R&S®HMO3000 Series
Mixed Signal Oscilloscopes
300/400/500 MHz Bandwidth

Elektronik
Product of the Year

Oscilloscope HMO3000
Test & Measurement
HAMEG Instruments

ROHDE & SCHWARZ
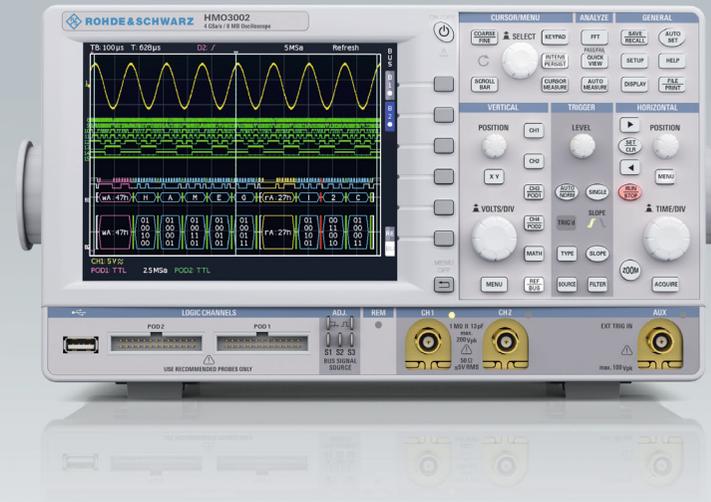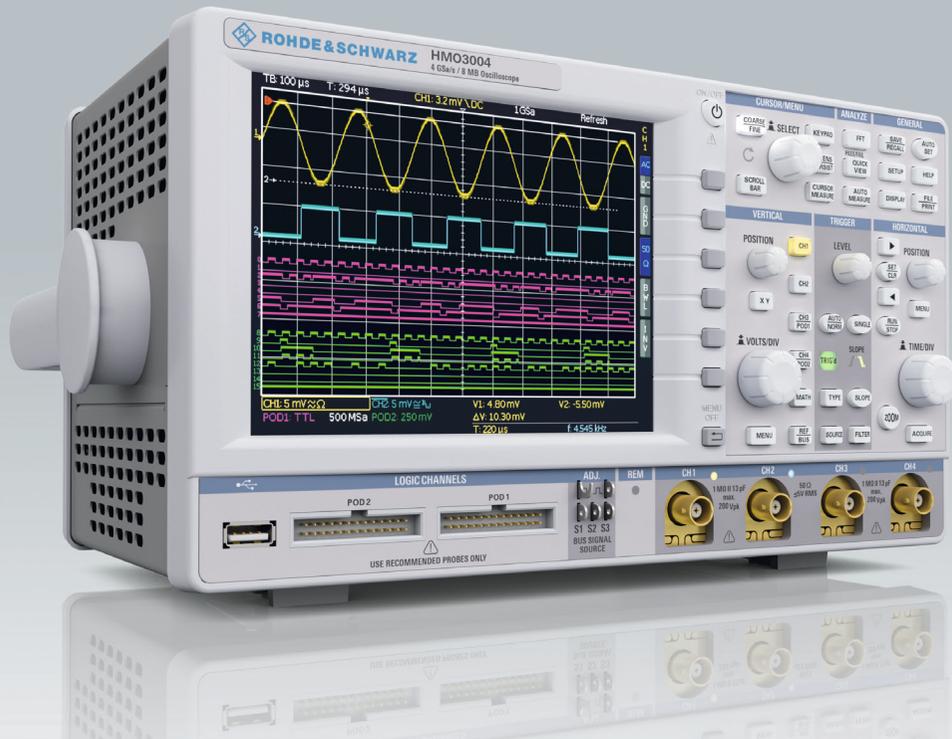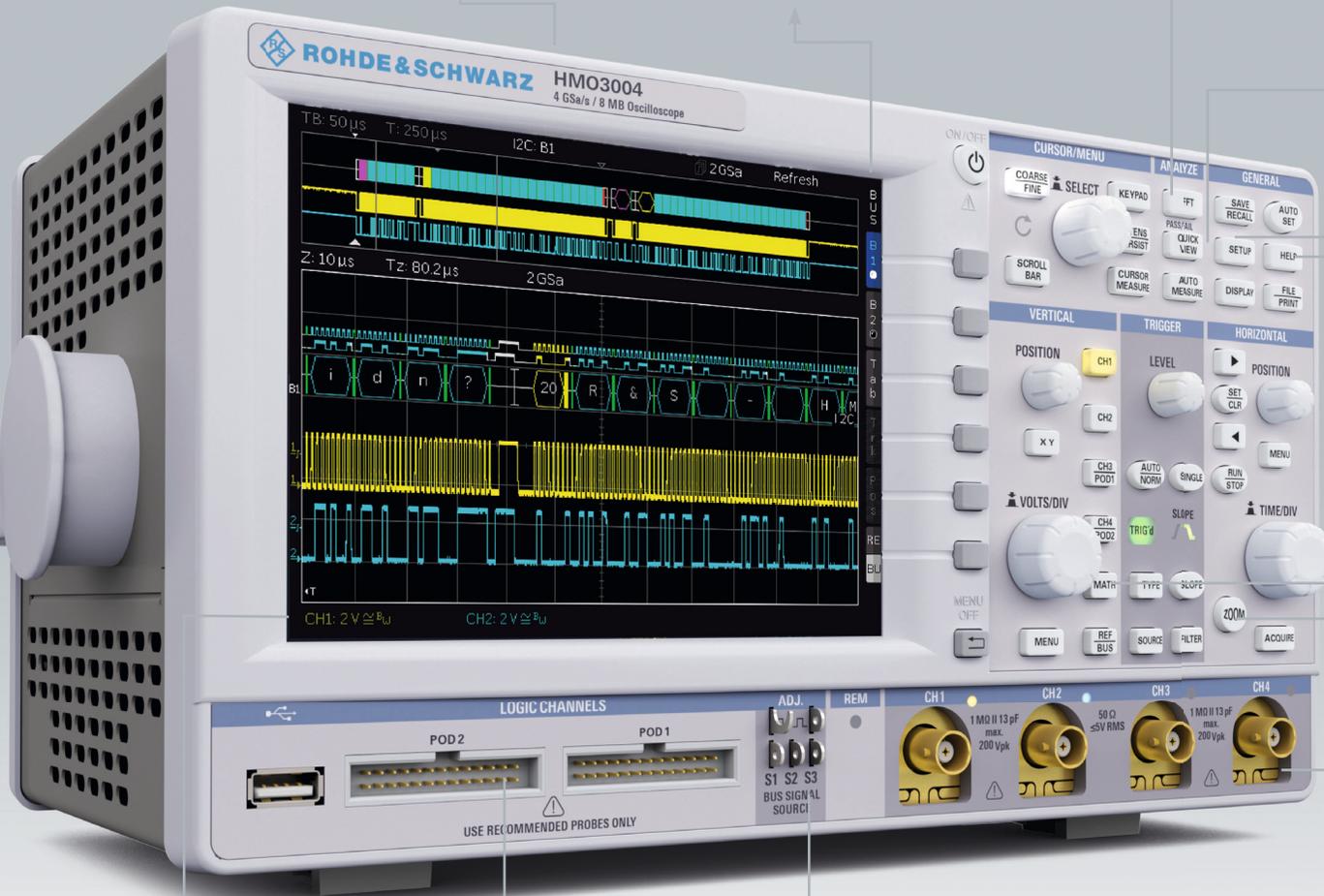
Precise signal analysis
4 Gsamples/s sampling rate
8 Msamples memory

Intelligent user interface
To optimize the screen
display the instrument
shows and hides menus

FFT
Superb FFT
functionality

Quick view
At the push of a button
the 16 most important
values of the measured
signal are permanently
updated and displayed

Setup
Intuitive, multi-lingual
user menu

Help
Context-sensitive help

Math
Wide range of programmable
math functions

Zoom
Memory zoom up to
250,000 : 1

Analog channels
Vertical sensitivity of up to
1 mV/div.

Fan
Maximum noise reduction by
temperature-controlled fan

Bus signal source
To create SPI, I²C, UART
and counter signals

Always with MSO functionality
Analyze analog channels plus up to
an additional 16 digital channels

Serial Bus Analysis
Hardware-based triggering and
decoding (optional)

USB
TCP/IP
optional RS-232
optional IEEE-488
6.5" VGA 16.5 cm
DVI-D Output
50 Ω 1 MΩ
Lab-VIEW
Software
Printed Manual

At a glance

Systems that are constantly becoming faster and more complex lead to ever higher demands on the required measurement technology. The oscilloscope series R&S®HMO3000 offers the solution for current requirements in regards to bandwidth, sampling rate and memory depth. Its bandwidth of up to 500 MHz allows to set a new milestone in the development of high-performance mixed-signal oscilloscopes at an attractive price.

The 2- and 4-channel instruments provide bandwidths of 300, 400 and 500 MHz, a sampling rate of 4 GSa/s and a memory depth of 8 MPts. The instruments are rounded off with a standard inclusion of the MSO functionality and several options for serial bus analysis to meet all requirements of modern development designs.

Rohde & Schwarz is offering the new R&S®HMO3000 series exclusively as mixed-signal oscilloscopes. It is also unnecessary to initially activate the mixed-signal functions via software options, as is the case with other suppliers. The low capacitance logic probe R&S®HO3508 (also available as double pack HO3516) is optional. It allows the analysis of up to 16 logic channels with a sampling rate of 1 GSa/s. The logic probe is not linked to a specific instrument serial number. This allows its use with all digital oscilloscope of the R&S®HMO series.

For communications between embedded systems and the environment the R&S®HMO3000 includes hardware-based signal triggering and decoding for all common protocols (I2C, SPI, UART, CAN and LIN). This option can be activated with an upgrade voucher at any time.

The integrated three-digit digital voltmeter enables service technicians to simultaneously perform voltage measurements on all analog channels with four values totalling.
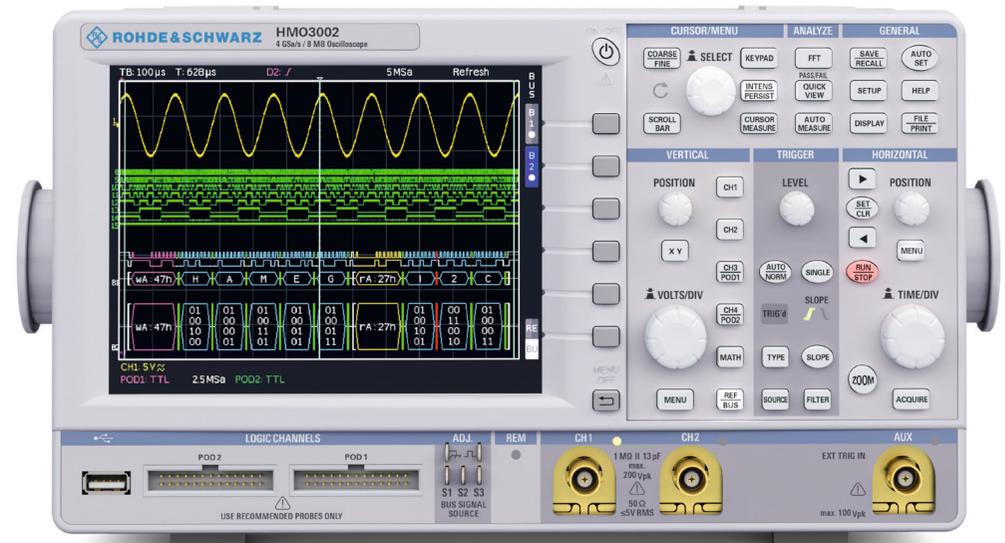
The segmented memory option R&S®HOO14 enables you to divide the available memory of your R&S®HMO3000 into up to 1000 segments. This procedure allows sampling rates of 200 000 Wfm/s, which makes it possible to capture rare anomalies occurring during many short events in quick succession. For the analysis of the recorded signals, all measurement functions of the R&S®HMO are available, including the Pass/Fail function.

Thanks to the FFT analysis function with 64 k test points the R&S®HMO3000 series keeps pace with significantly larger oscilloscopes also in the frequency domain. The time domain signal, measurement window, FFT analysis result are displayed together on a single screen, which makes it easier to evaluate the input waveform.

The R&S®HMO3000 series offers time domain, logic, protocol and frequency analysis in a single instrument and is a member of the Rohde & Schwarz family of scope-of-the-art oscilloscopes.

Key facts

Superior hardware-based acquisition for precise measurement results
- 4 Gsample/s sampling rate, 8 Msample memory depth
- High vertical sensitivity down to 1 mV/div
- Low-noise measurement due to state-of-the-art A/D converter
- High acquisition rate to identify signal faults
- Segmented memory and manually adjustable memory depth

Versatile measurement functions and fast results
- Wide selection of automatic measurement functions
- QuickView: key results at the push of a button
- Mask test: a new mask can be easily created with just a few keystrokes
- FFT: the easy way to analyze the signal spectrum

Logic analysis with the MSO option
- Mixed signal function as standard
- Precise triggering on signal events
- Straightforward display of digital signals
- Low test point loading due to active probe solution

Serial bus analysis: hardware-based triggering and decoding
- Versatile trigger options for isolating specific data packets
- Color-coded display of decoded bus signals
- Direct export of analyzed data to USB memory drive
- Simultaneous decoding of two buses in realtime

Voltmeter measurements using an oscilloscope
- Three-digit display for precise voltage measurements
- Simultaneous measurement on all analog channels of up to four voltage values totalling

Future-ready investment and scalability
- Free firmware updates
- Bandwidth upgrades as required
- Serial bus analysis and segmented memory via optional software licenses

| Application	How the R&S®HMO3000 meets your needs
Engineering lab	- Adjustable memory depth - Advanced math functions available as standard, math on math possible - Automeasurement for 28 user-defined parameters - Segmented memory (R&S®HOO14, R&S®HV114)
Analog circuit design	- Low-noise amplifier and A/D converter - 1 mV/div. sensitivity - 50 Ω/1 MΩ input impedance, switchable - Bandwidth upgrades via software options - Simultaneous voltmeter measurements on all analog channels
Embedded debugging	- Mixed signal option (MSO) with 16 logic channels - Serial bus trigger and hardware-accelerated decode (R&S®HOO10/11/12, R&S®HV110/111/112) - 7-digit hardware counter - Superb FFT functionality
Production environment	- Remote control for automated data acquisition - Pass/fail tests based on user-defined masks with error signal output - Automatic signal measurement at the push of a button - USB/RS-232, Ethernet/USB or GPIB (IEEE 488) interfaces
General purpose and education	- Fast boot time - Low-noise, intelligent temperature management - Extended display size through Virtual Screen technology - DVI-D output for external display

Model overview

	500 MHz	400 MHz	300 MHz
4 channel	**R&S®HMO3054**	**R&S®HMO3044**	**R&S®HMO3034**
2 channel	**R&S®HMO3052**	**R&S®HMO3042**	**R&S®HMO3032**

300 MHz, 400 MHz, 500 MHz

Should your requirements change, then so does the R&S®HMO3000, as the 300 MHz models can be extended to 400 MHz and 500 MHz bandwidth via software
upgrades whenever required. This is done with option upgrade vouchers available at your dealer.

❙ For 300 MHz to 400 MHz: HV342 (2 channel) and HV344 (4 channel)
❙ For 300 MHz to 500 MHz: HV352 (2 channel) and HV354 (4 channel)
❙ For 400 MHz to 500 MHz: HV452 (2 channel) and HV454 (4 channel)

Vouchers for bandwidth upgrades or serial bus analysis options are available at your dealer. The individual voucher number and the serial number of the instrument to be upgraded is entered at http://voucher.rohde-schwarz.com. The customer immediately receives the respective licence key which can be loaded via USB memory drive into the instrument.
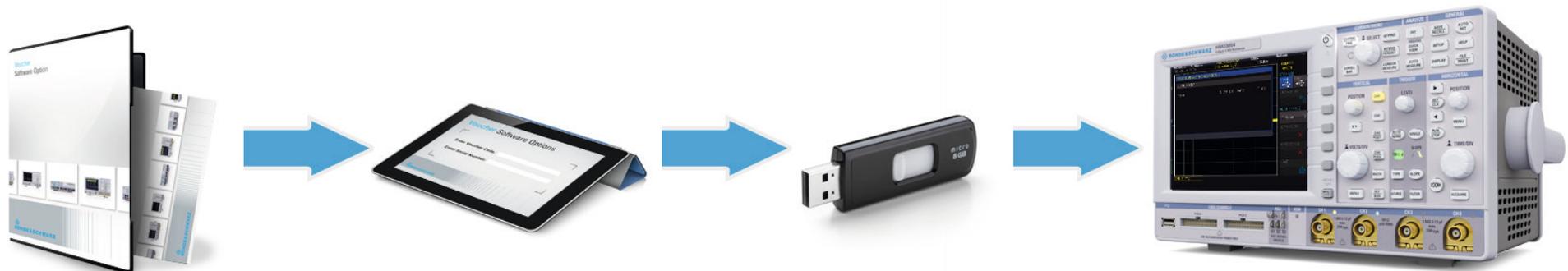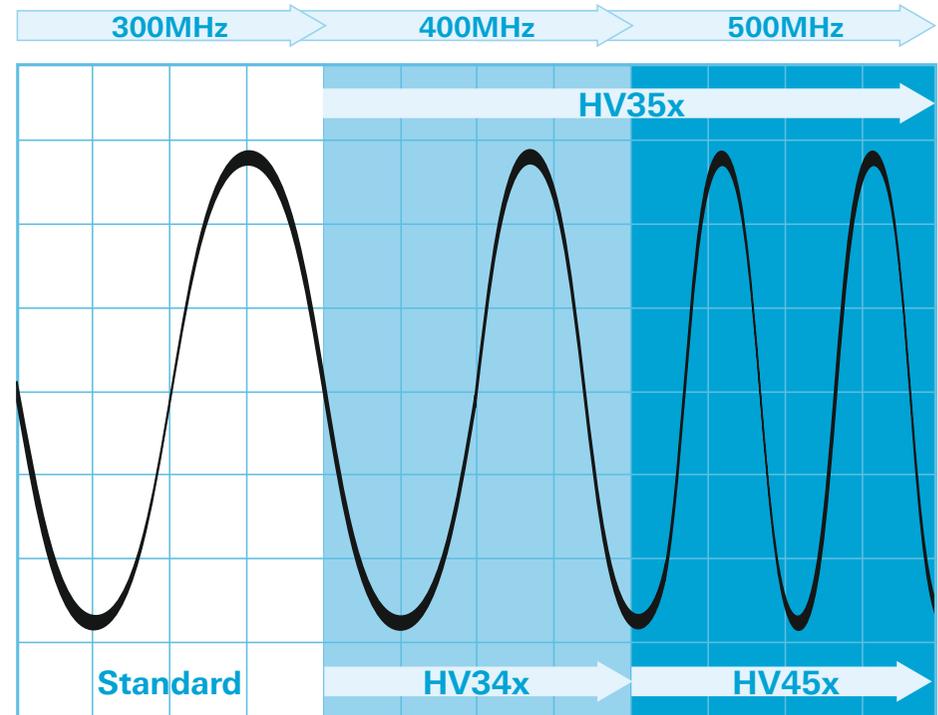
Always a MSO

The mixed signal functionality is always included in the R&S®HMO3000 series with no software option being necessary to unlock it.
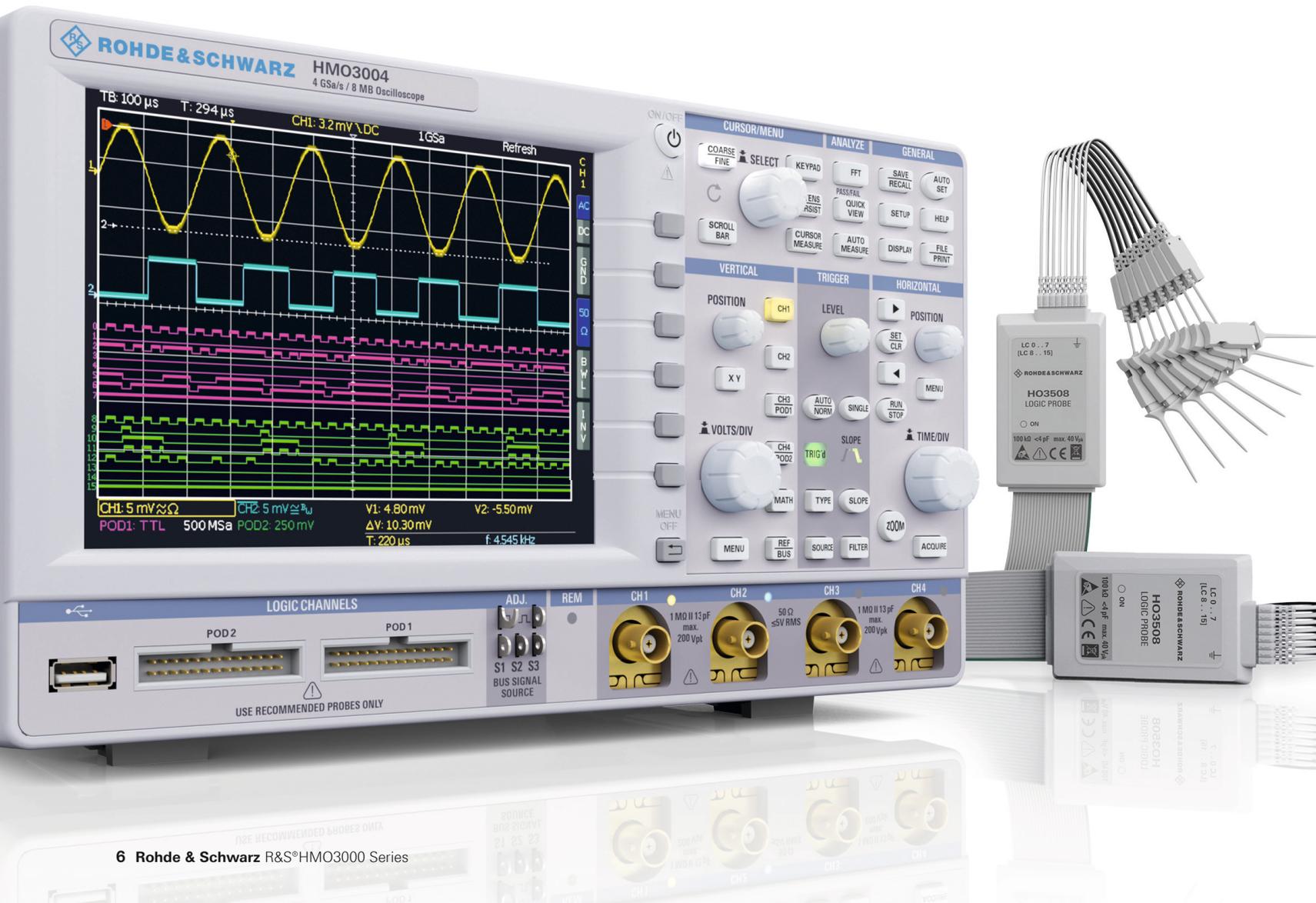
Rohde & Schwarz is offering the R&S®HMO3000 series exclusively as a mixed-signal oscilloscope. The great advantages of these instruments are best illustrated by taking a look at how ADCs (Analog Digital Converter) or DACs (Digital Analog Converter) are integrated.

These transformer modules include an analog signal on the one side and a digital signal on the other side. As shown in the image below the latency time of a DAC can be determined with one simple cursor measurement. Therefore a MSO allows developers to devote their full attention to the circuit without having to waste energy on the measurement setup.

The active logic probe R&S®HO3508 (also available as double pack HO3516) is available separately and is not linked to a specific serial number of an instrument. It can be used with any R&S®HMO oscilloscope.
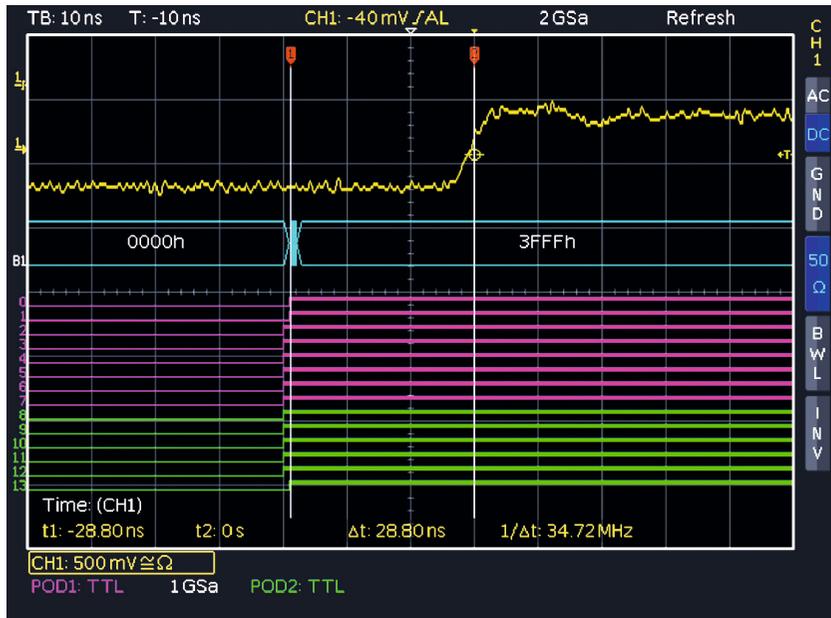
14 bit DAC signal change

❚ Logic probe R&S®HO3508 fits to all R&S®HMO series oscilloscopes (also available as double pack HO3516)
❚ No hardware lock to a specific device
❚ 8 logic channels available on each logic probe
❚ Signal threshold adjustable for each logic pod

Specifications R&S®HO3508	
Channels	8
Memory depth per channel	4 MPts (R&S®HMO3000 series)
Input impedance	100 kΩ ‖ <4 pF
Max. input frequency	350 MHz
Max. input voltage	40 V (DC + AC)
Thresholds	TTL, CMOS, ECL, user-defined (-2 V to +8 V)
Measuring category	CAT I
Cable length	approx. 1 m

Serial Bus Analysis

I^2C, SPI, CAN or LIN – in terms of interaction with the outside world for embedded systems, it is safe to say that these are the most commonly used communication protocols. The R&S®HMO3000 series by Rohde & Schwarz offers you hardware-accelerated signal triggering and decoding for all of these protocols. You can upgrade your instrument via software licence keys with those functions required to develop your application:

❙ R&S®HOO10 / R&S®HV110: Analysis of I^2C, SPI and UART/RS-232 signals on analog and logic channels
❙ R&S®HOO11 / R&S®HV111: Analysis of I^2C, SPI and UART/RS-232 signals on all analog channels
❙ R&S®HOO12 / R&S®HV112: Analysis of CAN and LIN signals on analog and logic channels

Serial bus trigger types:
❙ I^2C: Start, Stop, ACK, nACK, Address/Data
❙ SPI: Start, End, Serial Pattern (32Bit)
❙ UART/RS-232: Startbit, Frame Start, Symbol, Pattern
❙ LIN: Frame Start, Wake Up, Identifier, Data, Error
❙ CAN: Frame Start, Frame End, Identifier, Data, Error

SPI bus signal, MISO / MOSI decoded

HEX decoded CAN bus signal


I^2C bus signal in zoom view

Segmented Memory

The segmented memory option R&S®HOO14 enables you to divide the available acquisition memory of the R&S®HMO3000 into up to 1000 segments.

This procedure allows sampling rates of 200 000 Wfm/s, which makes it possible to capture rare anomalies occurring during many short events in quick succession.

Segmentation can be applied on the acquisition of analog and digital channels as well as onto the decoding of serial busses. Additionally, all measurement functions for analyzing the recorded signals are available, including the Pass/Fail function.

You can upgrade to option R&S®HOO14 at any time with voucher R&S®HV114. The individual voucher number and the serial number of the instrument is entered at http://voucher.rohde-schwarz.com.
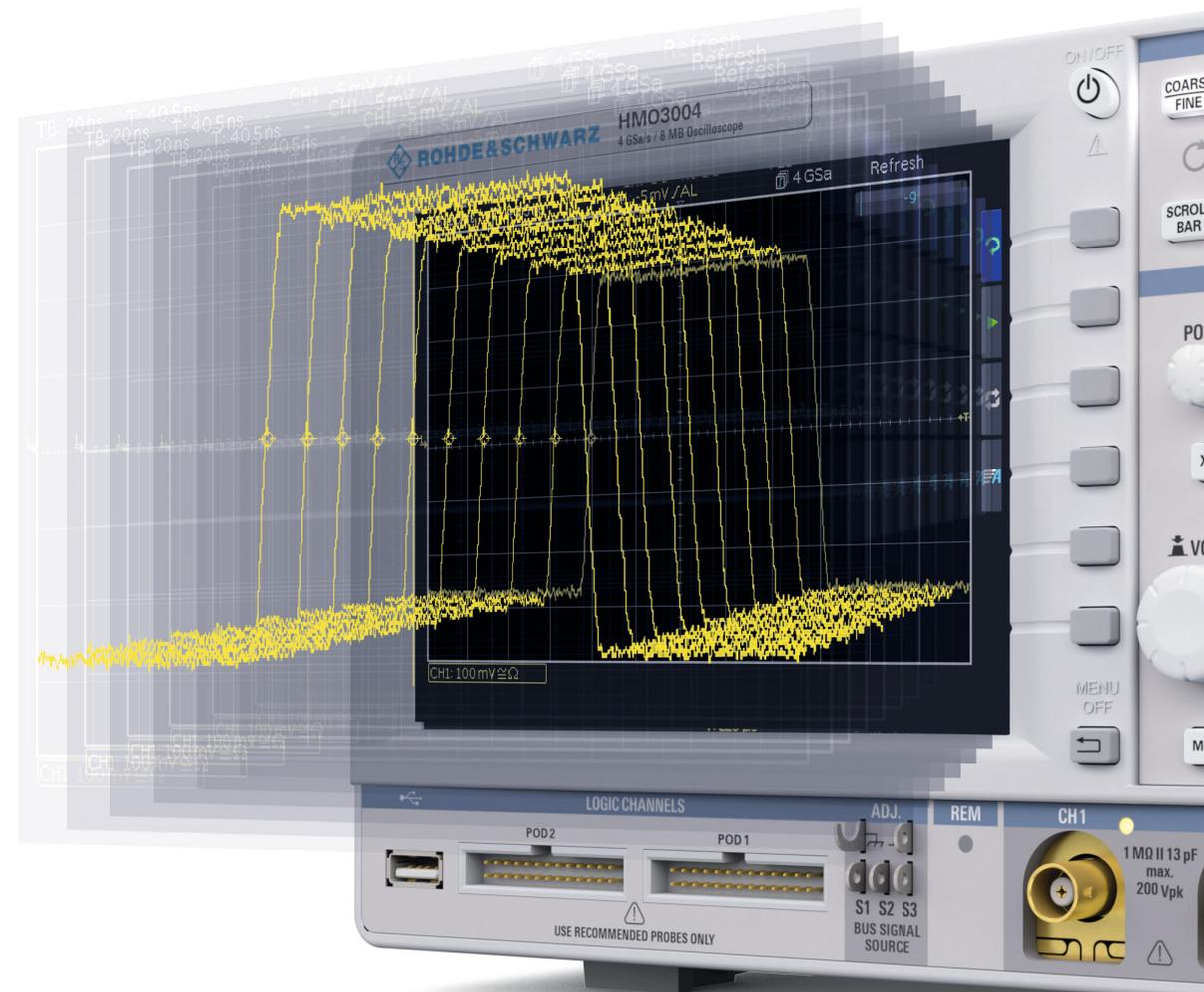
| Segmented Memory (R&S®HOO14, R&S®HV114)	
Acquisition memory divided into segments	
Maximum segments	1000
Minimum segment size	5 kPts
Maximum segment size	1 MPts
Re-arming time	<3 µs
Maximum acquisition rate	200 000 Wfm/s
Segment player	Displays all recorded segments manually or automatically, all measurement functions including pass/fail can be used with recorded segments
Sources	all analog and digital channels, busses

Digital Voltmeter (DVM)

The three-digit digital voltmeter is also a standard feature which makes the work of service technicians in particular easier. Voltage measurements can be performed simultaneously for all analog channels. Integrated into a single compact device it allows you to keep your workplace tidy.

❚ Perform measurements simultaneously on all analog channels, with up to four freely definable parameters totalling
❚ These options are available: DC, DC_{rms}, AC_{rms}, Crest Factor, V_{pp}, V_{p+}, V_{p-}
❚ You decide about the position of the values on the screen
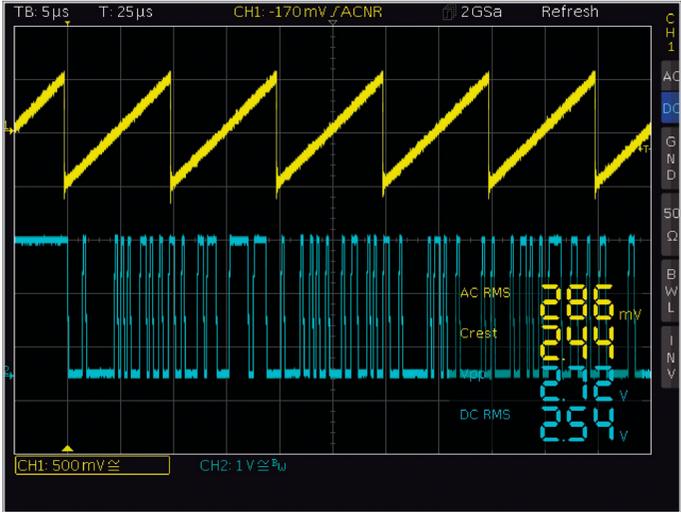
DVM on two analog channels with four measurement parameters
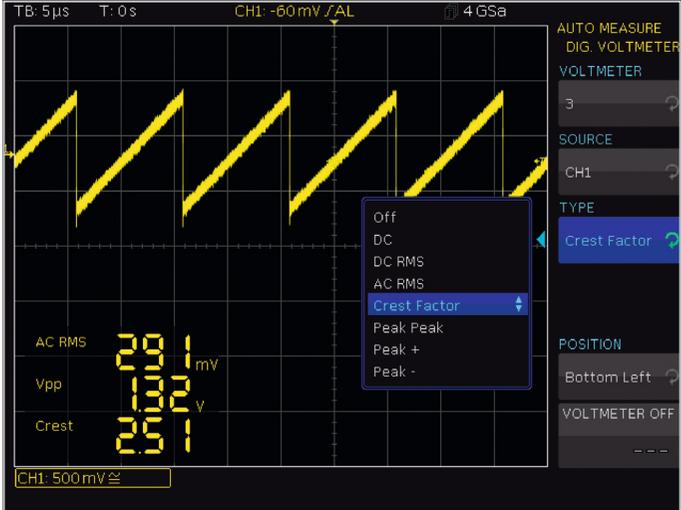
Ramp waveform measured by DVM

HZ15 probe
(sold separately)

Frequency Analysis

Due to the outstanding FFT functionality of the R&S®HMO series oscilloscopes signals can also be analysed in the frequency domain with up to 65,536 points. Additional practical tools such as cursor measurement as well as peak-detect functions are also available. They allow engineers to complete their analysis significantly faster, also in the frequency domain.
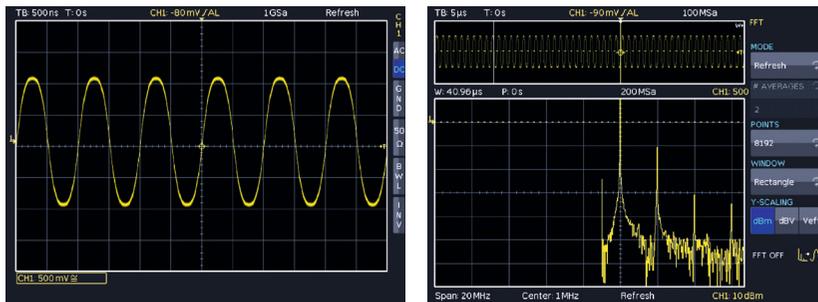
Sinusoid signal in the time domain

Frequency spectrum exposes the distortion

Easy analysis in frequency domain

In the time domain quite often the distortion of input signals cannot be detected with the naked eye. For instance, an acquired sine wave signal appears to be undistorted. Only the frequency spectrum – available with just one push of a button – clearly displays additional harmonics that occur as harmonic oscillations for multiples of the basic frequency.

Since FFT is also active for previously stored signals, it is possible to subsequently analyze any sections of those signals captured in single shot mode or stop mode with an adjustable window width.
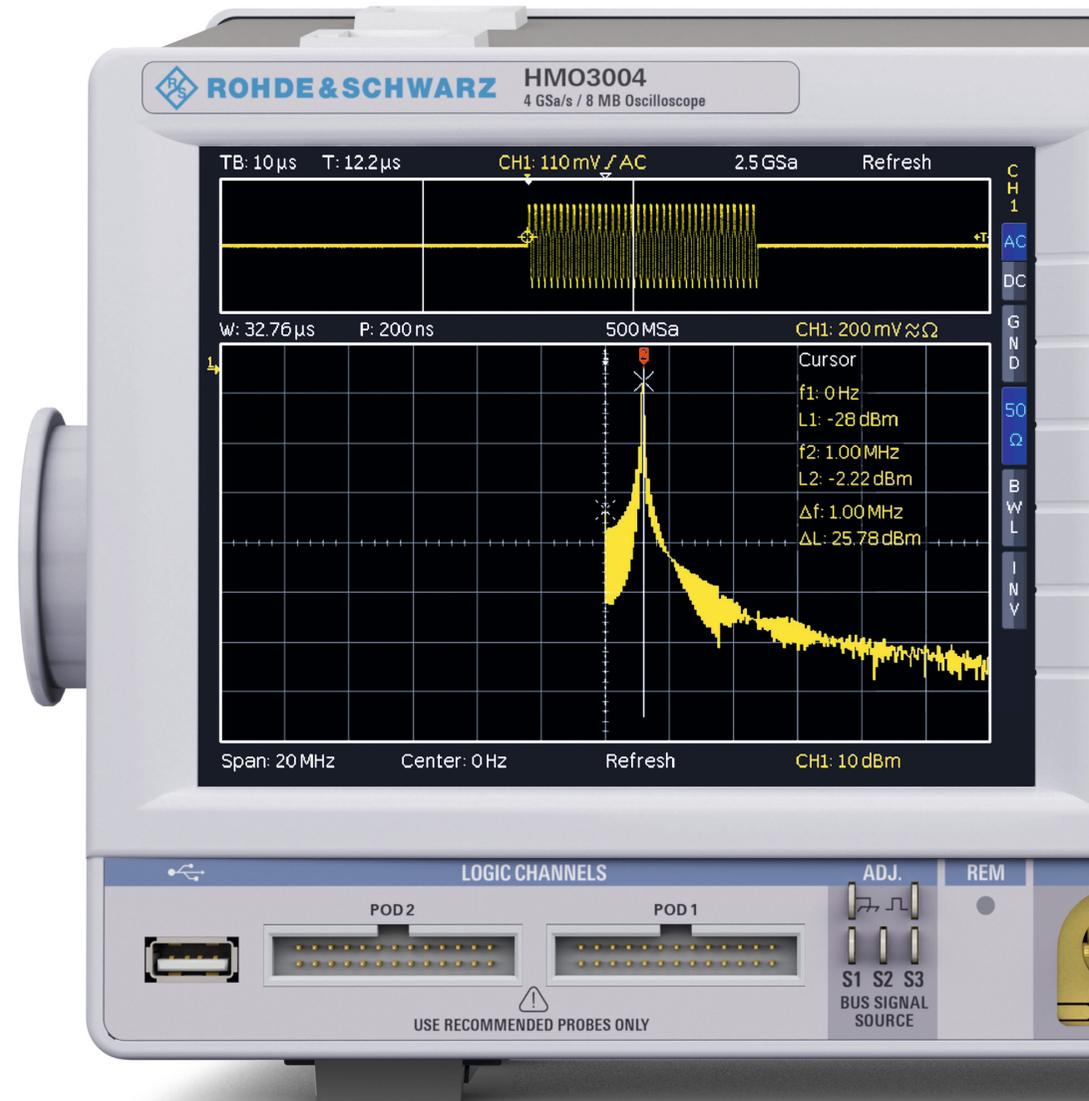
R&S®HMO3002 series 2-channel mixed signal oscilloscope
R&S®HMO3004 series 4-channel mixed signal oscilloscope

R&S®HMO3032, R&S®HMO3034: 300 MHz
R&S®HMO3042, R&S®HMO3044: 400 MHz
R&S®HMO3052, R&S®HMO3054: 500 MHz

from firmware version 5.520

Display

Screen size / type	16.5 cm (6.5 ") VGA Color Display
Resolution	640 (H) x 480 (V) pixel
Backlight	500 cd/m² (LED)
Display range in horizontal direction	
without menu bar	12 Div (600 pixel)
with menu bar	10 Div (500 pixel)
Display range in vertical direction	8 Div (400 pixel)
with VirtualScreen usage	20 Div
Color depth	256 colors
Trace display	pseudo-color, inverse intensity
Levels of trace brightness	32
Button brightness	light, dark

Vertical System

DSO mode	
2-channel models	CH1, CH2
4-channel models	CH1, CH2, CH3, CH4
MSO mode	
2-channel models	CH1, CH2, POD1, POD2
4-channel models	CH1, CH2, CH3|POD1, CH4|POD2

Analog Channels

Y-bandwidth (-3dB)	
(1mV, 2mV)/Div	R&S®R&S®HMO303x: 180 MHz R&S®HMO304x, HMO305x: 200 MHz
(5mV bis 5V)/Div	R&S®HMO303x: 300 MHz R&S®HMO304x: 400 MHz R&S®HMO305x: 500 MHz
Lower AC bandwidth	2 Hz
Bandwidth limitation (switchable)	about 20 MHz

Rise time (calculated, 10% to 90%)	
R&S®HMO303x	< 1.166 ns
R&S®HMO304x	< 0.875 ns
R&S®HMO305x	< 0.700 ns
DC gain accuracy	2 % of full scale
Input sensitivity	
all analog channels	1 mV/Div to 5 V/Div (1 MΩ and 50 Ω)
coarse stepping	12 calibrated steps, 1-2-5
variable stepping	freely between calibrated steps
Impedance	1 MΩ II 13 pF ±2 pF (50 Ω switchable)
Coupling	DC, AC, GND
Max. input voltage	(derates at 20 db/decade to 5 V_{rms} above 100 kHz)
1 MΩ	200 V_p
50 Ω	5 V_{rms}, max. 30 V_p
Position range	±8 Div (from center of screen)
Offset control	
1 mV/Div, 2 mV/Div	±0.2 V - 8 Div x sensitivity
5 mV/Div to 20 mV/Div	±1.0 V - 8 Div x sensitivity
50 mV/Div	±2.5 V - 8 Div x sensitivity
100 mV/Div, 200 mV/Div	±20 V - 8 Div x sensitivity
500 mV/Div to 5 V/Div	±50 V - 8 Div x sensitivity
XY/XYZ mode	selectively all analog channels
Inversion	selectively all analog channels

Logic Channels (with logic probe R&S®HO3508/HO3516)

Thresholds	TTL, CMOS, ECL, user-defined (-2 V to +8V)
Impedance	100 kΩ || 4 pF
Coupling	DC
Max. input voltage	40 V_p

Trigger System

Trigger Mode

Auto	Triggers automatically also without any specific trigger event
Normal	Triggers only on specific trigger events
Single	Triggers once on a trigger event
Trigger indicator	Screen and panel (LED)
Trigger sensitivity	
up to 2 mV/Div	1.5 Div
2 mV/Div to 5 mV/Div	1.0 Div

from 5 mV/Div	0.8 Div
external	0.5 V_{pp} to 10 V_{pp}
Trigger level setting	
with auto level	Linking peak value and trigger level, adjustable between peak values of a signal
without auto level	±8 Div (from center of screen)
external	±5 V
Trigger coupling	
Auto level	5 Hz to 300/400/500 MHz
AC	5 Hz to 300/400/500 MHz
DC	DC to 300/400/500 MHz
HF	30 kHz to 300/400/500 MHz
selectable filters	
LF	DC to 5 kHz, selectable in DC and auto level mode
low-pass (noise rejection)	200 MHz, selectable in AC, DC, HF and auto level mode
Trigger hold-off	50 ns to 17 s

External Trigger Input (BNC)

Impedance	1 MΩ || 14 pF ±2 pF
Sensitivity	0.5 V_{pp} to 10 V_{pp}
Trigger level	±5 V
Max. input voltage	100 V_p
Coupling	DC, AC

Trigger/Auxiliary Output (BNC)

Functions	Pulse output for every acquisition trigger event, error output on mask violation
Output level	3.8 V
Pulse polarity	positive
Pulse width	>150 ns (trigger event), >0.5 µs (mask violation)

Trigger Types

Edge

Direction	increasing, decreasing, both
Trigger coupling	auto level AC, DC, HF
Switchable filters	LF, noise rejection
Sources	all analog and digital channels, mains, external (AC, DC)

Edge A/B

Direction	increasing, decreasing, both
Source A, B	all analog channels, external (AC, DC)
Frequency range	DC to 300/400/500 MHz

Min. signal amplitude	0.8 Div
Trigger level range (seperately adjustable with different sources)	±8 Div (from center of screen)
external	±5.0 V
Trigger coupling	
State A	auto level, AC, DC, HF, LF, low-pass
State B	
same sources	as state A
different sources	DC, HF, low-pass
Trigger setting	
time based	16 ns to 8.589 s, resolution min. 4 ns
event based	1 to 2^{16} events

Pulse Width

Polarity	positive, negative
Functions	equal, not equal, lower, higher, within/without a range
Pulse duration	4 ns to 8.5 s, resolution min. 0.5 ns
Sources	all analog and digital channels

Logic

Functions	
boolean operators	AND, OR, TRUE, FALSE
time based operators	equal, not equal, lower, higher, within/without a time range, timeout
Duration	4 ns to 8.5 s, resolution min. 0.5 ns
States	H, L, X
Sources	all logic channels

Video

Sync. pulse polarity	positive, negative
Supported standards	NTSC, SECAM, PAL, PAL-M, SDTV 576i, HDTV 720p, HDTV 1080i, HDTV 1080p
Field	even/odd, either
Line	line number selectable, all
Sources	all analog channels, external (AC, DC)

Risetime

Functions	rise/fall time, both
Time range	4 ns to 8.5 s, resolution min. 0.5 ns
Time based operators	equal, not equal, lower, higher
Variance	±2 ns to ±33.5 ms, resolution 2 ns
Sources	all analog channels

Runt

Polarity	positive, negative, both
Sources	all analog channels

Serial Busses (optional)

Bus representation	Up to two busses can be analyzed at the same time. Color-coded display of decoded data in ASCII, binary, decimal and hexadecimal format.
Option / Voucher codes	
R&S®HOO10 / R&S®HV110	Analysis of I²C, SPI, UART/RS-232 signals on analog and logic channels
R&S®HOO11 / R&S®HV111	Analysis of I²C, SPI, UART/RS-232 signals on all analog channels
R&S®HOO12 / R&S®HV112	Analysis of CAN and LIN signals on analog and logic channels
Trigger types by protocols	
I²C	Start, Stop, ACK, NACK, Address/Data
SPI	Start, End, Serial Pattern (32 Bit)
UART/RS-232	Startbit, Frame Start, Symbol, Pattern
LIN	Frame Start, Wake Up, Identifier, Data, Error
CAN	Frame Start, Frame End, Identifier, Data, Error

Horizontal System

Time domain (Yt)	main screen, time domain and zoom window
Frequency domain (FFT)	time domain and frequency domain window (FFT)
XY/XYZ mode	voltage (XY), intensity (Z)
VirtualScreen	virtual display of 20 Div for all math, logic, bus, reference signals
Reference signals	up to 4 references
Channel deskew	-62.5 ns to +61.5 ns, step size 500 ps
Memory zoom	up to 250,000:1
Time basis	
accuracy	±15.0 x 10^{-6}
aging	±5.0 x 10^{-6} per year
Operation modes	
REFRESH	1 ns/Div to 50 s/Div
ROLL	50 ms/Div to 50 s/Div

Acquisition System

Realtime Sampling Rate

2-channel models	2 x 2 GSa/s or 1 x 4 GSa/s
4-channel models	4 x 2 GSa/s or 2 x 4 GSa/s
logic channels	16 x 1 GSa/s

Memory Depth

2-channel models	2 x 4 MPts or 1 x 8 MPts
4-channel models	4 x 4 MPts or 2 x 8 MPts
Resolution	8 bit, (HiRes up to 16 bit)
Waveform arithmetics	refresh, roll (loose/triggered), average (up to 1024), envelope, peak detect (500 ps), filter (low-pass, adjustable), high resolution (up to 16 bit)
Record modes	automatic, max. sampling rate, max. waveform update rate, specific record length (10 kPts to 2 MPts)

Interpolation

all analog channels	sin(x)/x, linear, sample-hold
logic channels	pulse

Delay

pre-trigger	0 to 4x10^6 Sa x (1/sample rate), x2 in interlaced mode
post-trigger	0 to 8,59 x 10^9 Sa x (1/sample rate)
Waveform update rate	up to 5000 Wfm/s
Waveform display	dots, vectors, persistence afterglow
Persistence afterglow	min. 50 ms

Segmented Memory (optional, R&S®HOO14 / R&S®HV114)

Segment size	5 kPts to 1 MPts
max. number of segments	up to 1,000
Re-arming time	less than 3 µs
Sampling rate	200.000 Wfm/s
Segment player	Displays all recorded segments manually or automatically. All measurement functions including pass/fail testing can be applied on the recorded segments.
Sources	all analog and digital channels, busses

Waveform Measurements and Operation

Operation	menu-driven (multilingual), auto-set, help functions (multilingual)
Automatic measurements	voltage (V_{pp}, V_{p+}, V_{p-}, V_{rms}, V_{avg}, V_{min}, V_{max}), amplitude, phase, frequency, period, rise/fall time (80%, 90%), overshoot (pos/neg), pulse width (pos/neg), burst width, duty cycle (pos/neg), standard deviation, delay, crest factor, edge/pulse count (pos/neg), trigger period, trigger frequency
Automatic search functions	edge, pulse, peak, rise/fall time, runt

Cursor measurements	voltage (V_1, V_2, ΔV), time (t_1, t_2, Δt, $1/\Delta t$), ratio X, ratio Y, pulse and edge count (pos/neg), peak values (V_{pp}, V_{p+}, V_{p-}), mean/RMS/standard deviation, duty cycle (pos/neg), burst width, rise/fall time (80%, 90%), ratio marker, crest factor
Quick measurements (QUICKVIEW)	voltage (V_{pp}, V_{p+}, V_{p-}, V_{rms}), frequency, period (predefined), 6 additional measure-ment functions (see automatic measurement functions) freely selectable plus statistics
Marker	up to 8 freely positionable markers for easy navigation, automatic marker positioning based on search specification

Frequency Counter (hardware based)

Resolution	7 digit
Frequency range	0.5 Hz to 300/400/500 MHz
Accuracy	$\pm15.0 \times 10^{-6}$
Aging	$\pm5.0 \times 10^{-6}$ per year

Mask Testing

Functions	Pass/Fail comparison with an user-definied mask performed on waveforms
Sources	all analog channels
Mask definition	mask enclosing acquired waveform with user-defined tolerance
Actions	
on mask violations	beep, acquisition stop, screenshot, trigger pulse, automatically saving trace data
during acquisiton	statistics: number of completed tests, number of passes / failed acquisition (absolute and in percent), test duration

Waveform Maths

Quickmath

Functions	addition, substraction, multiplication, division
Sources	2 analog channels

Mathematics

Functions	addition, substraction, multiplication, division, minimum / maximum, square, square root, absolute value, pos/neg wave, reciprocal, inverse, log10/ln, derivation, integration, filter (lowpass/highpass)
Editing	formula editor, menu-driven
Sources	all analog channels, user-defined constants
Storage location	math. memory
Number of formula sets	5 formula sets
Number of equations	5 equations per formula set
Simultaneous display of math. functions	1 formula set with max. 4 equations

Frequency Analysis (FFT)

Parameters	frequency span, center frequency, vertical scale, vertical position
FFT length	2 kpts, 4 kpts, 8 kpts, 16 kpts, 32 kpts, to 64 kpts
Window	Hanning, Hamming, Rectangular, Blackman
Scale	dBm, dBV, V_{rms}
Waveform arithmetics	refresh, envelope, average (up to 512)
Cursor measurement	2 horizontal cursors, previous/next peak search
Sources	all analog channels

Pattern Generator

Functions	probe adjust, bus signal source, counter, random pattern
Probe ADJ output	1 kHz, 1 MHz square wave: $1.0 V_{pp}$ (tr <4 ns)
Bus signal source (4 bit)	I²C (100 kBit/s, 400 kBit/s, 1 MBit/s), SPI (100 kBit/s, 250 kBit/s, 1 MBit/s), UART (9600 Bit/s, 115,2 kBit/s, 1 MBit/s)
Counter (4 bit)	frequency: 1 kHz, 1 MHz direction: incrementing
Random pattern (4 bit)	frequency: 1 kHz, 1 MHz

Interfaces

for mass storage	2 x USB-Host, Typ A (FAT16/32)
for remote control	HO730 dual interface: Ethernet (RJ-45) / USB-Device (Typ B)
Optional interfaces	HO720 dual interface: USB-Device (Typ B) / RS-232 HO740 interface: IEEE-488 (GPIB)
External monitor interface	DVI-D (480 p, 60 Hz), HDMI compatible

General Data

Application memory	8 MB for references, formulas, device settings, languages and help functions
Save/Recall	
Device settings	on internal file system or external USB memory, available file formats: SCP, HDS
Reference waveforms	on internal file system or external USB memory, available file formats: BIN (MSB/LSB), FLT (MSB/LSB), CSV, TXT, HRT
Traces	on external USB memory, available file formats: BIN (MSB/LSB), FLT (MSB/LSB), CSV, TXT, HRT
data	display or acquisition data
sources	single or all analog channels
Screenshots	on external USB memory, available file formats: BMP, GIF, PNG (color, inverted, grey-scale)

Math. equation sets	on internal file system or external USB memory
Realtime clock (RTC)	date and time
Power supply	
AC supply	100 V to 240 V, 50 Hz to 60 Hz, CAT-II
Power consumption	
2-channel models	max. 70 W
4-channel models	max. 90 W
Safety	in line with IEC 61010-1 (ed. 3), IEC 61010-2-30 (ed. 1), EN 61010-1, EN 61010-2-030 , CAN/CSA-C22.2 No. 61010-1-12 , CAN/CSA-C22.2 No. 61010-2-030-12 ,UL Std. No. 61010-1 (3rd Edition) , UL61010-2-030
Temperature	
operating temperature range	+5 °C to +40 °C
storage temperature range	-20 °C to +70 °C
Rel. humidity	5 % to 80 % (without condensation)
Mechanical data	
dimensions (W x H x D)	285 x 175 x 220 mm
weight	3.6 kg
All specifications at 23°C after 30 minute warm-up.	

Accessories included:
R&S®HO732 Ethernet/USB dual interface card, line cord, printed operating manual, 2/4 probes: R&S®RT-ZP05 (up to 500 MHz, 10:1 with attenuation ID)

Bandwidth Upgrade Vouchers

Description	Voucher-Codes
Bandwidth upgrade 300 MHz to 400 MHz	HV342 (2-channel models) HV344 (4-channel models)
Bandwidth upgrade 300 MHz to 500 MHz	HV352 (2-channel models) HV354 (4-channel models)
Bandwidth upgrade 400 MHz to 500 MHz	HV452 (2-channel models) HV454 (4-channel models)

Bus Analysis and Segmented Memory

Description	Option-Code	Voucher-Code
I²C, SPI, UART/RS-232 on analog and digital channels	R&S®HOO10	R&S®HV110
I²C, SPI, UART/RS-232 on all analog channels	R&S®HOO11	R&S®HV111
CAN und LIN on analog and digital channels	R&S®HOO12	R&S®HV112
Segmented memory	R&S®HOO14	R&S®HV114

Recommended Accessories

R&S®HO720
USB-device/RS-232 dual-interface card

R&S®HO740
IEEE-488 (GPIB) interface card, galvanically isolated

HZO20
High voltage probe 1000:1 (400 MHz, 1000 V_{rms})
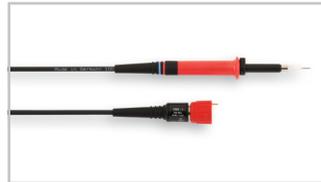
HZO30
1 GHz active probe (0.9 pF, 1 MΩ)

HZ115
Differential Probe 100:1/1000:1

R&S®HO3508
8 channel logic probe (350 MHz, 4 pF)

HZO40
Active differential probe 200 MHz (10:1, 3.5 pF, 1 MΩ)

HZO41
Active differential probe 800 MHz (10:1, 1 pF, 200 kΩ)

HZO50
AC/DC current probe 30 A, DC to 100 kHz

HZO51
AC/DC current probe 100/1000 A, DC to 20 kHz


HZ99
Carrying case for protection and transport

HZ46
19" rackmount kit, 4 RU

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