

Technical Data

R&S®HMO1002 Series R&S®HMO1202 Series

2-channel digital oscilloscopes with 50/70/100/200/300MHz bandwidth

from firmware version 4.527

Display

Screen size / type	16,5cm (6,5") VGA color display
Resolution	640 (H) x 480 (V) pixels
Backlight	400cd/m ² (LED)
Display range in horizontal direction	
without menu bar	12 Div (600 pixels)
with menu bar	10 Div (500 pixels)
Display range in vertical direction	
with VirtualScreen usage	20 Div
Color depth	256 colors
Trace display	pseudo-color, inverse brightness
Levels of trace brightness	32

Vertical System

DSO mode	CH1, CH2
MSO mode (POD with logic probe R&S®HO3508)	
R&S®HMO1002 series	CH1, POD, Ext.In oder CH1, CH2, Ext.In
R&S®HMO1202 series	CH1, CH2, POD, Ext.In

Analog Channels

Y-bandwidth (-3dB)	
(1 mV, 2mV)/Div	
R&S®HMO1002 series	50 MHz
R&S®HMO1202 series	100 MHz
(5mV bis 10V)/Div	
R&S®HMO1052	50 MHz
R&S®HMO1072	70 MHz
R&S®HMO1102	100 MHz
R&S®HMO1212	100 MHz
R&S®HMO1222	200 MHz
R&S®HMO1232	300 MHz
Lower AC bandwidth	2Hz
Bandwidth limitation (switchable)	about 20MHz
Rise time (calculated, 10% to 90%)	
R&S®HMO1052 (50 MHz)	<7 ns
R&S®HMO1072 (70 MHz)	<5 ns
R&S®HMO1102 (100 MHz)	<3.5 ns
R&S®HMO1212 (100 MHz)	<3.5 ns
R&S®HMO1222 (200 MHz)	<1.75 ns
R&S®HMO1232 (300 MHz)	<1.15 ns
DC gain accuracy (all ranges)	3% of full scale
Input sensitivity range	
all analog channels	1 mV/Div to 10 V/Div
coarse stepping	13 calibrated steps, 1-2-5 sequence
variable stepping	freely between calibrated steps
Impedance	
R&S®HMO1002 series	1 MΩ 16 pF ±2 pF
R&S®HMO1202 series	1 MΩ 16 pF ±2 pF, 50 Ω (switchable)
Coupling	DC, AC, GND

Max. input voltage	
1 MΩ	200 V _p (derates at 20db/decade to 5V above 100kHz)
50 Ω (R&S®HMO1202 series)	5 V _{eff} , max. 30 V _s
Position range	
R&S®HMO1002 series	±5 Div (from center of screen)
R&S®HMO1202 series	±15 Div (from center of screen)
Channel isolation	35 dB from DC to specified bandwidth (same V/Div range)
XY mode	CH1, CH2
Inversion	selectively all analog channels
Logic Channels with Logic Probe R&S®HO3508	
Thresholds	TTL, CMOS, ECL, user-defined (-2V 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 5mV/Div	1.5 Div
from 5mV/Div	0.8 Div
Trigger level setting	
with auto level	adjustable between peak values of a signal
without auto level	±5 Div (from center of screen)
external	-5V to +5V
Trigger Coupling	
AC	
R&S®HMO1002 series	<5 mV/Div: 10 Hz to 65 MHz >5 mV/Div: 10 Hz to 65/90/130 MHz
R&S®HMO1202 series	<5 mV/Div: 10 Hz to 130 MHz >5 mV/Div: 10 Hz to 130/220/300 MHz
DC	
R&S®HMO1002 series	<5 mV/Div: DC to 65 MHz >5 mV/Div: DC to 65/90/130 MHz
R&S®HMO1202 series	<5 mV/Div: DC to 130 MHz >5 mV/Div: DC to 130/220/300 MHz
HF	
R&S®HMO1002 series	<5 mV/Div: 30 kHz to 65 MHz >5 mV/Div: 30 kHz to 65/90/130 MHz
R&S®HMO1202 series	<5 mV/Div: 30 kHz to 130 MHz >5 mV/Div: 30 kHz to 130/220/300 MHz
selectable filters	
LF	DC to 5 kHz (-3db), selectable in DC and auto level mode
noise rejection	min. level: 1.5 Div (> 5 mV/Div) selectable with AC, DC and HF coupling
Trigger hold-off	auto, 50 ns to 10 s
External Input (BNC)	
Function	ext. trigger input, additional digital channel
Impedance	1 MΩ 16 pF ±2 pF
Accuracy	300 mV _{SS}
Trigger level range	-5V bis +5V

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Max. input voltage	100 V _s (derates at 20 db/decade to 5V above 100 kHz)
Trigger coupling	
AC	
R&S®HMO1002 series R&S®HMO1202 series	10 Hz to 50/70/100 MHz 10 Hz to 100/200/300 MHz
DC	
R&S®HMO1002 series R&S®HMO1202 series	DC to 50/70/100 MHz DC to 100/200/300 MHz
Trigger Output via AUX OUT (BNC)	
Functions	Pulse output for every acquisition trigger event, error output on mask violation
Output level	approx. 3V
Pulse polarity	positive
Pulse width	>150 ns (trigger event), >0.5 μs (mask violation)
Trigger Types	
Edge	
Direction	rising, falling, both
Trigger coupling	auto level AC, DC, HF
Switchable filters	LF, noise rejection
Sources	
R&S®HMO1002, R&S®HMO1202	all analog and digital channels, AC line, external (AC, DC)
Pulse Width	
Polarity	positive, negative
Functions	equal, not equal, lower, higher, within/without a range
Pulse duration	16 ns to 10 s, resolution min. 2 ns
Sources	all analog channels
Logic	
Functions	
boolean operators	AND, OR, TRUE, FALSE
time based operators	equal, not equal, lower, higher, within/without a time range, timeout
Duration	16 ns to 10 s, resolution min. 2 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)
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 I ² C, SPI, UART/RS-232 signals on analog and logic channels
R&S®HOO11, R&S®HV111	Analysis of I ² C, 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	
I ² C	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 mode	voltage (XY)
VirtualScreen	virtual display of ±10 Div for all math, logic, bus, reference signals
Component tester	voltage (X), current (Y)
Reference signals	up to 4 references
Channel deskew	±32 ns, step size 2 ns
Memory zoom	up to 50.000:1
Time base	
accuracy	±50.0 x 10 ⁻⁶
aging	±10.0 x 10 ⁻⁶ per year
Operation modes	
REFRESH	
R&S®HMO1002 series R&S®HMO1202 series	2 ns/Div to 50 s/Div 1 ns/Div to 50 s/Div
ROLL	50 ms/Div to 50 s/Div
Acquisition System	
Realtime Sampling Rate	
Analog channels	
R&S®HMO1002 series R&S®HMO1202 series	2x 500 MSa/s or 1x 1 GSa/s 2x 1 GSa/s or 1x 2 GSa/s
Logic channels	
R&S®HMO1002 series R&S®HMO1202 series	8x 500 MSa/s 8x 1 GSa/s
Memory depth	
Analog channels	
R&S®HMO1002 series R&S®HMO1202 series	2x 500 kSa or 1x 1 MSa 2x 1 MSa or 1x 2 MSa
Logic channels	
R&S®HMO1002 series R&S®HMO1202 series	500 kSa per channel 1 MSa per channel
Resolution	8 Bit, (HiRes up to 16Bit)
Waveform arithmetics	refresh, roll (loose/triggered), average (up to 1024), envelope, peak detect (2 ns), filter (low-pass, adjustable), high resolution (up to 16 bit)
Record modes	automatic, max. sampling rate, max. waveform rate
Interpolation	
all analog channels	sin(x)/x, linear, sample-hold
logic channels	pulse
Delay	
pre-trigger	
R&S®HMO1002 series R&S®HMO1202 series	0 to 500.000 Sa x (1/sample rate) 0 to 1.000.000 Sa x (1/sample rate) (multiplied by 2 in interlaced mode)
post-trigger	0 to 8x10 ⁶ Sa x (1/sample rate)
Waveform update rate	up to 10,000 Wfm/s

Waveform display	dots, vectors, persistence afterglow
Persistence afterglow	min. 50 ms
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%), pulse width (pos/neg), burst width, duty cycle (pos/neg), standard deviation, delay, crest factor, overshoot (pos/neg), edge/pulse count (pos/neg), trigger period, trigger frequency
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-}), V_{mean} , V_{rms} , standard deviation, duty cycle (pos/neg), rise/fall time (80%, 90%), ratio marker, crest factor
Quick measurements (QUICKVIEW)	voltage (V_{pp} , V_{p+} , V_{p-} , V_{rms} , V_{mean}), rise/fall time, frequency, period plus 6 additional measurement functions (see automatic measurement functions, freely selectable)
Marker	up to 8 freely positionable markers for easy navigation
Frequency Counter (hardware based)	
Resolution	5 digit
Frequency range	
R&S®HMO1002 R&S®HMO1202	0.5 Hz bis 50/70/100 MHz 0.5 Hz bis 100/200/300 MHz
Accuracy	$\pm 50.0 \times 10^{-6}$
Aging	$\pm 10.0 \times 10^{-6}$ per year
Mask Testing	
Functions	Pass/Fail comparison with an user-defined 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 acquisition	statistics: number of completed tests, number of passes / failed acquisitions (absolute and in percent), test duration
Waveform Maths	
Quickmath	
Functions	addition, subtraction, multiplication, division
Sources	CH1, CH2
Mathematics (R&S®HMO1202 series)	
Functions	addition, subtraction, 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, 64 Kpts, 128 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
Probe Adjust Output	
Operation	manual, adjust-wizzard
Frequency	1 kHz, 1 MHz
Level	
R&S®HMO1002 series R&S®HMO1202 series	approx. $2.5V_{pp}$ ($t_a < 4$ ns) approx. $2.5V_{pp}$ ($t_a < 1$ ns)
Pattern Generator	
Functions	square wave / probe adjust, bus signal source, counter, programmable pattern
Square wave (Probe ADJ output)	frequency range: < 1 MHz to 500 kHz level: $2.5V_{pp}$ ($t_a < 4$ ns) polarity: normal, invert duty cycle: 1% to 99%
Bus Signal Source (4 Bit)	I ² C (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), CAN (up to 50 MBit/s), LIN (up to 50 MBit/s)
Counter (4 Bit)	frequency: < 1 MHz to 25 MHz direction: incrementing, decrementing
Programmable pattern (4 Bit)	sampling time: 20 ns to 42 s memory depth: 2048 sa pattern idle time: 20 ns to 42 s
Function Generator	
Waveform modes	DC, sine, square, triangle/ramp, pulse
Sine	frequency range: 0.1 Hz to 50 kHz flatness: ± 1 dB relative to 1 kHz DC offset: max. $\pm 3V$
Square	frequency range: 0.1 Hz to 25 kHz rise time: < 4 μ s DC offset: max. $\pm 3V$
Triangle / Ramp	frequency range: 0.1 Hz bis 10 kHz DC offset: max. $\pm 3V$
Pulse	frequency range: 0.1 Hz to 10 kHz duty cycle: 10% to 90% DC offset: max. $\pm 3V$
Sampling rate	978 kSa/s
Frequency accuracy	$\pm 50.0 \times 10^{-6}$
Aging	$\pm 10.0 \times 10^{-6}$ per year
Amplitude	
DC	$\pm 3V$
high impedance load	$60mV_{pp}$ to $6V_{pp}$
50 Ω load	$30mV_{pp}$ to $3V_{pp}$
accuracy	3%
Digital Voltmeter	
Display (3-digit)	Primary and secondary measurement value per channel, simultaneous measuring on all channels
Functions	DC, DC_{rms} , AC_{rms} , V_{pp} , V_{p+} , V_{p-} , crest factor
Sources	all analog channels
Component Tester	
Parameters	voltage (X), current (Y)
Testing frequency	50 Hz, 200 Hz

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Voltage	10V _p (open)
Current	10mA (short)
Reference potential	Ground (PE)
Interfaces	
for mass storage (FAT16/32)	1x USB host (type A), max. 500 mA
for remote control	Ethernet (RJ45), USB device (type B)
General Data	
Application memory	3MB for references and device settings
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
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)
Realtime clock (RTC)	date and time
Power supply	
AC supply	100V to 240V, 50Hz to 60Hz, CAT-II
power consumption	
R&S®HMO1002	max. 25W
R&S®HMO1202	max. 30W
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 temp. 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 140mm
net weight	2.5kg
EMC	
RF emission	in line with CISPR 11/EN 55011 class B
Immunity	in line with IEC/EN 61326-1 table 2, immunity test requirements for industrial environments. Test criterion is displayed noise level within ±1 div for 5mV/div input sensitivity

All specifications at 23°C after 30 minutes warm-up

Bandwidth Upgrades R&S®HMO1002 Series

Description	Option Code	Voucher Code
Bandwidth upgrade 50MHz to 70MHz	R&S®HOO572	R&S®HV572
Bandwidth upgrade 50MHz to 100MHz	R&S®HOO512	R&S®HV512
Bandwidth upgrade 70MHz to 100MHz	R&S®HOO712	R&S®HV712

Bandwidth Upgrades R&S®HMO1202 Series

Description	Option Code	Voucher Code
Bandwidth upgrade 100MHz to 200MHz	R&S®HOO312	R&S®HV312
Bandwidth upgrade 100MHz to 300MHz	R&S®HOO313	R&S®HV313
Bandwidth upgrade 200MHz to 300MHz	R&S®HOO323	R&S®HV323

Bus Analysis Options

Description	Option Code	Voucher Code
I ² C, SPI, UART/RS-232 on analog and digital channels	R&S®HOO10	R&S®HV110
I ² C, 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

Accessories included:

Line cord, printed operating manual, 2x HZ154 probes (R&S®HMO1002) or 2x RT-ZP03 probes (R&S®HMO1202), HZ20 adapter: BNC plug to 4mm banana sockets, software-CD

Accessories:

HO3508	8 channel logic probe (350MHz, 4pF)
HZ115	Differential Probe 100:1/1000:1
HZO20	High voltage probe 1000:1 (400MHz, 1000Vrms)
HZO30	1GHz active probe (0.9pF, 1MΩ)
HZO40	Active differential probe 200MHz (10:1, 3.5pF, 1MΩ)
HZO41	Active differential probe 800MHz (10:1, 1pF, 200kΩ)
HZO50	AC/DC Current Probe 30A, DC to 100kHz
HZO51	AC/DC Current Probe 100/1000A, DC to 20kHz
HZ51	150MHz passive probe 10:1 (12pF, 10MΩ)
HZ52	250MHz passive probe 10:1 (10pF, 10MΩ)
HZ53	100MHz passive probe 100:1 (4.5pF, 100MΩ)
HZO90	Carrying case for protection and transport
HZO91	4RU 19" rackmount kit