

R&S® RTE oscilloscopes: ease of use combined with powerful analysis tools

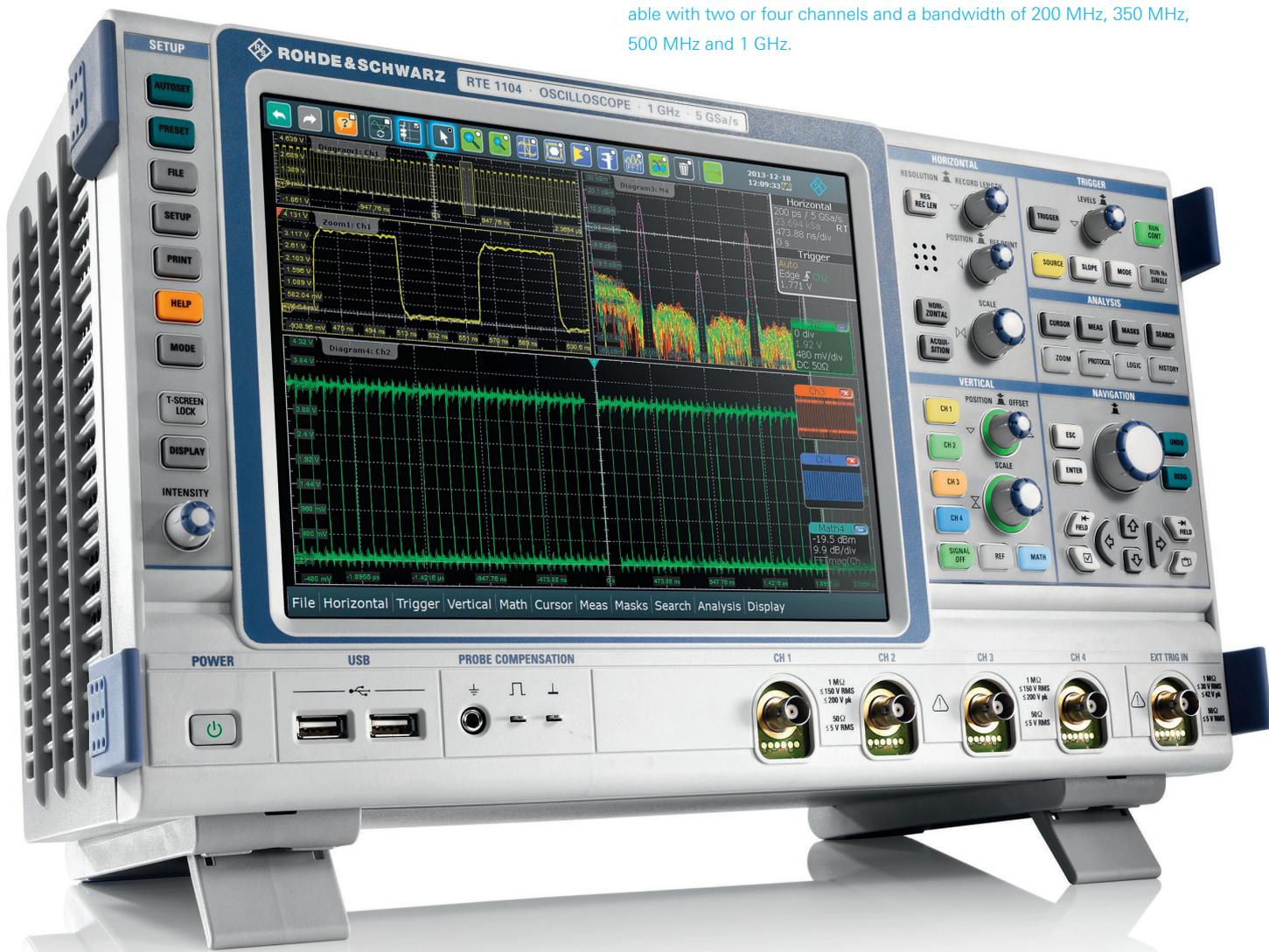
The new R&S® RTE digital oscilloscopes offer fast and reliable solutions for everyday T&M tasks such as general debugging, embedded design development and power electronics analysis. Users benefit from features unusual in this price class, such as 5 Gsample/s per channel and an acquisition rate of one million waveforms per second.

More confidence in measurement results

Digital oscilloscopes can be used for a wide range of applications from simple measurements such as frequency and rise and fall times to complex analyses such as determining the switching loss of a switched-mode power supply. The most important factor for users is that they can rely on the quality of

measurement results. That goes without saying for R&S® RTE oscilloscopes (Figs. 1 and 2), which benefit from the company's many years of experience in the development of precision test and measurement equipment. The new oscilloscope series is positioned under the R&S® RTO family in the Rohde&Schwarz oscilloscope portfolio (see box on page 32).

Fig. 1: The multifunctional R&S® RTE oscilloscopes provide time domain, logic, protocol and frequency analysis in a single box. They are available with two or four channels and a bandwidth of 200 MHz, 350 MHz, 500 MHz and 1 GHz.



The R&S® RTE at a glance	
Bandwidth	200 MHz, 350 MHz, 500 MHz, 1 GHz (upgradeable)
Analog channels	2 / 4 channels
Sample rate	5 Gsample/s per channel
Memory depth	10 Msample per channel (optionally 50 Msample)
Acquisition rate	> 1 000 000 waveforms/s
ENOB (ADC)	> 7
R&S® RTE-B1 mixed signal option	16 digital channels, 5 Gsample/s and 100 Msample per channel
Color display (touchscreen)	10.4", 1024 × 768 pixel

Fig. 2: Key features of the R&S® RTE oscilloscopes.

The more details an oscilloscope can show, the higher the probability that the user will be able to analyze signal faults or important events. As a prerequisite, the oscilloscope must have a high time resolution that is based on the sampling rate. In addition, many applications also require long record lengths, for instance for analyzing the data content of serial protocols. In order to maintain a high sampling rate even for long signal sequences, the oscilloscope requires a deep memory. The R&S® RTE offers a powerful combination of sampling rate and memory depth. A sampling rate of 5 Gsample/s at a memory depth of 10 Msample is available per channel (can be optionally expanded to 50 Msample per channel).

The less often signal faults occur, the longer it can take to detect them. This makes a high acquisition rate critical. The core of the R&S® RTE is an ASIC that was especially designed for parallel processing. As a result, the R&S® RTE can acquire, analyze and display more than one million waveforms per

second without a special acquisition mode (Fig. 3). The high acquisition rate makes it possible to find signal faults faster and more reliably, effectively shortening debugging time.

The highly accurate digital trigger system is another factor ensuring precise results. This unique system determines when a trigger condition is met by directly analyzing the digitized signal with 500 fs resolution independently of the current sampling rate. The result is very low trigger jitter (< 1 ps RMS) and high measurement accuracy. Thanks to the digital trigger system, the trigger hysteresis can be adjusted to the signal quality. This ensures, for example, stable triggering even on extremely noisy signals.

The single-core A/D converter with more than seven effective bits (ENOB) almost completely eliminates signal distortion. The input sensitivity of 1 mV/div without any bandwidth limitations ensures that low-amplitude signals can also be measured with a high degree of accuracy.

More functions and faster results

The R&S® RTE oscilloscopes include many integrated measurement tools for detailed signal analysis. They range from simple cursor functions to mask tests to complex mathematical operations. Many measurement functions such as histograms, spectrum display and mask tests are hardware-implemented. This makes the oscilloscope very responsive and ensures high acquisition rates, so that statistically conclusive measurement results are available fast.



The app version of this article contains a video about the R&S® RTE.

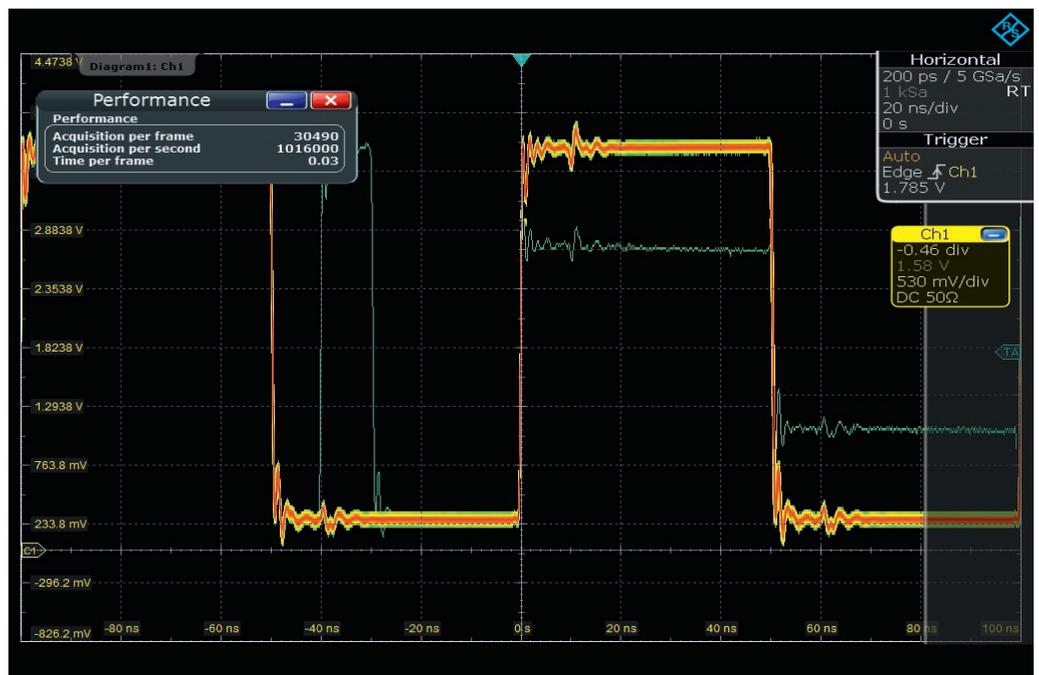


Fig. 3: The R&S® RTE oscilloscopes find rare signal faults very quickly thanks to their high acquisition rate of one million waveforms per second.

In addition to the automatic measurements that are customary for digital oscilloscopes, the R&S® RTE offers the QuickMeas function, which is unique for an instrument in this class. QuickMeas simultaneously displays the results of several measurement functions (Fig. 4), which users select according to their needs. A toolbar at the upper edge of the screen provides fast access to all R&S® RTE tools.

Mask tests reveal whether a specific signal lies within defined tolerance limits and use statistical pass/fail evaluation to assess the quality and stability of a device under test. Mask creation in the R&S® RTE is simply a matter of pressing a few buttons. The high acquisition rate ensures that mask violations are detected rapidly and reliably. Signal anomalies and unexpected results are easy to identify by stopping the measurement if the mask is violated.

Where does the interference pulse in the signal come from? What caused the loss of a data bit? The real cause of a problem can often only be found by looking at the history of a signal sequence. The R&S® RTE history function always provides access to previously acquired waveforms. This enables users to later analyze in detail the measurement data stored in memory.

The FFT function of the R&S® RTE makes spectral analysis easy (Fig. 5). The high acquisition and postprocessing rate conveys the impression of a live spectrum, and operation is as simple as entering the center frequency, span and resolution



Fig. 4: In the R&S® RTE oscilloscopes, up to eight automatic measurements can be configured and activated simultaneously.

bandwidth. Using the persistence mode, rapid signal changes, sporadic signal interference and weak superimposed signals can easily be made visible. The ability to overlap FFT frames enables the R&S® RTE to also detect intermittent signals such as pulsed interferers. This powerful FFT function plus the high dynamic range and input sensitivity of up to 1 mV/div make the oscilloscopes ideal for tasks such as EMI debugging of electronic circuits during product development (see page 38).

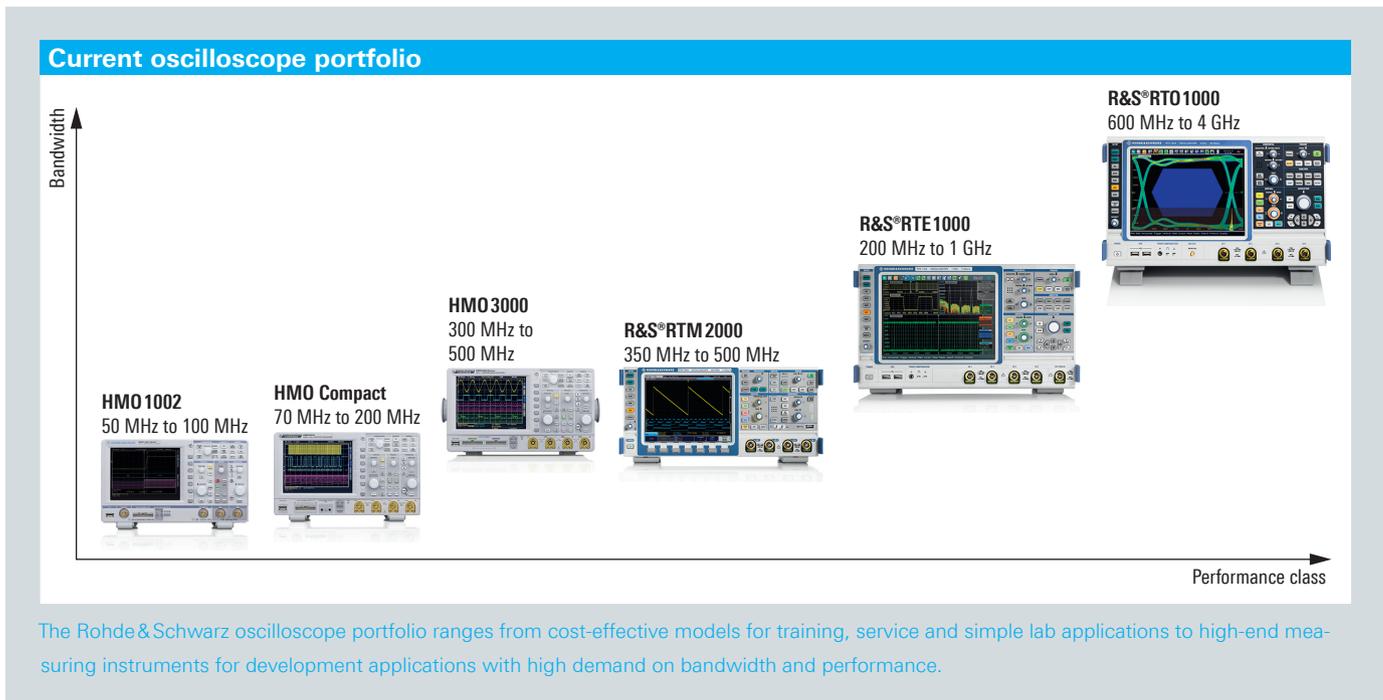
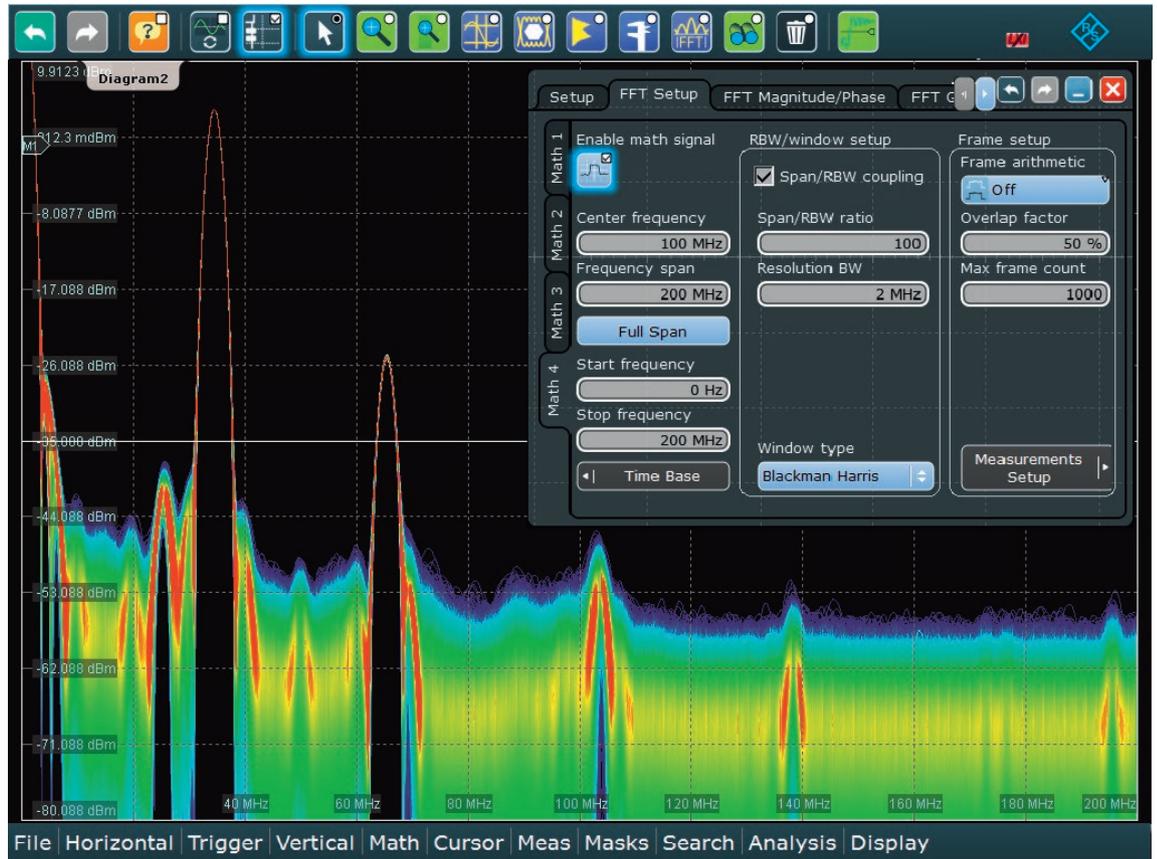


Fig. 5: The R&S®RTE FFT function offers accuracy, speed, functionality and ease of use.



More fun to use

Thanks to the high-resolution 10.4" XGA touchscreen, users can intuitively perform their daily T&M tasks. For example, users can simply drag & drop waveforms to arrange them on the screen, and they can flexibly organize the screen according to their requirements by dividing it into several diagrams. Realtime miniature views of the signals on the edge of the screen allow users to always see what is happening. The R&S®RTE controls are color-coded and indicate which channel is currently active. The color coding corresponds to the signal display on the screen. Dialog boxes are opened as semi-transparent overlays over the active waveforms, which maintain their full size. Users can adjust the transparency of dialog boxes as required. Signal flow diagrams and forward and back buttons in the dialog boxes simplify navigation. The configurable toolbar provides fast access to frequently used functions. Users simply select a tool and apply it to their waveform. Tools with related functions are grouped together. In addition to the standard tool suite, the R&S®RTE features many highlights such as fingertip zoom, which allows users to quickly view signal details by moving their finger or mouse along the signal. Another example is the SaveSet tool, which enables users to quickly load different configurations. To select the right configuration, the user simply swipes a screenshot.

Broad range of dedicated application solutions

In addition to the standard functionality, the R&S®RTE oscilloscopes offer various optional application solutions, including trigger and decoding options for serial buses (such as I²C, SPI and CAN) and a power analysis option. The logic analysis capability offered by the R&S®RTE is essential for analyzing digital components of embedded designs. The R&S®RTE-B1 mixed signal option can be added to any base unit and offers 16 additional digital channels with a sampling rate of 5 Gsample/s and a memory depth of 100 Msample per channel. It is possible to decode up to four serial or parallel buses simultaneously.

A comprehensive portfolio of high-quality active and passive probes is available for the R&S®RTE to perform measurements in common voltage and current ranges. One of the highlights of the active probes from Rohde&Schwarz is a micro button on the probe tip. This button can be used to perform a variety of functions such as run / stop, autoset and adjust offset on the oscilloscope. The highly precise R&S®ProbeMeter DC voltmeter (measurement error: $\pm 0.1\%$) is integrated into the active probe and provides a convenient means of answering questions such as "Is the supply voltage correct?" and "Is DC voltage superimposed?"

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