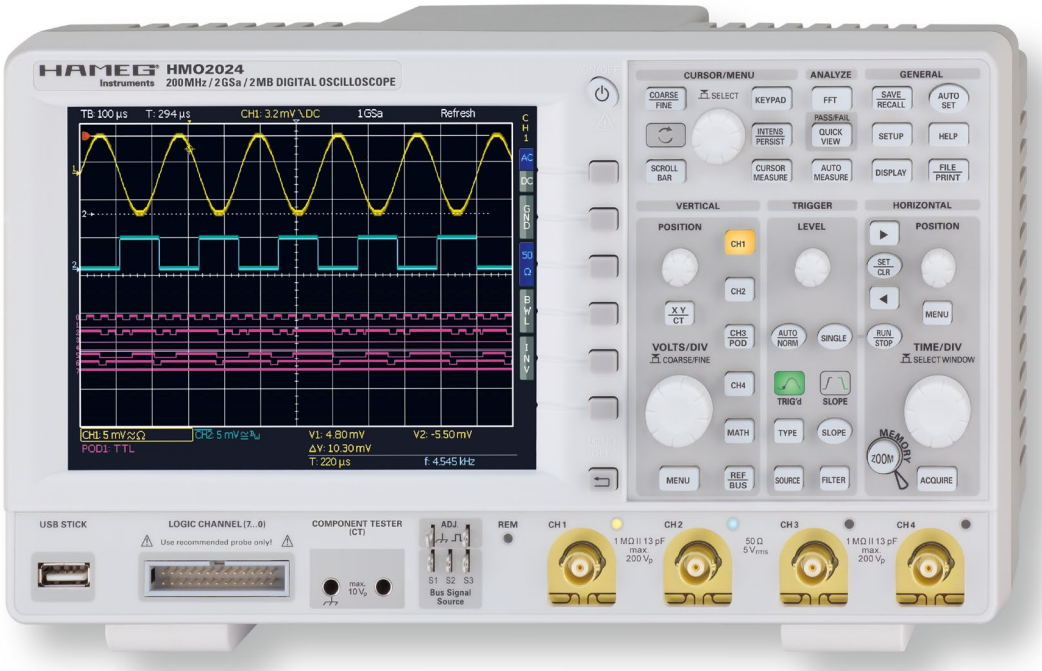
HAMEG Instruments
A Rohde&Schwarz Company

200 MHz 2[4] Channel Digital Oscilloscope
HMO2022 [HMO2024]

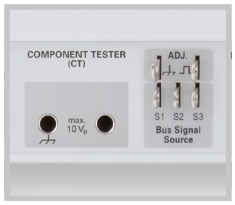
HMO2024



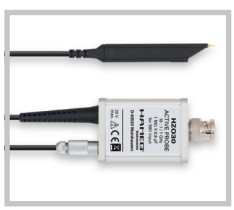
DVI Output · USB · USB Stick · optional TCP/IP · optional IEEE-488 · inclusive · 6,5" VGA 16,5cm

8 Channel
Logic Probe HO3508

Component Tester/
Bus Signal Source



Active Probe HZO30



- ☑ **2GSa/s Real Time, Low Noise Flash A/D Converter (Reference Class)**
- ☑ **2MPts Memory, Memory Zoom up to 50,000:1**
- ☑ **MSO** (Mixed Signal Opt. HO3508) with 8 Logic Channels
- ☑ **Serial Bus** Trigger and Hardware accelerated Decode, I²C, SPI, UART/RS-232 (Opt. HOO10, HOO11)
- ☑ 8 User definable Markers for easy Navigation
- ☑ Pass/Fail Test based on Masks
- ☑ Vertical Sensitivity 1mV/div., Offset Control ±0.2...±20V
- ☑ 12div. x-Axis Display Range, 20div. y-Axis Display Range (**V**irtual**S**creen)
- ☑ Trigger Modes: Slope, Video, Pulsewidth, Logic, Delayed, Event
- ☑ Component tester, 6 Digit Counter, Automeasurement, Formula Editor, Ratiocursor, FFT for Spectral Analysis
- ☑ Crisp 16.5cm (6.5") TFT VGA Display, DVI Output
- ☑ Lowest Noise Fan
- ☑ 3 x USB for Mass Storage, Printer and Remote Control optional IEEE-488 (GPIB) or Ethernet/USB

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All data valid at 23 °C after 30 minute warm-up.

Display

Display:	16.5 cm (6.5") VGA Color TFT
Resolution:	640 x 480 Pixel
Backlight:	LED 400 cd/m²
Display area for curves:	
without menu	400 x 600 Pixel (8 x 12 div.)
with menu	400 x 500 Pixel (8 x 10 div.)
Color depth:	256 colors
Intensity steps per trace:	0...31

Vertical System

Channels:	
DSO mode	CH 1, CH 2 [CH 1...CH 4]
MSO mode	CH 1, CH 2, LCH 0...7 (logic channels) [CH 1, CH 2, LCH 0...7, CH4] with Option HO3508
Auxiliary input:	Frontside [Rear side]
Function	Ext. Trigger
Impedance	1 MΩ || 14 pF ±2 pF
Coupling	DC, AC
Max. input voltage	100 V (DC + peak AC)
XYZ-mode:	All analog channels on individual choice
Invert:	CH 1, CH 2 [CH 1...CH 4]
Y-bandwidth (-3 dB):	200 MHz (5 mV...5 V)/div 100 MHz (1 mV, 2 mV)/div
Lower AC bandwidth:	2 Hz
Bandwidth limiter (switchable):	approx. 20 MHz
Rise time (calculated):	<1.75 ns
DC gain accuracy	2 %
Input sensitivity:	13 calibrated steps
CH 1, CH 2 [CH 1...CH 4]	1 mV/div....5 V/div. (1–2–5 Sequence)
Variable	Between calibrated steps
Inputs CH 1, CH 2 [CH 1...CH 4]:	
Impedance	1 MΩ II 14 pF ±2 pF
Coupling	DC, AC
Max. input voltage	200 V (DC + peak AC), 50 Ω <5 V_{rms}
Measuring circuits:	Measuring Category I (CAT I), UL 61010B-1
Position range	±10 Divs
Offset control:	
1 mV, 2 mV	±0,2 V - 10 div. * Sensitivity
5...50 mV	±1 V - 10 div. * Sensitivity
100 mV	±2,5 V - 10 div. * Sensitivity
200 mV...2 V	±40 V - 10 div. * Sensitivity
5 V	±100 V - 10 div. * Sensitivity
Logic channels	With Option HO3508
Select. switching thresholds	TTL, CMOS, ECL, 2x User -2...+8 V
Impedance	100 kΩ || <4 pF
Coupling	DC
Max. input voltage	40 V (DC + peak AC)

Triggering

Analog channels:	
Automatic:	Linking of peakdetection and triggerlevel
Min. signal height	0.8 div.; 0.5 div. typ.
Frequency range	5 Hz...250 MHz
Level control range	From peak- to peak+
Normal (without peak):	
Min. signal height	0.8 div.; 0.5 div. typ.
Frequency range	0...250 MHz
Level control range	-10...+10 div from center of the screen
Operating modes:	Slope/Video/Logic/Pulses/Busses (optional)
Slope:	Rising, falling, both
Sources:	CH 1, CH 2, Line, Ext., LCH 0...7 [CH 1...CH 4, Line, Ext., LCH 0...7]
Coupling:	**AC:** 5 Hz...250 MHz **DC:** 0...250 MHz **HF:** 30 kHz...250 MHz **LF:** 0...5 kHz **Noise rejection:** switchable
Video:	
Standards	PAL, NTSC, SECAM, PAL-M, SDTV 576i, HDTV 720p, HDTV 1080i, HDTV 1080p
Fields	Field 1, field 2, both
Line	All, selectable line number
Sync. Impulse	Positive, negative
Sources:	CH 1, CH 2, Ext. [CH 1...CH 4]
Logic:	AND, OR, TRUE, FALSE
Sources:	LCH 0...7
State	LCH 0...7 X, H, L
Pulses:	Positive, negative
Modes	equal, unequal, less than, greater than, within/without a range
Range	min. 16 ns, max. 268.434 ms, resolution from 16 ns until 2 µs
Sources:	CH 1, CH 2, Ext. [CH 1...CH 4]
Indicator for trigger action:	LED
Ext. Trigger via:	Auxiliary input 0.3 V...10 V_{pp}
2nd Trigger:	
Slope:	Rising, falling, both
Min. signal height	0.8 div.; 0.5 div. typ.
Frequency range	0...250 MHz
Level control range	-10...+10 div.
Operating modes:	
after time	32 ns...536 ms
after incidence	$1...2^{16}$
Busses (Opt. HO010):	I²C/SPI/UART/RS-232
Sources:	CH 1, CH 2, Ext., LCH 0...7 [CH 1...CH 4, Ext., LCH 0...7]
Busses (Opt. HO011):	I²C/SPI/UART/RS-232
Sources:	CH 1, CH 2, Ext. [CH 1...CH 4, Ext.]
Format	hexadecimal, binary
I²C	Trigger on Start, Stop, Restart, NACK, Adress (7 or 10 Bit), Data, Adress and Data, up to 5 Mb/s
SPI	up to 32 Bit Data, Chip select (CS) pos. or neg., without CS, up to 12,5 Mb/s
UART/RS-232	up to 8 Bit Data, up to 30 Mb/s

Horizontal System

Domain representation:	Time, Frequency (FFT), Voltage (XY)
Representation Time Base:	Main-window, main- and zoom-window
Memory Zoom:	Up to 50,000:1
Accuracy:	50 ppm
Time Base:	
Refresh operating modes	2 ns/div....20 ms/div.
Roll operating modes	50 ms/div....50 s/div.

Digital Storage

Sampling rate (real time):	2 x 1 GSa/s, 1 x 2 GSa/s [4 x 1 GSa/s, 2 x 2 GSa/s] Logic channels: 8 x 1 GSa/s
Memory:	2 x 1 MPts, 1 x 2 MPts [4 x 1 MPts, 2 x 2 MPts]
Operation modes:	Refresh, Average, Envelope, Peak-Detect Roll: free run/triggered, Filter
Resolution (vertical)	8 Bit
Resolution (horizontal)	
Yt Mode	50 Pts./div.
XY Mode	8 Bit
Interpolation:	Sinx/x, linear, Sample-hold
Persistence:	Off, 50 ms...∞
Delay pretrigger:	0...8 Million x (1/samplerate)
posttrigger:	0...2 Million x (1/samplerate)
Display refresh rate:	Up to 2000 waveforms/s
Display:	Dots, vectors, „persistence"
Reference memories:	typ. 10 Traces

Operation/Measuring/Interfaces

Operation:	Menu-driven (multilingual), Autoset, help functions (multilingual)
Save/Recall memories:	typ. 10 complete instrument parameter settings
Frequency counter:	
0.5 Hz...250 MHz	6 Digit resolution
Accuracy	50 ppm
Auto measurements:	Frequency, Period, pulse count, V_{pp}, V_{p+}, V_{p-}, V_{rms}, V_{avg}, V_{top}, V_{base}, t_{width+}, t_{width-}, $t_{dutycycle+}$, $t_{dutycycle}$, t_{rise}, t_{fall}, pos. edge count, neg. edge count, pos. pulse count, neg. pulse count
Cursor measurements:	ΔV, Δt, 1/Δt (f), V to Gnd, Vt related to Trigger point, ratio X and Y, pulse count, peak to peak, peak+, peak-, Average, Mean, standard deviation
Interface:	Dual-Interface USB type B/RS-232 (HO720), 2x USB type A (front- and rear side each 1x) max. 100 mA, DVI-D for ext. Monitor
Optional:	IEEE-488 (HO740), Ethernet/USB (HO730)

Display functions

Marker:	up to 8 user definable marker for easy navigation

VirtualScreen:	virtual Display with 20 div. vertical for all Math-, Logic-, Bus- and Reference Signals
Busdisplay:	up to 2 busses, user definable, parallel or serial busses (option), decode of the bus value in ASCII, binary, decimal or hexadecimal, up to 4 lines
Parallel	logic channels can also be used as source for bus definition
I²C (Opt. HO010, HO011)	color coded Read-, Write Adress, Data, Start, Stop, acknowledge, missing acknowledge, Errors and Trigger condition
SPI (Opt. HO010, HO011)	color coded Data, Start, Stop, Errors and Trigger condition
UART/RS-232 (Opt. HO010, HO011)	color coded Data, Start, Stop, Errors and Trigger condition

Mathematic functions

Number of formula sets:	5 formula sets with up to 5 formulas each
Sources:	All channels and math. memories
Targets:	Math. memories
Functions:	ADD, SUB, 1/X, ABS, MUL, DIV, SQ, POS, NEG, INV, INTG, DIFF, SQR, MIN, MAX, LOG, LN, Low-, High-pass filter
Display:	Up to 4 math. memories with label

Pass/Fail functions

Sources:	Analog channels
Type of test:	Mask around a signal, userdefined tolerance
Functions:	Stop, Beep, screen shot (screen print-out) and/or output to printer for pass or fail, event counting up to 4 billion, including the number and the percentage of pass and fail events

General Information

Component tester	
Test voltage:	approx. 7 V_{rms} (open circuit), approx. 100 Hz
Test current:	max. 7 mA_{rms} (short circuit)
Reference Potential:	Ground (safety earth)
Probe ADJ Output:	1 kHz/1 MHz square wave signal ~1 V_{pp} (ta <4 ns)
Bus Signal Source	SPI, I²C, UART, Parallel (4 Bit)
Internal RTC (Realtime clock)**:**	Date and time for stored data
Line voltage:	90...253 V, 50/60 Hz, CAT II
Power consumption:	Max. 50 Watt at 230 V, 50 Hz
Protective system:	Safety class I (EN61010-1)
Operating temperature:	+5...+40 °C
Storage temperature:	-20...+70 °C
Rel. humidity:	5...80 % (non condensing)
Dimensions (W x H x D)**:**	285 x 175 x 140 mm
Weight:	<2.5kg

Accessories supplied: Line cord, Operating manual, 2 [4] Probes, 10:1 with attenuation ID (HZO10), CD

Recommended accessories:

HO010	Serial bus trigger and hardware accelerated decode, I²C, SPI, UART/RS-232 on Logic channels and Analog channels
HO011	Serial bus trigger and hardware acelerated decode, I²C, SPI, UART/RS-232 on Analog channels
HO3508	active 8 Channel Logic Probe
HO730	Dual-Interface Ethernet/USB
HO740	Interface IEEE-488 (GPIB) galvanically isolated
HZO91	4RU 19¨ Rackmount Kit
HZO90	Carrying Case for protection and transport
HZO20	High Voltage probe 1000:1 (400 MHz)
HZO30	single ended active probe (1 GHz)
HZO50	AC/DC Currentprobe 20 A, DC...100 kHz
HZO51	AC/DC Currentprobe 1000 A, DC...20 kHz

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