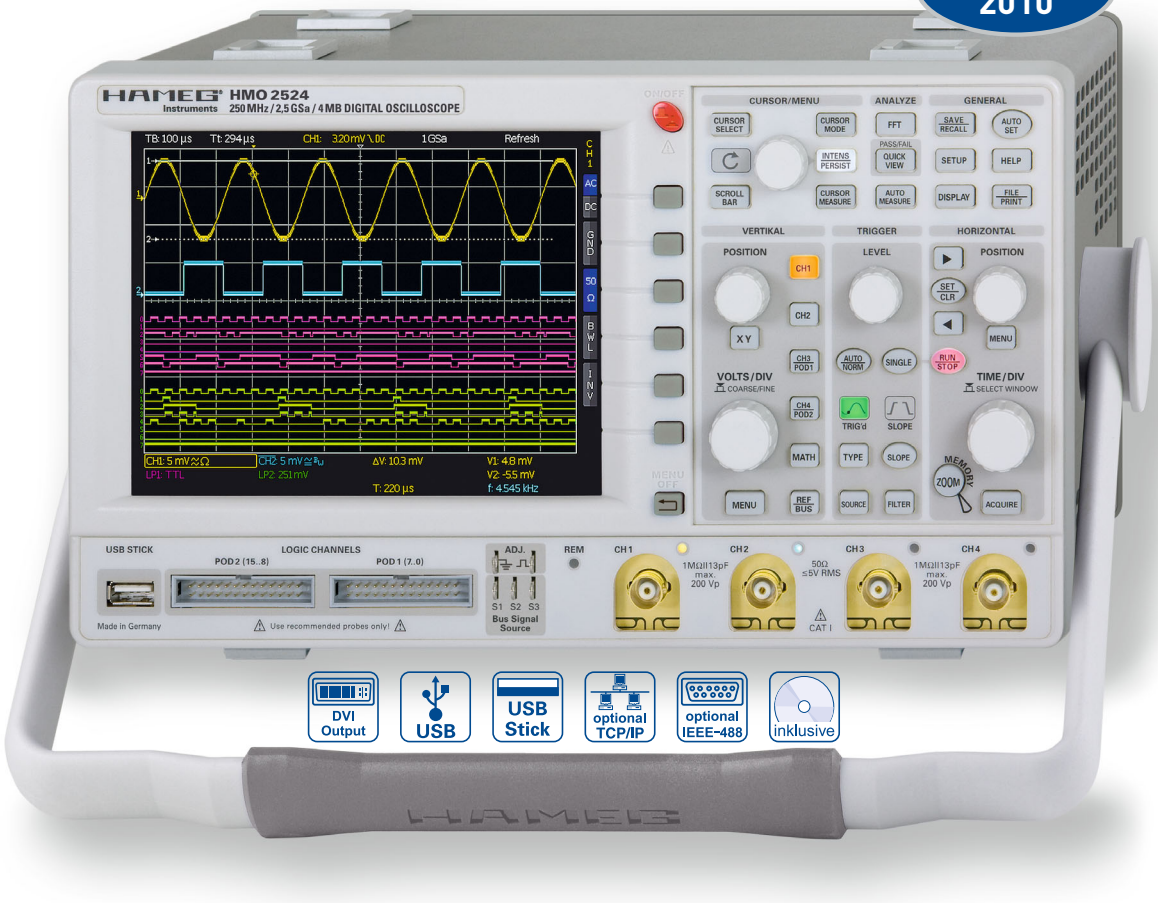
HAMEG Instruments

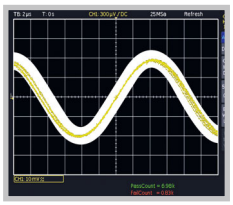
250MHz 4 Channel Digital Oscilloscope
HMO2524

January 2010

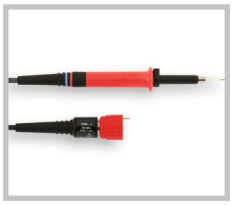
HMO2524



Mask test



Passive Probe 1000:1
HZO20



AC/DC Current Probe
100/1000A HZO51

- ☑ **2.5GSa/s Real time, 25GSa/s Random sampling, low noise flash A/D converter (reference class)**
- ☑ **4MPts memory, memory Zoom up to 100,000:1**
- ☑ **MSO** (Mixed Signal Opt. HO3508/HO3516) with 8/16 logic channels
- ☑ **Serial bus** trigger and hardware acelerated decode , I²C, SPI, UART/RS-232 (Opt. HO010)
- ☑ 8 user definable marker 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
- ☑ 6 digit counter, automeasurement, formula editor, ratiocursor, FFT for spectral analysis
- ☑ Crisp 16.5cm (6.5") TFT VGA display, DVI output
- ☑ Lowest noise fan
- ☑ 3xUSB for mass storage, printer and remote control optional IEEE-488 or Ethernet/USB

250 MHz 4 Channel Digital Oscilloscope HMO2524

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

Display	
Display:	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 channel:	0...31
Vertical System	
Channels:	
DSO mode	CH1...CH4
MSO mode	CH1...CH3 LCH 0...7 (with 1 x Option HO3508) CH1, CH2, LCH 0...15 (with 2 x Option HO3508)
Auxiliary input:	Rear side
Function	Ext. Trigger
Impedance	1MΩ || 13pF ± 2pF
Coupling	DC, AC
Max. input voltage	100V (DC + peak AC)
XYZ-mode:	All analog channels on individual choise
Invert:	CH1...CH4
Y-bandwidth (-3dB)**:**	250MHz (5mV...5V)/div. 100MHz (1mV, 2mV)/div.
Lower AC bandwidth:	2Hz
Bandwidth limiter (switchable)**:**	approx. 20MHz
Rise time (calculated)**:**	< 1,5 ns
DC gain accuracy	2%
Input sensitivity:	12 calibrated steps
CH1...CH4	1mV/div....5V/div. (1-2-5 Sequence)
Variable	Between calibrated steps
Inputs CH1...CH4:	
Impedance	1MΩ II 13pF ± 2pF (50Ω switchable)
Coupling	DC, AC, GND
Max. input voltage	200V (DC + peak AC), 50Ω < $5V_{rms}$
Measuring circuits:	Measuring Category I (CAT I)
Position range	± 10 Divs
Offset control:	
1mV, 2mV	± 0,2V
5...50mV	± 1V
100mV...5V	± 20V
Logic channels	With Option HO3508
Select. switching thresholds	TTL, CMOS, ECL, 2 x User -2...+8V
Impedance	100kΩ || < 4pF
Coupling	DC
Max. input voltage	40V (DC + peak AC)
Triggering	
Analog channels:	
Automatic:	Linking of peakdetection and triggerlevel
Min. signal height	0.8div; 0.5div typ.
Frequency range	5Hz...300MHz
Level control range	From peak- to peak+
Normal (without peak)**:**	
Min. signal height	0.8div; 0.5div typ.
Frequency range	0...300MHz
Level control range	–10....+10div.
Operating modes:	Slope/Video/Logic/Pulse/Busses (optional)
Slope:	Rising, falling, both
Sources:	CH1...CH4, Line, Ext., LCH0...15
Coupling:	**AC:** 5Hz...300MHz **DC:** 0...300MHz **HF:** 30kHz...300MHz **LF:** 0...5kHz **Noise rejection:** 100MHz LPF switchable
Video:	Pos./neg. sync. impulse
Standards	525 Line/60Hz systems 625 Line/50Hz systems
Fields	Field 1, field 2, both
Line	All, selectable line number
Source	CH1...CH4
Logic:	AND, OR, TRUE, FALSE
Source	LCH0...15
State	LCH0...15 X, H, L
Indicator for trigger action:	LED
Ext. Trigger via:	Auxiliary input [Aux. input at rear side] 0,3V...10V_{ss}
2nd Trigger:	
Slope	Rising, falling, both
Min. signal height	0.8 div.; 0.5 div. typ.
Frequency range	0...300 MHz
Level control range	-10....+10 div.
Operating modes:	
after time	20 ns...0.1 s
after incidence	$1...2^{16}$

Horizontal System	
Domain representation:	Time, Frequency (FFT), Voltage (XY)
Representation Time Base:	Main-window, main- and zoom-window
Memory Zoom:	Up to 100.000:1
Accuracy:	15ppm
Time Base:	
Refresh operating modes	2ns/div....20ms/div.
Roll operating modes	50ms/div....50s/div.
Digital Storage	
Sampling rate (real time)**:**	4 x 1,25 GSa/s, 2 x 2,5 GSa/s Logic channels: 16 x 1,25GSa/s
Sampling rate (random)**:**	25GSa/s (n/a to logic channels)
Memory:	4 x 2 MPts, 2 x 4 MPts
Operation modes:	Refresh, Average, Envelope, Peak-Detect Roll: free run/triggered, Smooth
Resolution (vertical)	8 Bit
Resolution (horizontal)	
Yt Mode	50 Pts./div.
XY Mode	8 Bit
Interpolation:	Sinx/x (CH1...CH4), Pulse (LCH 0...15)
Persistence:	Off, 50ms...∞
Delay pretrigger:	0...2 Million x (1/samplerate)
posttrigger:	0...8 Million x (1/samplerate)
Display refresh rate:	Up to 2500 waveforms/s
Display:	Dots, vectors (interpolation), '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:	
0.5Hz...300MHz	6 Digit resolution
Accuracy	15ppm
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}
Cursor measurements:	ΔV, Δt, 1/Δt (f), V to Gnd, V_t related to Trigger point, ratio X and Y, pulse count, peak to peak, peak+, peak-
Interface:	Dual-Interface USB/RS-232 (HO720) USB-Stick (frontside) USB-Printer (rear side) for Postscript Printer DVI-D for ext. monitor
Optional:	IEEE-488, Ethernet/USB
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	analog channels can also be used as source for bus definition
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, EXP
Display:	Up to 4 math. memories with label
Pass/Fail functions	
Sources:	All channels and math. memories
Type of test:	Mask around a signal, userdefined tolerance
Functions:	Stop and/or Beep for Pass or Fail, Count up to 1 Mio events, including number of Pass and Fail
General Information	
Probe ADJ Output:	1kHz/1MHz square wave signal ca. 1 V_{pp} (ta < 4ns)
Bus Signal Source:	Three outputs (frontside) which generates a selection of serial or parallel data for test and training purposes
Internal RTC (Realtime clock)**:**	Date and time for stored data
Line voltage:	105...253V, 50/60Hz, CAT II
Power consumption:	Max. 70Watt at 230V, 50Hz
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 220 mm
Weight:	3.6 kg

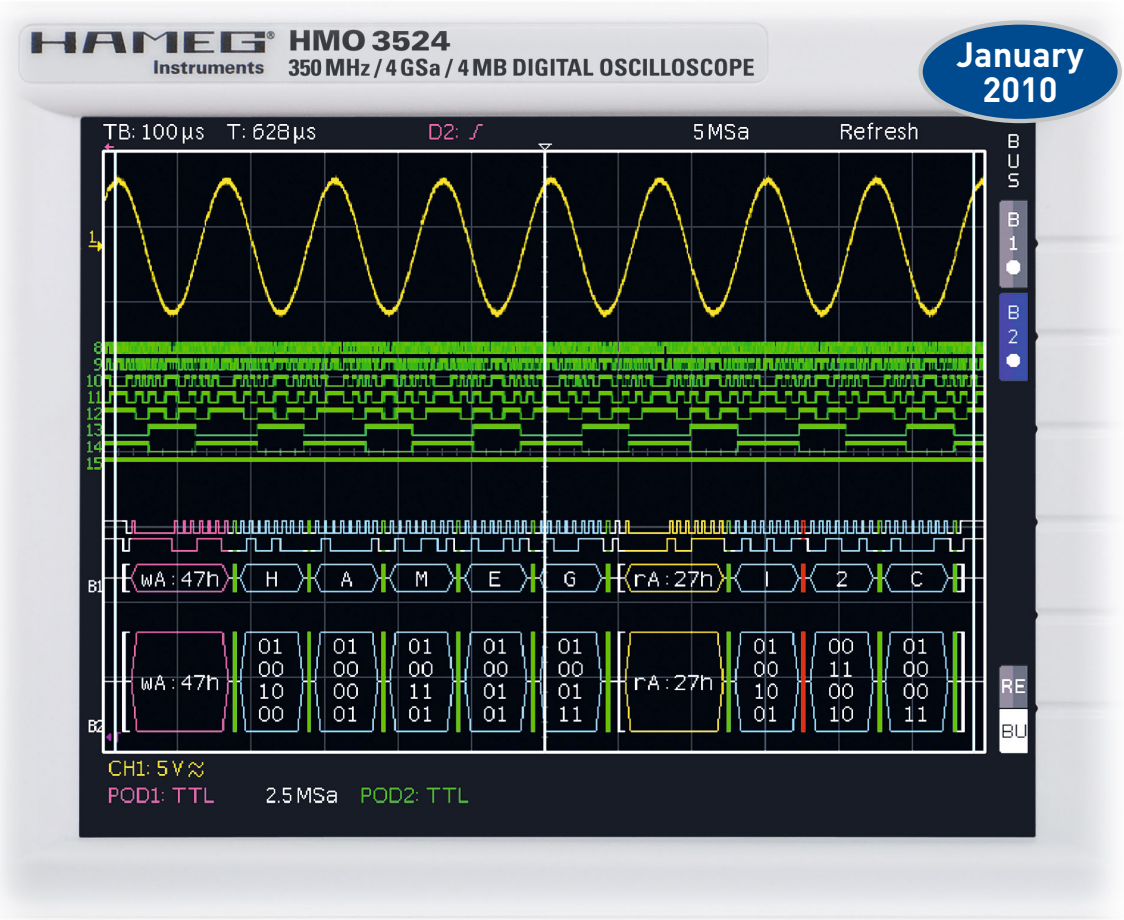
Accessories supplied: Line cord, Operating manual, 2 [4] Probes, 10:1 with attenuation ID (HZ350), Dual-Interface USB/RS-232 (HO720), CD
Optional accessories you can find at www.hameg.com/HMO2524

HAMEG Instruments

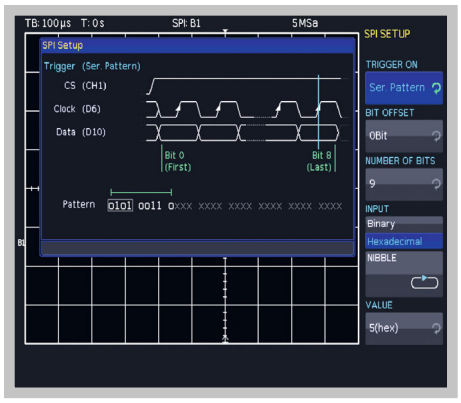
H0010 Serial Bus

for all Oscilloscopes of the HMO Series

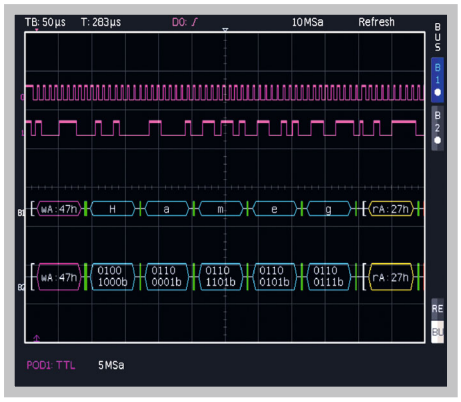
H0010



SPI Bus Trigger Setup



I²C Bus ASCII and binary



- ☑ I²C, SPI, UART/RS-232 Bus trigger and decode
- ☑ Hardware accelerated decode in realtime
- ☑ Color coded display of the content for intuitive analysis and easy overview
- ☑ More details of the decoded values come visible with increasing zoom factor
- ☑ Bus display with synchronous display of the data and may be clock signal
- ☑ Decode into ASCII, Binary, Hexadecimal or Decimal format
- ☑ Up to four lines to show the decoded values comfortable
- ☑ Powerful trigger to isolate specific messages
- ☑ Option for all HMO Scopes, retrofittable

Analog meets digital and serial

The option HO010 for the HAMEG oscilloscopes of the HMO series is a tool set to support and simplify the development and debug of embedded systems. Hardware accelerated decode for the widely used serial busses I²C, SPI and UART/RS-232 shows the messages in ASCII, binary, hexadecimal or even decimal format in realtime. Color coding of the different parts of the messages (f.e. Adress ID, Data, Start etc.) makes the analysis very intuitive. The wide range of flexible trigger functions make sure that all relevant messages can be acquired. For example you can trigger on a specific write address ID with a specific datavalue on a I²C message. These makes the HO010 a powerful and meaningful option for any mixed signal scope of the HMO series.

	I²C Bus	SPI Bus	UART/RS-232 Bus
Bus Configuration			
Baud rates	up to 10 Mb/s	up to 25 Mb/s	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud, up to 1 Mb/s
Number of Bit's	7 or 10 Bit for Adress ID 8 Bit for Data	32 Bit for Data	8 Bit for Data 1, 1,5, 2 Bit for Stop Bit
Polarity	n/a	Chip select, positive or negative, or without Chipselect (2-wire SPI) Clock rising or falling edge Data high or Low active	High or Low active
Parity	n/a	n/a	none, odd or even
Trigger			
Source	digital Channel LCH0...15 (Opt. HO3508)	digital Channel LCH0...15 (Opt. HO3508)	digital Channel LCH0...15 (Opt. HO3508)
Event	7 or 10 Bit Address ID 7 or 10 Bit Address ID with 8 Bit Data Start Stop Restart missing Acknowledge Adress ID without Acknowledge	Data packets up to 32 Bit with positive or negative Chip Select or without Chip Select, (2-wire SPI)	Data packets up to 8 Bit
Input format	Hexadecimal or Binary	Hexadecimal or Binary	Hexadecimal or Binary
Hardware accelerated Decode			
Source	digital Channel LCH0...15 (Opt. HO3508)	digital Channel LCH0...15 (Opt. HO3508)	digital Channel LCH0...15 (Opt. HO3508)
Display	Bus display, color coded for Read Adress ID: Yellow Write Adress ID: Magenta Date: Cyan Start: White Stop: White ACK/NACK: Green/Red Error: Red Trigger Condition: Green up to four lines for decoded values, synchronous display of the Bit lines	Bus display, color coded for Date: Cyan Start: White Stop: White Error: Red Trigger Condition: Green up to four lines for decoded values, synchronous display of the Bit lines	Bus display, color coded for Date: Cyan Start: White Stop: White Error: Red Trigger Condition: Green up to four lines for decoded values, synchronous display of the Bit lines
Format	Adress ID: hexadecimal Data ASCII, binary, decimal, hexadecimal	n/a Data ASCII, binary, decimal, hexadecimal	n/a Data ASCII, binary, decimal, hexadecimal

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