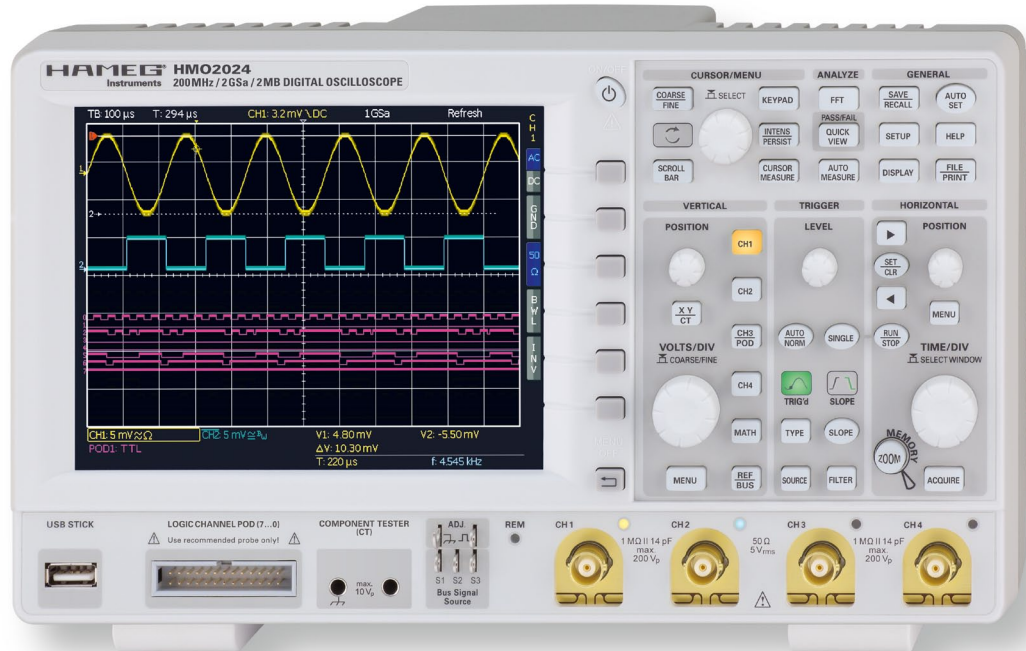


# 200 MHz 2[4] Channel Digital Oscilloscope HMO2022 [HMO2024]

HMO2024



2 Channel Version  
HMO2022



Side view



8 Channel  
Logic Probe H03508



- ✓ 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. H03508) with 8 Logic Channels
- ✓ Serial Bus Trigger and Hardware accelerated Decode, I<sup>2</sup>C, SPI, UART/RS-232 (Opt. H0010, H0011)
- ✓ 8 User definable Markers for easy Navigation
- ✓ Pass/Fail Test based on Masks
- ✓ Vertical Sensitivity 1mV/div., Offset Control  $\pm 0.2... \pm 20V$
- ✓ 12div. x-Axis Display Range, 20div. y-Axis Display Range (VirtualScreen)
- ✓ Trigger Modes: Slope, Video, Pulsethrough, 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

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

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/m <sup>2</sup>
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	100V (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...5V)/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...5V/div. [1-2-5 Sequence]
Variable	Between calibrated steps
Inputs CH 1, CH 2 [CH 1...CH 4]:	
Impedance	1 MΩ    14 pF ±2 pF
Coupling	DC, AC
Max. input voltage	200V (DC + peak AC), 50 Ω <5V <sub>rms</sub>
Measuring circuits:	Measuring Category I [CAT I], UL 61010B-1
Position range	±10 Divs
Offset control:	
1 mV, 2 mV	±0.2V - 10 div. * Sensitivity
5...50 mV	±1V - 10 div. * Sensitivity
100 mV	±2.5V - 10 div. * Sensitivity
200 mV...2V	±40V - 10 div. * Sensitivity
5V	±100V - 10 div. * Sensitivity
Logic channels	With Option HO3508
Select. switching thresholds	TTL, CMOS, ECL, 2x User -2...+8V
Impedance	100 kΩ    <4 pF
Coupling	DC
Max. input voltage	40V (DC + peak AC)

### Triggering

Analog channels:	
Automatic:	Linking of peakdetection and triggerlevel
Min. signal height	0.8 div.; 0.5 div. typ. [1.5 Div at ≤ 2 mV/Div]
Frequency range	5 Hz...250 MHz [5 Hz...120 MHz at ≤ 2 mV/Div]
Level control range	From peak- to peak+
Normal [without peak]:	
Min. signal height	0.8 div.; 0.5 div. typ. [1.5 Div at ≤ 2 mV/Div]
Frequency range	0 Hz...250 MHz [0 Hz...120 MHz at ≤ 2 mV/Div]
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. 10 s, resolution min. 8 ns
Sources:	CH 1, CH 2, Ext. [CH 1...CH 4]
Indicator for trigger action:	LED
Ext. Trigger via:	Auxiliary input 0.3V...10V <sub>pp</sub>
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...10 s
after incidence	1...2 <sup>16</sup>
Busses [Opt. H0010]:	I <sup>2</sup> C/SPI/UART/RS-232
Sources:	CH 1, CH 2, Ext., LCH 0...7 [CH 1...CH 4, Ext., LCH 0...7]
Busses [Opt. H0011]:	I <sup>2</sup> C/SPI/UART/RS-232
Sources:	CH 1, CH 2, Ext. [for Chip Select at SPI] [CH 1...CH 4, Ext.] [for Chip Select at SPI]
Format	hexadecimal, binary
I <sup>2</sup> C	Trigger on Start, Stop, Restart, NACK, Address (7 or 10 Bit), Data, Address 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:	2 ns/div...50 s/div.
Roll Mode:	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, HiRes
Resolution [vertical]	8 Bit, (HiRes up to 10 Bit)
Resolution [horizontal]	40 ps
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:	Amplitude, standard deviation, V <sub>pp</sub> , V <sub>p+</sub> , V <sub>p-</sub> , V <sub>rms</sub> , V <sub>avg</sub> , V <sub>top</sub> , V <sub>base</sub> , frequency, period, pulse count, t <sub>width+</sub> , t <sub>width-</sub> , t <sub>dutycycle+</sub> , t <sub>dutycycle-</sub> , t <sub>rise</sub> , t <sub>fall</sub> , pos. edge count, neg. edge count, pos. pulse count, neg. pulse count, trigger frequency, trigger period, phase, delay
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-, mean value, RMS value, 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 (GPIB) (HO740), Ethernet/USB (HO730)

### Display functions

Marker:	up to 8 user definable marker for easy navigation
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<b>VirtualScreen:</b>	virtual Display with 20 div. vertical for all Math-, Logic-, Bus- and Reference Signals
<b>Busdisplay:</b>	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
<b>Parallel</b>	logic channels can also be used as source for bus definition
<b>I<sup>2</sup>C</b> (Opt. H0010, H0011)	color coded Read-, Write Adress, Data, Start, Stop, acknowledge, missing acknowledge, Errors and Trigger condition
<b>SPI</b> (Opt. H0010, H0011)	color coded Data, Start, Stop, Errors and Trigger condition
<b>UART/RS-232</b> (Opt. H0010, H0011)	color coded Data, Start, Stop, Errors and Trigger condition

#### Mathematic functions

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

#### Pass/Fail functions

<b>Sources:</b>	Analog channels
<b>Type of test:</b>	Mask around a signal, userdefined tolerance
<b>Functions:</b>	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

<b>Component tester</b>	
<b>Test voltage:</b>	10V <sub>P</sub> (open) typ.
<b>Test current:</b>	10 mA <sub>P</sub> (short) typ.
<b>Test frequency:</b>	50 Hz/200 Hz typ.
<b>Reference Potential:</b>	Ground (safety earth)
<b>Probe ADJ Output:</b>	1 kHz/1 MHz square wave signal ~1V <sub>pp</sub> (ta < 4 ns)
<b>Bus Signal Source</b>	SPI, I <sup>2</sup> C, UART, Parallel (4 Bit)
<b>Internal RTC (Realtime clock):</b>	Date and time for stored data
<b>Line voltage:</b>	90...253 V, 50/60 Hz, CAT II
<b>Power consumption:</b>	Max. 50 Watt at 230V, 50 Hz
<b>Protective system:</b>	Safety class I (EN61010-1)
<b>Operating temperature:</b>	+5...+40 °C
<b>Storage temperature:</b>	-20...+70 °C
<b>Rel. humidity:</b>	5...80% (non condensing)
<b>Dimensions (W x H x D):</b>	285 x 175 x 140 mm
<b>Weight:</b>	<2.5kg

**Accessories supplied:** Line cord, Operating manual, 2 [4] Probes, 10:1 with attenuation ID (HZ010), CD

#### Recommended accessories:

H0010	Serial bus trigger and hardware accelerated decode, I <sup>2</sup> C, SPI, UART/RS-232 on Logic channels and Analog channels
H0011	Serial bus trigger and hardware accelerated decode, I <sup>2</sup> C, SPI, UART/RS-232 on Analog channels
H03508	active 8 Channel Logic Probe
H0730	Dual-Interface Ethernet/USB
H0740	Interface IEEE-488 (GPIB) galvanically isolated
HZ091	4RU 19" Rackmount Kit
HZ090	Carrying Case for protection and transport
HZ020	High Voltage probe 1000:1 (400 MHz)
HZ030	single ended active probe (1 GHz)
HZ050	AC/DC Currentprobe 20A, DC...100 kHz
HZ051	AC/DC Currentprobe 1000A, DC...20 kHz