

Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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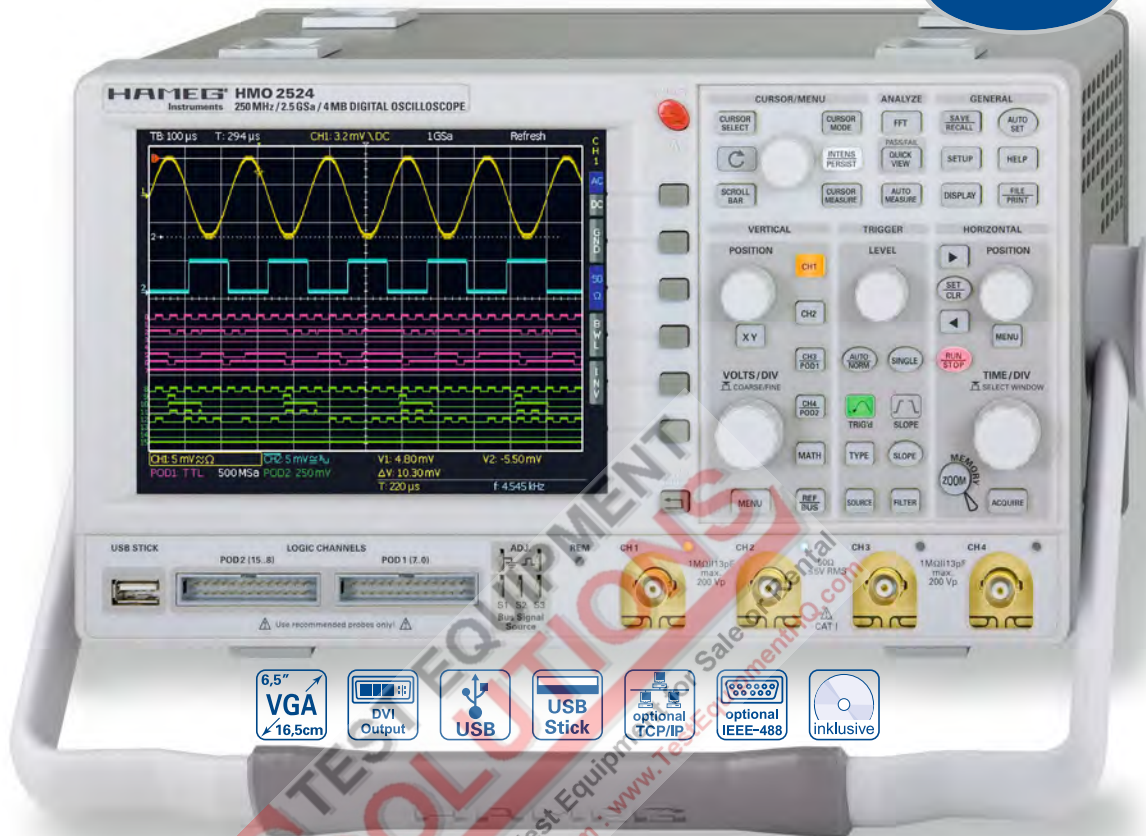
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250MHz 4 Channel Digital Oscilloscope HMO2524

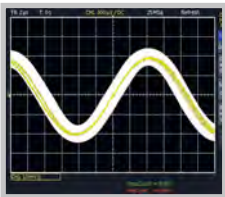
NEW



HMO2524



Mask test



Passive Probe 1000:1
HZ020



AC/DC Current Probe
100/1000A HZ051



- ☑ 2.5GSa/s Real time, 25GSa/s Random sampling, low noise flash A/D converter (reference class)
- ☑ 4MPts memory, memory **Z**oom up to 100,000:1
- ☑ MSO (Mixed Signal Opt. H03508/H03516) with 8/16 logic channels
- ☑ Serial bus trigger and hardware accelerated decode, I²C, SPI, UART/RS-232 (Opt. H0010)
- ☑ 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 (VirtualScreen)
- ☑ 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 400cd/m ²
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 LCH0...7 (with 1 x Option HO3508) CH1, CH2, LCH0...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 choice
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 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	± 10Divs
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	0.8div; 0.5div. typ.
Frequency range	0...300MHz

Level control range	-10...+10div.
Operating modes:	
after time	20 ns...0.1 s
after incidence	1...2 ¹⁶
Busses (Opt. HO010):	I ² C/SPI/UART/RS-232
Source	LCH0...LCH15
Format	hexadecimal, binary
I ² C	Trigger on Start, Stop, Restart, ACK, NACK, Adress (7 or 10 Bit), Data, Address and Data, up to 10 Mb/s
SPI	up to 32 Bit Data, Chip select (CS) pos. or neg., without CS, up to 25 Mb/s
UART/RS-232	up to 8 Bit Data, up to 62.5 Mb/s

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)	8Bit
Resolution (horizontal)	
Yt Mode	50 Pts./div.
XY Mode	8 Bit
Interpolation:	Sinx/x (CH1...CH4), Pulse (LCH0...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 set- tings
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} , pos. edge count, neg. edge count, pos. pulse count, neg. pulse count
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 (HO-740), Ethernet/USB (HO-730)

Display functions

Marker:	up to 8 user definable marker for easy navi- gation
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 hexadeci- mal, up to 4 lines
Parallel	logic channels can also be used as source for bus definition
I ² C (Opt. HO010)	color coded Read-, Write Adress, Data, Start, Stop, missing acknowledge, Errors and Trigger condition
SPI (Opt. HO010)	color coded Read-, Write Adress, Data, Start, Stop, Errors and Trigger condition
UART/RS-232 (Opt. HO010)	color coded Read-, Write Adress, 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
Display:	Up to 4 math. memories with label

Storage temperature:	-20...+70°C
Rel. humidity:	5...80% (non condensing)
Dimensions (W x H x D):	285x175x220mm
Weight:	3.6 kg

Pass/Fail functions

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

General Information

Probe ADJ Output:	1kHz/1MHz square wave signal ca. 1V _{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

Accessories supplied: Line cord, Operating manual, 4 Probes, 10:1 with attenuation ID (HZ350), Dual-Interface USB/RS-232 (HO720), CD	
Optional accessories:	
HO010	Serial bus trigger and hardware accelerated decode, I ² C, SPI, UART/RS-232 on Logic channels
HO3508	active 8 Channel Logic Probe
HO3516	2x HO3508, active 8 Channel Logic Probes
HO730	Dual-Interface Ethernet/USB
HO740	Interface IEEE-488 (GPIB) galvanically isolated
HZ355	Slimline Probe 10:1 with automatically identification
HZ355DU	Upgrade from 2x HZ350 to 2x HZ355
HZ46	4RU 19" Rackmount Kit
HZO20	High Voltage probe 1000:1 (400 MHz)
HZO30	single ended active probe (1GHz)
HZO50	AC/DC Currentprobe 20A, DC...100kHz
HZO51	AC/DC Currentprobe 1000A, DC...20kHz
additional accessories you can find at www.hameg.com/HM02524	

H0010 Serial Bus for all Oscilloscopes of the HMO Series

Analog meets digital and serial
 The option H0010 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. Address 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 H0010 a powerful and meaningful option for any mixed signal scope of the HMO series.

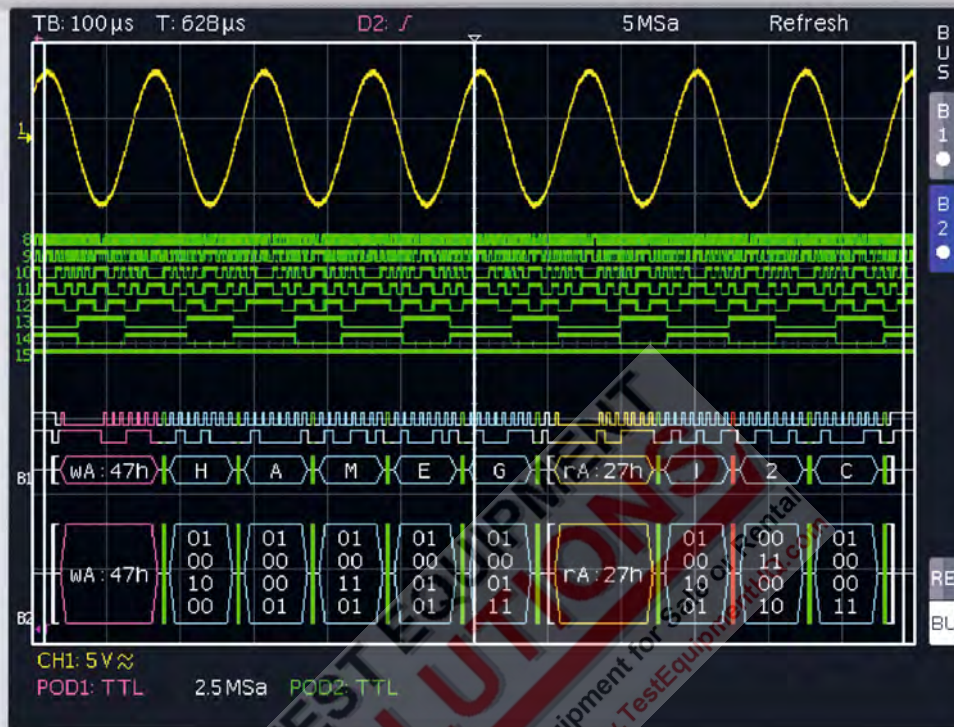
	I ² C Bus	SPI Bus	UART/RS-232 Bus
Bus Configuration			
Baud rates	up to 10Mb/s	up to 25Mb/s	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud, up to 62,5Mb/s
Number of Bit's	7 or 10 Bit for Adress ID 8 Bit for Data	32 Bit for Data	8 Bit for Data 1, 1,5, 2 Bit for Stop Bit
Polarity	n/a	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

H0010 Serial Bus

for all Oscilloscopes of the HMO Series

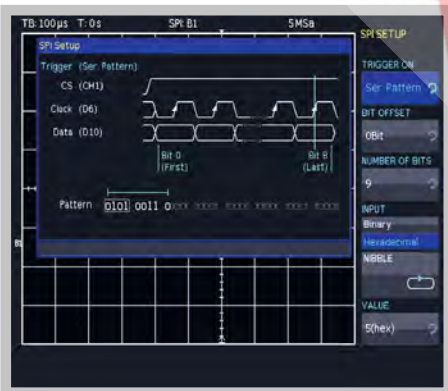
HAMEG® HMO 2524
Instruments 250 MHz / 2,5 GSa / 4 MB DIGITAL OSCILLOSCOPE

NEW

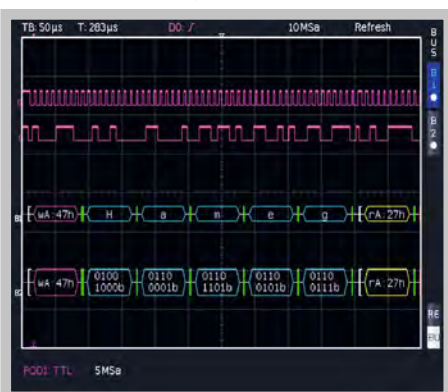


H0010

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