Mpoints on 2 channels,<br>800 Mpoints on 1 channel |
| | R&S®RTO6-B104 option | 400 Mpoints on 4 channels,<br>800 Mpoints on 2 channels (restriction:<br>400 Mpoints on 2 channels when channel 1 and 2 or channel 3 and 4 are turned on),<br>800 Mpoints on 1 channel |
| | R&S®RTO6-B110 option | 1 Gpoints on 4 channels,<br>2 Gpoints on 2 channels (restriction:<br>1 Gpoints on 2 channels when channel 1 and 2 or channel 3 and 4 are turned on),<br>2 Gpoints on 1 channel |
| Realtime digital filters | selectable for the data acquisition and/or the trigger system | |
| | lowpass | cutoff frequency selectable from 100 kHz to analog bandwidth |
| Decimation modes | sample | first sample in decimation interval |
| | peak detect | largest and smallest sample in decimation interval |
| | high resolution | average value of samples in decimation interval |
| | root mean square | root of squared average of samples in decimation interval |
| Waveform arithmetic | off | no arithmetic |
| | envelope | envelope of acquired waveforms |
| | average | average of acquired waveforms, max. average depth depends on decimation mode [2] |
| | sample | max. 16 777 215 |
| | high resolution | max. 65 535 |
| | root mean square | max. 255 |
| | reset condition | no reset (standard), reset by time, reset by number of processed waveforms |
| Waveform streams per channel | | up to 3 with independent selection of decimation mode and waveform arithmetic |
| Sampling modes | realtime mode | max. sampling rate set by digitizer |
| | interpolated time | enhancement of sampling resolution by interpolation;<br>max. equivalent sampling rate is 4 Tsample/s |
| Interpolation modes | | linear, sin(x)/x, sample & hold |
| Ultra segmented mode | continuous recording of waveforms in acquisition memory without interruption due to visualization | |
| | max. realtime waveform acquisition rate | > 2 500 000 waveforms/s |
| | min. blind time between consecutive acquisitions | < 300 ns |

## Differential signals

| | | |
|---|---|---|
| General description | Calculation of differential and common mode signals from p part and n part connected to separate input channels. The R&S®RTO64 digital trigger concept enables these signals to be used as a trigger input. | |
| Input channels | | channel 1, channel 2, channel 3, channel 4 |
| Differential signal | difference between two input channels | channel 1 and channel 2, channel 3 and channel 4 |
| Common mode signal | sum of two input channels | channel 1 and channel 2, channel 3 and channel 4 |
| Maximum number of outputs | differential signals | 2 |
| | common mode signals | 2 |

[1] The maximum available memory depth depends on the bit depth of the acquired data and, therefore, on the settings of the acquisition system, such as decimation mode, waveform arithmetic, number of waveform streams or high definition mode.

[2] Waveform averaging is not compatible with peak detect decimation.

| High definition mode | | |
|---|---|---|
| General description | The high definition mode increases the numeric resolution of waveform signals with digital filtering to reduce noise. The signals with increased numeric resolution are used as a triggering input thanks to the R&S®RTO64 digital trigger concept. | |
| Numeric resolution | R&S®RTO6-B90, R&S®RTO6-B91, R&S®RTO6-B92, R&S®RTO6-B93, R&S®RTO6-B94, R&S®RTO6-B96 options (4 channels) | |
| | bandwidth | bit resolution |
| | 10 kHz to 50 MHz | 16 bit |
| | 100 MHz | 14 bit |
| | 200 MHz | 13 bit |
| | 300 MHz | 12 bit |
| | 500 MHz | 12 bit |
| | 1 GHz | 10 bit |
| | R&S®RTO6-B94, R&S®RTO6-B96 options (2 channels) | |
| | bandwidth | bit resolution |
| | 10 kHz to 200 MHz | 16 bit |
| | 300 MHz | 12 bit |
| | 500 MHz | 12 bit |
| | 1 GHz | 11 bit |
| | 2 GHz | 10 bit |
| Realtime sampling rate | R&S®RTO6-B90, R&S®RTO6-B91, R&S®RTO6-B92, R&S®RTO6-B93, R&S®RTO6-B94, R&S®RTO6-B96 options (4 channels) | max. 5 Gsample/s on each channel |
| | R&S®RTO6-B94, R&S®RTO6-B96 options (2 channels) | max. 10 Gsample/s on each channel |
| Input sensitivity | | input sensitivity range extends down to 500 µV/div;<br>500 µV/div is a magnification of 1 mV/div setting. |

| Trigger system | | |
|---|---|---|
| Sources | | channel 1, channel 2, channel 3, channel 4, inverted channels, external trigger, differential, common mode |
| Sensitivity | | $10^{-4}$ div, from DC to instrument bandwidth for all vertical scales |
| Trigger jitter | full-scale sine wave of frequency set to –3 dB bandwidth | < 1 ps (RMS) (meas.) |
| Coupling mode | standard | same as selected channel |
| | lowpass filter | cutoff frequency selectable from 100 kHz to 50 % of analog bandwidth |
| Sweep mode | | auto, normal, single, n single |
| Event rate | max. | one event for every 400 ps time interval |
| Trigger level | range | ±5 div from center of screen |
| Trigger hysteresis | modes | auto (standard) or manual |
| | sensitivity | $10^{-4}$ div, from DC to instrument bandwidth for all vertical scales |
| Holdoff range | time | 100 ns to 10 s, fixed and random |
| | events | 1 event to 2 000 000 000 events |
| **Main trigger modes** | | |
| Edge | triggers on specified slope (positive, negative or either) and level | |
| Glitch | triggers on glitches of positive, negative or either polarity that are shorter or longer than specified width | |
| | glitch width | 100 ps to 1000 s |
| | | 50 ps to 1000 s<br>(R&S®RTO6-B94, R&S®RTO6-B96 options) |

| Trigger system | | |
|---|---|---|
| Width | triggers on positive or negative pulse of specified width; width can be shorter, longer, inside or outside the interval | |
| | pulse width | 100 ps to 1000 s |
| | | 50 ps to 1000 s<br>(R&S®RTO6-B94, R&S®RTO6-B96 options) |
| Runt | triggers on pulse of positive, negative or either polarity that crosses one threshold but fails to cross a second threshold before recrossing the first one; runt pulse width can be arbitrary, shorter, longer, inside or outside the interval | |
| | runt pulse width | 100 ps to 1000 s |
| | | 50 ps to 1000 s<br>(R&S®RTO6-B94, R&S®RTO6-B96 options) |
| Window | triggers when signal enters or exits a specified voltage range;<br>triggers also when signal stays inside or outside the voltage range for a specified period of time | |
| Timeout | triggers when signal stays high, low or unchanged for a specified period of time | |
| | timeout | 100 ps to 1000 s |
| | | 50 ps to 1000 s<br>(R&S®RTO6-B94, R&S®RTO6-B96 options) |
| Interval | triggers when time between two consecutive edges of same slope (positive or negative) is shorter, longer, inside or outside a specified range | |
| | interval time | 100 ps to 1000 s |
| | | 50 ps to 1000 s<br>(R&S®RTO6-B94, R&S®RTO6-B96 options) |
| Slew rate | triggers when the time required by a signal edge to toggle between user-defined upper and lower voltage levels is shorter, longer, inside or outside the interval;<br>edge slope may be positive, negative or either | |
| | toggle time | 100 ps to 1000 s |
| | | 50 ps to 1000 s<br>(R&S®RTO6-B94, R&S®RTO6-B96 options) |
| Data2clock | triggers on setup time and hold time violations between clock and data present on any two input channels; users can specify monitored time interval ranging from –100 ns to 100 ns around a clock edge and must be at least 100 ps wide | |
| Pattern | triggers when a logical combination (and, nand, or, nor) of the input channels stays true for a period of time shorter, longer, inside or outside a specified range | |
| State | triggers when a logical combination (and, nand, or, nor) of the input channels stays true at a slope (positive, negative or either) in one selected channel | |
| Serial pattern | triggers on serial data pattern up to 128 bit clocked by one input channel;<br>pattern bits may be high (H), low (L) or don't care (X); clock edge slope may be positive, negative or either; hardware CDR selectable as clock source (requires R&S®RTO6-K13 option) | |
| | max. data rate | < 2.50 Gbps |
| | | < 5 Gbps<br>(R&S®RTO6-B94, R&S®RTO6-B96 options) |
| TV/video | triggers on baseband analog progressive and interlaced video signals including NTSC, PAL, PAL-M, SECAM, EDTV and HDTV broadcast standards as well as custom bi-level and tri-level sync video standards | |
| | trigger modes | all fields, odd fields, even fields, all lines, line number |
| **Advanced trigger modes** | | |
| Zone trigger | triggers on user-defined zones drawn on the display | |
| | source | acquired waveforms (input channels), math waveforms |
| | number of zones | up to 8 |
| | zone shapes | rectangles, polygones |
| | zone types | must intersect, must not intersect |
| | combination of zones | logical combination of zones of multiple sources using Boolean expressions |
| | trigger compatibility | compatible with the edge, glitch, width, runt, window, timeout, interval, slew rate, data2clock, pattern, state, serial pattern, trigger qualification, and sequence trigger modes |

| Trigger system | | |
|---|---|---|
| Trigger qualification | trigger events may be qualified by a logical combination of unused channels | |
| | qualifiable events | edge, glitch, width, runt, window, timeout, interval |
| Sequence trigger (A/B/R trigger) | triggers on B event after occurrence of A event; delay condition after A event specified either as time interval or number of B events; an optional R event resets the trigger sequence to A | |
| | A event | any trigger mode |
| | B event | edge, glitch, width, runt, window, timeout, interval, slew rate |
| | R event | edge, glitch, width, runt, window, timeout, interval, slew rate |
| Serial bus trigger | optional | see dedicated triggering and decoding options |
| NFC trigger | | with R&S®RTO6-K11 option |
| CDR trigger | triggers on clock signal recovered from the trigger source signal; phase of the trigger instant user-selectable as fraction of bit period;<br>requires R&S®RTO6-K13 option | |
| | CDR configuration parameters | PLL order (first or second), nominal bit rate, loop bandwidth, relative bandwidth, damping factor, unit interval offset |
| | CDR bit rate range | |
| | R&S®RTO6-B90, R&S®RTO6-B91, R&S®RTO6-B92, R&S®RTO6-B93 options | 200 kbps to 2.5 Gbps |
| | R&S®RTO6-B94, R&S®RTO6-B96 options | 200 kbps to 2.5 Gpbs standard,<br>400 kbps to 5.0 Gbps when operating at 20 Gsample/s realtime sampling rate[3)] |
| External trigger input | input impedance | 50 Ω (nom.) or 1 MΩ (nom.) \|\| 20 pF (meas.) |
| | max. input voltage at 50 Ω | 5.5 V (peak) |
| | max. input voltage at 1 MΩ | 30 V (RMS)<br>derates at 20 dB/decade to 5 V (RMS) above 25 MHz |
| | trigger level | ±5 V |
| | sensitivity | |
| | input frequency ≤ 100 MHz | 300 mV ($V_{pp}$) |
| | 100 MHz < input frequency ≤ 500 MHz | 600 mV ($V_{pp}$) |
| | input coupling | AC, DC (50 Ω and 1 MΩ), GND,<br>HF reject (attenuates > 50 kHz or > 50 MHz, user-selectable),<br>LF reject (attenuates < 5 kHz or < 50 kHz, user-selectable) |
| | trigger modes | edge (rise or fall) |
| Trigger out | functionality | a pulse is generated for every acquisition trigger event |
| | output voltage | 0 V to 5 V at high impedance;<br>0 V to 2.5 V at 50 Ω |
| | pulse width | selectable between 50 ns and 60 ms |
| | pulse polarity | low active or high active |
| | output delay | depends on trigger settings |
| | jitter | ±600 ps (meas.) |

[3)] The frontends of the R&S®RTO6-B94 and the R&S®RTO6-B96 sample at 20 Gsample/s when at most one channel of each pair {channel 1, channel 2} and {channel 3, channel 4} is active; and the user-selected sampling resolution in realtime sampling mode or interpolated time sampling mode is 50 ps or smaller.

| RF characteristics [4] | | |
|---|---|---|
| Sensitivity/noise density | at 1.001 GHz<br>(measurement of the power spectral density at 1.001 GHz at input sensitivity 1 mV/div, corresponding to –36 dBm input range of the oscilloscope, using the FFT with center frequency 1.001 GHz, span 500 kHz, RBW 3 kHz) | –159 dBm (1 Hz) (meas.) |
| | at 100 kHz<br>(measurement of the power spectral density at 100 kHz at input sensitivity 1 mV/div, corresponding to –36 dBm input range of the oscilloscope, using the FFT with center frequency 100 kHz, span 20 kHz, RBW 200 Hz) | –156 dBm (1 Hz) (meas.) |
| Noise figure | at 1.001 GHz<br>(calculated based on the noise density above) | 15 dB (meas.) |
| | at 100 kHz (calculated based on the noise density above) | 18 dB (meas.) |
| Signal-to-noise ratio | measured for an input carrier with frequency 1 GHz and level 0 dBm at input sensitivity 70 mV/div, corresponding to 0 dBm input range of the oscilloscope, using the FFT with center frequency 1 GHz, span 100 MHz, RBW 400 Hz at +20 MHz from the center frequency | 112 dB (meas.) |
| Absolute amplitude accuracy | 0 Hz to 5 GHz | ±1 dB (meas.) |
| Spurious-free dynamic range | measured for an input carrier with frequency 950 MHz and level 0 dBm at input sensitivity 70 mV/div, corresponding to 0 dBm input range of the oscilloscope, using the FFT with center frequency 2 GHz, span 4 GHz, RBW 100 kHz | 68 dBc (meas.) |
| Second harmonic distortion | measured for an input carrier with frequency 950 MHz and level 0 dBm at input sensitivity 70 mV/div, corresponding to 0 dBm input range of the oscilloscope, using the FFT with center frequency 950 MHz, span 4 GHz, RBW 100 kHz | –49 dBc (meas.) |
| Third harmonic distortion | measured for an input carrier with frequency 950 MHz and level 0 dBm at input sensitivity 70 mV/div, corresponding to 0 dBm input range of the oscilloscope, using the FFT with center frequency 950 MHz, span 4 GHz, RBW 100 kHz | –44 dBc (meas.) |

| Waveform measurements | | |
|---|---|---|
| General features | measurement panels | up to 8 measurement panels;<br>each panel may contain any number of automatic measurements of the same category |
| | gate | delimits the display region evaluated for automatic measurements |
| | reference levels | user-configurable vertical levels define support structures for automatic measurements |
| | statistics | displays maximum, minimum, mean, standard deviation, RMS and measurement count for each automatic measurement |
| | track | measurement results displayed as continuous trace that is time-correlated to the measurement source |
| | long-term analysis | history of selected measurements as trace against count index |
| | histogram | available for the main measurement of each measurement panel; automatic or manual selection of bin number and scale;<br>counters for measurements under, within and over the histogram range |
| | limit check | measurements tested against user-defined margins and limits;<br>pass or fail conditions may launch automatic response: acquisition stop, beep, print and save waveform |

[4] The RF characteristics are measured for the R&S®RTO6-B96 option with 6 GHz bandwidth.

| Waveform measurements | | |
|---|---|---|
| Measurement category | amplitude and time | amplitude, high, low, maximum, minimum, peak-to-peak, mean, RMS, sigma, overshoot, area, rise time, fall time, positive width, negative width, period, frequency, duty cycle, delay, phase, burst width, pulse count, positive switching, negative switching, cycle area, cycle mean, cycle RMS, cycle sigma, setup/hold time, setup/hold ratio, pulse train, slew rate rising, slew rate falling, DC voltmeter (requires Rohde&Schwarz active probe with R&S®ProbeMeter function) |
| | eye diagram | extinction ratio, eye height, eye width, eye top, eye base, Q factor, S/N ratio, duty cycle distortion, eye rise time, eye fall time, eye bit rate, eye amplitude, jitter (peak-to-peak, 6-sigma, RMS) |
| | spectrum | channel power, bandwidth, occupied bandwidth, harmonic search, total harmonic distortion THD in dB and % using power values, total harmonic distortion variants $THD_a$, $THD_u$ and $THD_r$ using voltage, overall voltage and overall voltage root means square, peak list ($THD_a$, $THD_u$, $THD_r$ and peak list require R&S®RTO6-K37 option) |
| | jitter | cycle-to-cycle jitter, N-cycle jitter, cycle-to-cycle width, cycle-to-cycle duty cycle, time-interval error, data rate, unit interval, skew delay, skew phase; requires R&S®RTO6-K12 option |
| Cursors | setup | up to 4 cursor sets on screen, each set consisting of two horizontal and two vertical cursors |
| | target | acquired waveforms (input channels), math waveforms, reference waveforms, track waveforms, XY diagrams |
| | operating mode | vertical measurements, horizontal measurements or both; vertical cursors either set manually or locked to waveform |
| Histogram | source | acquired waveform (input channels), math waveform, reference waveform |
| | mode | vertical (for timing statistics), horizontal (for amplitude statistics) |
| | automatic measurements | waveform count, waveform samples, histogram samples, histogram peak, peak value, maximum, minimum, median, range, mean, sigma, mean ± 1, 2 and 3 sigma, marker ± probability |

| Mask testing | | |
|---|---|---|
| Test definition | number of masks | up to 8 simultaneously |
| | source | acquired waveforms (input channels), math waveforms |
| | fail condition | sample hit or waveform hit |
| | fail tolerance | minimum number of fail events for test fail in range from 0 to 4 000 000 000 |
| | test rate | up to 600 000 waveforms/s |
| | action on error | acquisition stop, beep, print and save waveform |
| | save/load to file | test and mask settings (.xml format) |
| Mask definition with segments | number of independent segments | up to 8 |
| | segment definition | array of points and connecting rule (upper, lower, inner) define segment region |
| | segment input | point and click on touchscreen, editable list |
| Mask definition with tolerance tube | input signal | acquired waveform |

## Mask testing

| | | |
|---|---|---|
| | definition of tolerance tube | horizontal width, vertical width, vertical stretch, vertical position |
| Mask definition with eye mask assistant (requires R&S®RTO6-K12 option) | primary mask shape | |
| | type | diamond, square, hexagon, octagon |
| | dimensions | main and secondary height, main and secondary width, depending on selected shape |
| | position | vertical offset, horizontal offset |
| | secondary mask shapes | |
| | locations | any combination of left, right, top, bottom |
| | position | horizontal and vertical offset with respect to center of primary mask shape |
| Result statistics | category | completed acquisitions, remaining acquisitions, state, sample hits, mask hits, fail rate, test result (pass or fail) |
| Visualization options | waveform style | vectors, dots |
| | violation highlighting | hits (on/off), highlight persistence (50 ms to 50 s or infinite), waveform color (default: red) |
| | mask colors | configurable colors for mask without violation (default: translucent gray), mask with violation (default: translucent red), mask with contact (default: translucent pale red) |

## Waveform math

| | | |
|---|---|---|
| General features | number of math waveforms | up to 8 |
| | number of reference waveforms | up to 4 |
| | waveform arithmetic | user-selectable average or envelope of consecutive waveforms |
| Algebraic expressions | user may define complex mathematical expressions involving waveforms and measurement results | |
| | math functions | add, subtract, multiply, divide, absolute value, square, square root, integrate, differentiate, exp, $\log_{10}$, $\log_e$, $\log_2$, rescale, sin, cos, tan, arcsin, arccos, arctan, sinh, cosh, tanh, autocorrelation, crosscorrelation |
| | logical operators | not, and, nand, or, nor, xor, nxor |
| | relational operators | Boolean result of =, ≠, >, <, ≤, ≥ |
| | frequency domain | spectral magnitude and phase, real and imaginary spectra, group delay |
| | digital filter | lowpass, highpass |
| | special functions | CDR transform; requires R&S®RTO6-K12 option |
| Optimized math | operators | add, subtract, multiply, invert, absolute value, differentiate, $\log_{10}$, $\log_e$, $\log_2$, rescale, FIR, FFT magnitude |
| Spectrum analysis | FFT magnitude spectrum | |
| | setup parameters | center frequency, frequency span, frame overlap, frame window (rectangular, Hamming, Hann, Blackman, Gaussian, Flattop, Kaiser Bessel), user-selectable spectrum averaging, RMS, envelope, max. hold and min. hold (max. hold and min. hold require R&S®RTO6-K37 option) |
| | max. realtime waveform acquisition rate | > 1000 waveforms/s |

## Search and mark function

| | | |
|---|---|---|
| General description | scans acquired waveforms for occurrence of a user-defined set of events and highlights each occurrence | |
| Basic setup | source | all physical input channels, math waveforms, reference waveforms |
| | search panels | up to 8, where each panel may manage multiple event searches |

## Search and mark function

| | | |
|---|---|---|
| | search mode | manually triggered or continuous |
| | search conditions | |
| | supported events | edge, glitch, width, runt, window, timeout, interval, slew rate, data2clock, state |
| | event configuration | identical to corresponding trigger event |
| | event selection | single or multiple events on same source |
| Search oscilloscope | mode | current waveform, gated time interval |
| Result visualization | table | |
| | sort mode | horizontal position or vertical value |
| | max. result count | specifies max. table size |
| | zoom window | centered on highlighted event |

## Display characteristics

| | |
|---|---|
| Diagram types | Yt, XY, spectrum, long-term measurement, spectrogram (spectrogram requires R&S®RTO6-K37 option) |
| Display interface configuration | display area can be split up into separate diagram areas by dragging and dropping signal icons;<br>each diagram area can hold any number of signals;<br>diagram areas may be stacked on top of each other and later accessed via the dynamic tab menu |
| Signal icon | each active waveform is represented by a separate signal icon on the signal bar;<br>the signal icon displays individual vertical and acquisition settings;<br>a waveform can be minimized to signal icon to appears as a realtime preview in miniature;<br>measurement results may also be minimized to a signal icon |
| Toolbar | quick access to 28 important tools;<br>directly set most common parameters in a simple menu and access to more detailed parameters in main menu;<br>user-defined selection of tools in toolbar |
| Upper menu | displays trigger, horizontal and acquisition settings;<br>quick access to settings |
| Main menu | provides access to all instruments settings in compact menu |
| Axis label | X-axis ticks and Y-axis ticks labeled with tick value and physical unit |
| Diagram label | diagrams may be individually labeled with a descriptive user-defined name |
| Diagram layout | grid, crosshair, axis labels and diagram label may be switched on and off separately |
| Persistence | 50 ms to 50 s, or infinite |
| Zoom | user-defined zoom window provides vertical and horizontal zoom;<br>each diagram area supports multiple zoom windows;<br>touchscreen interface simplifies resize and drag operations on zoom window |
| Signal colors | predefined or user-defined color tables for persistence display |

## Input and output

| | | |
|---|---|---|
| **Front** | | |
| Channel inputs | | BNC-compatible, for details see vertical system |
| | probe interface | auto-detection of passive probes,<br>Rohde&Schwarz active probe interface |
| Auxiliary output | | SMA connector, for future use |
| Probe compensation output | signal shape | rectangle, $V_{low}$ = 0 V, $V_{high}$ = 1 V<br>amplitude 1 V ($V_{pp}$) ± 5 % |
| | frequency | 1 kHz ± 1 % |
| | impedance | nom. 50 Ω |
| Ground jack | | connected to ground |
| USB interface | | 2 ports, type A plug, version 2.0 |
| **Rear** | | |
| External trigger input | | BNC, for details see trigger system |
| Trigger out | | BNC, for details see trigger system |
| USB interface | | 2 ports, type A plug and<br>1 port, type B plug, version 3.1 Gen 1 |

| Input and output | | |
|---|---|---|
| LAN interface | | RJ-45 connector, supports 10/100/1000BASE-T |
| External monitor interface | | HDMI 2.0 and DisplayPort++ 1.3, output of oscilloscope display or extended desktop display |
| GPIB interface | | see R&S®RTO6-B10 option |
| Reference input | connector | BNC female |
| | impedance | 50 Ω (nom.) |
| | input frequency range | 1 MHz to 20 MHz, in 1 MHz steps |
| | sensitivity | ≥ 0 dBm into 50 Ω, ≥ 8 dBm at 1 MHz |
| Reference output | connector | BNC female |
| | impedance | 50 Ω (nom.) |
| | output signal with internal reference | 10 MHz (specified in timebase accuracy), 7 dBm (nom.) |
| | output signal with external reference | none |
| Security slot | | for standard Kensington style lock |

| General data | | |
|---|---|---|
| **Display** | type | 15.6" LC TFT color display with capacitive touchscreen |
| | resolution | 1920 × 1080 pixel (full HD) |
| Operating system | | Windows 10 64 bit |
| **Temperature** | | |
| Temperature loading | operating temperature range | 0 °C to +45 °C |
| | storage temperature range | –40 °C to +70 °C |
| Temperature loading | | in line with MIL-PRF-28800F section 4.5.5.1.1.1 class 3 tailored to +45 °C for operation |
| Climatic loading | | +25 °C/+40 °C at 85 % relative humidity cyclic, in line with IEC 60068-2-30 |
| | | +30 °C/+40 °C/+45 °C at 95/75/45 %, in line with MIL-PRF-28800F section 4.5.5.1.1.2 class 3 tailored to +45 °C for operation |
| **Altitude** | | |
| Operating | | up to 3000 m above sea level |
| Nonoperating | | up to 4600 m above sea level |
| **Mechanical resistance** | | |
| Vibration | sinusoidal | 5 Hz to 150 Hz, max. 1.8 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6 |
| | | 5 Hz to 55 Hz, in line with MIL-PRF-28800F section 4.5.5.3.2 class 3 |
| | random | 8 Hz to 500 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64 |
| | | 5 Hz to 500 Hz, acceleration 2.058 g (RMS), in line with MIL-PRF-28800F section 4.5.5.3.1 class 3 |
| Shock | | 40 g shock spectrum, in line with MIL-STD-810G, method no. 516.6, procedure I |
| | | 30 g functional shock, halfsine, duration 11 ms, in line with MIL-PRF-28800F section 4.5.5.4.1 |
| **EMC** | | |
| RF emission | | in line with CISPR 11/EN 55011 group 1 class A (for a shielded test setup); instrument complies with EN 55011, EN 61326-1 and EN 61326-2-1 class A emission requirements and is suitable for use in industrial environments |
| Immunity | | in line with IEC/EN 61326-1 table 2, immunity test requirements for industrial environment[5)] |

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

| General data | | |
|---|---|---|
| **Certifications** | | VDE, $_{c}$CSA$_{US}$, KC |
| **Calibration interval** | | 1 year |
| **Power supply** | | |
| AC supply | | 100 V to 240 V at 50 Hz to 60 Hz and 400 Hz, max. 5.5 A to 2.3 A, in line with MIL-PRF 28800F section 3.5 |
| Power consumption | | max. 450 W |
| Safety | | in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1, UL 61010-1 |
| **Mechanical data** | | |
| Dimensions | W × H × D | 450 mm × 315 mm × 204 mm (17.72 in × 12.40 in × 8.03 in) |
| Weight | without options, nominal | 10.7 kg (23.59 lb) |

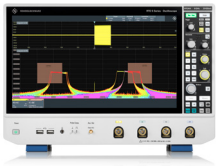
# OSCILLOSCOPE PORTFOLIO




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

[1] Upgradeable. [2] Requires an option.






| | MXO 4 | MXO 5 | R&S®RTO6 | R&S®RTP |
|---|---|---|---|---|
| | | | | |
| | 200/350/500 MHz/1/1.5 GHz | 100/200/350/500 MHz/1/2 GHz | 600 MHz/1/2/3/4/6 GHz | 4/6/8/13/16 GHz |
| | 4 | 4/8 | 4 | 4 |
| | 12 bit; 18 bit | 12 bit; 18 bit | 8 bit; 16 bit | 8 bit; 16 bit |
| | 500 µV to 10 V | 500 µV to 10 V | 1 mV to 10 V (HD mode: 500 µV to 10 V) | |
| | 500 µV to 1 V | 500 µV to 1 V | 1 mV to 1 V (HD mode: 500 µV to 1 V) | 2 mV to 1 V (HD mode: 1 mV to 1 V) |
| | | | | |
| | 2.5; 5 (2 channels interleaved) | 5 on 4 channels; 2.5 on 8 channels (2 channels interleaved) | 10; 20 (2 channels interleaved in 4 GHz and 6 GHz model) | 20; 40 (2 channels interleaved) |
| | standard: 400 Mpoints; max. upgrade: 800 Mpoints[2)] | standard: 500 Mpoints max. upgrade: 1 Gpoints[2)] | standard: 200 Mpoints/800 Mpoints; max. upgrade: 1 Gpoints/2 Gpoints | standard: 100 Mpoints/400 Mpoints; max. upgrade: 3 Gpoints |
| | standard: 10000 segments; option: 1000000 segments | standard: 10000 segments; option: 1000000 segments | standard | standard |
| | > 4500000 | > 4500000 on 4 channels | 1000000 (2500000 in ultra-segmented memory mode) | 750000 (3200000 in ultra-segmented memory mode) |
| | | | | |
| | digital | digital | digital (includes zone trigger) | advanced (includes zone trigger), digital trigger (14 trigger types) with real-time deembedding[2)], high speed serial pattern trigger including 8/16 Gbps clock data recovery (CDR)[2)] |
| | 0.0001 div, across full bandwidth, user controllable | 0.0001 div, across full bandwidth, user controllable | 0.0001 div, across full bandwidth, user controllable | 0.0001 div, across full bandwidth, user controllable |
| | | | | |
| | 16 | 16 | 16 | 16 |
| | | | | |
| | | | user configurable, hardware based | user configurable, hardware based |
| | basic (math on math) | basic (math on math) | advanced (formula editor, Python interface) | advanced (formula editor, Python interface) |
| | I²C, SPI, UART/RS-232/RS-422/RS-485, CAN, CAN FD, CAN XL, LIN | I²C, SPI, UART/RS-232/RS-422/RS-485, CAN, CAN FD, CAN XL, LIN | I²C, SPI, UART/RS-232/RS-422/RS-485, CAN, LIN, I²S, MIL-STD-1553, ARINC 429, FlexRay™, CAN FD, MIPI RFFE, USB 2.0/HSIC, MDIO, 8b10b, Ethernet, Manchester, NRZ, SENT, MIPI D-PHY, SpaceWire, MIPI M-PHY/UniPro, CXPI, USB 3.1 Gen 1, USB-SSIC, PCIe 1.1/2.0, USB Power Delivery, Automotive Ethernet 100/1000BASE-T1 | I²C, SPI, UART/RS-232/RS-422/RS-485, SENT, CAN, LIN, CAN FD, MIL-STD-1553, ARINC 429, SpaceWire, USB 2.0/HSIC/PD, USB 3.1 Gen 1/Gen 2/SSIC, PCIe 1.1/2.0/3.0, 8b10b, MIPI RFFE, MIPI D/M-PHY/UniPro, Automotive Ethernet 100/1000BASE-T1, Ethernet 10/100BASE-TX, MDIO, Manchester, NRZ |
| | power, digital voltmeter (DVM), frequency response analysis | power, digital voltmeter (DVM), frequency response analysis | power, advanced spectrum analysis and spectrogram, jitter and noise decomposition, clock data recovery (CDR), I/Q data and RF analysis (R&S®VSE), deembedding, TDR/TDT analysis | advanced spectrum analysis and spectrogram, jitter and noise decomposition, real-time deembedding, TDR/TDT analysis, I/Q data and RF analysis (R&S®VSE), advanced eye diagram |
| | – | | see specifications (PD 5216.1640.22) | see specifications (PD 3683.5616.22) |
| | | | | |
| | 13.3" touchscreen, 1920 × 1080 pixel (Full HD) | 15.6" touchscreen, 1920 × 1080 pixel (Full HD) | 15.6" touchscreen, 1920 × 1080 pixel (Full HD) | 13.3" touchscreen, 1920 × 1080 pixel (Full HD) |
| | | | | |
| | 414 × 279 × 162 | 445 × 314 × 154 | 450 × 315 × 204 | 441 × 285 × 316 |
| | 6 | 9 | 10.7 | 18 |
| | – | – | – | – |

# ORDERING INFORMATION

| Designation | Type | Order No. | | |
|---|---|---|---|---|
| **Step 1: base instrument** | | | | |
| 4 channel oscilloscope | R&S®RTO64 | 1802.0001.04 | | |
| **Step 2: choose one bandwidth option (mandatory)** | | | | |
| 600 MHz | R&S®RTO6-B90 | 1802.0182.02 | | |
| 1 GHz | R&S®RTO6-B91 | 1802.0199.02 | | |
| 2 GHz | R&S®RTO6-B92 | 1802.0201.02 | | |
| 3 GHz | R&S®RTO6-B93 | 1802.0218.02 | | |
| 4 GHz | R&S®RTO6-B94 | 1802.0224.02 | | |
| 6 GHz | R&S®RTO6-B96 | 1802.0230.02 | | |
| **Step 3: choose your hardware options** | | | | |
| Mixed-signal option 400 MHz, 16 digital channels | R&S®RTO6-B1 | 1801.6741.02 | | |
| Digital extension port (required for R&S®RT-ZVC) | R&S®RTO6-B1E | 1801.6735.02 | | |
| Arbitrary waveform generator | R&S®RTO6-B6 | 1801.6758.02 | | |
| Memory upgrade, 400 Mpoints per channel | R&S®RTO6-B104 | 1801.6793.02 | | |
| Memory upgrade, 1 Gpoints per channel | R&S®RTO6-B110 | 1801.6806.04 | | |
| Differential pulse source 16 GHz | R&S®RTO6-B7 | 1801.6764.02 | | |
| GPIB interface | R&S®RTO6-B10 | 1801.6770.02 | | |
| Replacement solid state disk | R&S®RTO6-B19 | 1801.6787.02 | | |
| **Step 4: choose serial trigger and decode software options** | | | **Included protocols** | |
| Bus analysis | R&S®RTO6-K500 | 1801.6864.02 | | |
| Low speed serial buses | R&S®RTO6-K510 | 1801.7019.02 | I²C/SPI/RS-232/UART/I²S/LJ/RJ/TDM/Manchester/NRZ | |
| Automotive protocols | R&S®RTO6-K520 | 1801.7025.02 | CAN/LIN incl. CAN-dbc file import/CAN FD, FlexRay™ incl. Fibex file import/SENT/CXPI | |
| Aerospace protocols | R&S®RTO6-K530 | 1801.7031.02 | MIL-STD-1553/ARINC 429/SpaceWire | |
| Ethernet protocols | R&S®RTO6-K540 | 1801.7048.02 | 10BASE-T/100BASE-TX/MDIO | |
| MIPI RFFE | R&S®RTO6-K550 | 1801.7054.02 | MIPI RFFE | |
| Automotive Ethernet | R&S®RTO6-K560 | 1801.7060.02 | IEEE 100BASE-T1/IEEE 1000BASE-T1 | |
| USB protocols | R&S®RTO6-K570 | 1801.7077.02 | USB 1.0/1.1/USB 2.0/HSIC/USB 3.1 Gen 1, USB Power Delivery (USB-PD)/USB SSIC | |
| MIPI M-PHY, D-PHY | R&S®RTO6-K580 | 1801.7083.02 | MIPI D-PHY/M-PHY/UniPro/Decoding for DSI und CSI-2 | |
| PCI Express | R&S®RTO6-K590 | 1801.7090.02 | 8b10b (up to 6.25 Gbit/s)/PCI Express Revision 1.x/2.x | |
| Trigger and decode bundle | R&S®RTO6-TDBDL | 1801.7725.02 | R&S®RTO6-K500/-K510/-K520/-K530/-K540/-K550/-K560/-K570/-K580/-K590 | |
| **Step 5: general analysis software options** | | | | |
| I/Q software interface | R&S®RTO6-K11 | 1801.6812.02 | | |
| Jitter analysis | R&S®RTO6-K12 | 1801.6829.02 | | |
| Clock data recovery | R&S®RTO6-K13 | 1801.6835.02 | | |
| Power analysis | R&S®RTO6-K31 | 1801.6858.02 | | |
| Spectrum analysis | R&S®RTO6-K37 | 1801.6870.02 | | |
| User-defined math with Python | R&S®RTO6-K39 | 1803.6778.02 | | |
| Deembedding base option | R&S®RTO6-K121 | 1801.6887.02 | | |
| TDR/TDT analysis | R&S®RTO6-K130 | 1801.6893.02 | | |
| Advanced jitter analysis | R&S®RTO6-K133 | 1801.6906.02 | | |
| Advanced noise analysis | R&S®RTO6-K134 | 1801.7677.02 | | |

| Designation | Type | Order No. | | |
|---|---|---|---|---|
| **Step 6: choose compliance test software options** | | | **Test fixture set** | |
| USB 2.0 compliance test | R&S®RTO6-K21 | 1801.6912.02 | R&S®RT-ZF1 | |
| Ethernet compliance test (10/100/1000BASE-T/EE) | R&S®RTO6-K22 | 1801.6929.02 | R&S®RT-ZF2 | |
| Ethernet compliance test (2.5/5/10GBASE-T) | R&S®RTO6-K23 | 1801.6935.02 | R&S®RT-ZF2 | |
| IEEE 100BASE-T1 compliance test | R&S®RTO6-K24 | 1801.6941.02 | R&S®RT-ZF8, R&S®RT-ZF7A or R&S®RT-ZF2, R&S®RT-ZF3 | |
| MIPI D-PHY compliance test | R&S®RTO6-K26 | 1801.6958.02 | – | |
| MIPI D-PHY 2.5 compliance test | R&S®RTO6-K27 | 1803.6578.02 | | |
| PCI Express 1.1/2.0 compliance test | R&S®RTO6-K81 | 1801.6964.02 | – | |
| IEEE 1000BASE-T1 compliance test | R&S®RTO6-K87 | 1801.6970.02 | R&S®RT-ZF8, R&S®RT-ZF7A or R&S®RT-ZF2, R&S®RT-ZF6 | |
| Ethernet compliance test (MGBASE-T1) | R&S®RTO6-K88 | 1801.7890.02 | | |
| IEEE 10BASE-T1 compliance test | R&S®RTO6-K89 | 1801.6987.02 | R&S®RT-ZF7A, R&S®RT-ZF7P or R&S®RT-ZF8 | |
| DDR3/DDR3L/LPDDR3 signal integrity debug and compliance test | R&S®RTO6-K91 | 1801.6993.02 | – | |
| eMMC compliance test | R&S®RTO6-K92 | 1801.7160.02 | – | |
| R&S®ScopeSuite automation | R&S®RTO6-K99 | 1326.4419.02 | – | |
| **Step 7: choose signal analysis software and options** | | | **Waveform mode** | **I/Q mode [1)]** |
| Baseband I/Q analysis | R&S®VSE | | • | • |
| Pulse measurements | R&S®VSE-K6 | 1320.7516.03 | • | • |
| Multichannel pulse analysis | R&S®VSE-K6a | 1345.1286.03 | • | • |
| Modulation analysis of AM/FM/PM modulated single carriers | R&S®VSE-K7 | 1320.7539.02 | • | • |
| Bluetooth® BR/EDR and Bluetooth® Low Energy measurements | R&S®VSE-K8 | 1345.1970.02 | • | • |
| GSM/EDGE/EDGE Evolution signal analysis | R&S®VSE-K10 | 1320.7574.03 | | • |
| Transient analysis | R&S®VSE-K60 | 1320.7868.03 | • | • |
| Analysis of digitally modulated signals | R&S®VSE-K70 | 1320.7522.02 | • | • |
| 3GPP WCDMA uplink and downlink signal analysis,including HSDPA, HSUPA and HSPA+ | R&S®VSE-K72 | 1320.7580.02 | | • |
| WLAN signal analysis, in line with the WLAN IEEE 802.11a/b/g/n/p/ac/ax standards | R&S®VSE-K91 | 1320.7597.02 | | • |
| Analysis of user-defined OFDM and OFDMA signals | R&S®VSE-K96 | 1320.7922.03 | • | • |
| LTE and LTE advanced signal analysis | R&S®VSE-K100 | 1320.7545.02 | | • |
| LTE and LTE advanced signal analysis | R&S®VSE-K102 | 1320.7551.03 | | • |
| LTE and LTE advanced signal analysis | R&S®VSE-K104 | 1320.7568.02 | | • |
| LTE narrowband IoT analysis | R&S®VSE-K106 | 1320.7900.03 | | • |
| 5G signal analysis | R&S®VSE-K144 | 1309.9574.03 | | • |
| 5G NR MIMO downlink signal analysis | R&S®VSE-K146 | 1345.1305.02 | | • |
| 3GPP 5G NR Release 16 extension for uplink/downlink | R&S®VSE-K148 | 1345.1392.02 | | • |
| HRP UWB measurements | R&S®VSE-K149 | 1345.1463.02 | • | • |
| 3GPP 5G NR Release 17 extension for uplink/downlink | R&S®VSE-K171 | 1345.1663.02 | | • |
| O-RAN measurements | R&S®VSE-K175 | 1350.7020.02 | | • |
| OneWeb reverse link | R&S®VSE-K201 | 1345.2018.02 | • | • |

[1)] Requires R&S®RTO-K11.

| Designation | Type | Order No. | | |
|---|---|---|---|---|
| **Step 8: choose probes and accessories** | | | | |
| **Standard accessories:** 4 × R&S®RT-ZP10 passive probe, quick start guide, power cord, accessories bag | | | | |
| **Additional probes:** See probes and accessories for Rohde&Schwarz oscilloscopes (PD 3606.8866.12) | | | | |
| Precision BNC to SMA adapter | R&S®RT-ZA16 | 1320.7074.02 | | |
| High-precision and low-loss matched cable pair, length: 1 m | R&S®RT-ZA17 | 1337.8991.02 | | |
| Front cover | R&S®RTO6-Z1 | 1801.6641.02 | | |
| Carrying case | R&S®RTO6-Z3 | 1801.6658.02 | | |
| Transit case | R&S®RTO6-Z4 | 1801.6712.02 | | |
| 19" rackmount kit | R&S®ZZA-RTO6 | 1801.6729.02 | | |

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