150MHz 2[4] Channel Digital Oscilloscope HMO1522 [HMO1524]

- 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
- 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 (Virtual Screen)
- 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
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


8 User definable Markers for easy Navigation

Pass/Fail Test based on Masks

Vertical Sensitivity 1mV/div.

12div. x-Axis Display Range, 20div. y-Axis Display Range (Virtual Screen)

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
200 MHz 2 (4) Channel Digital Oscilloscope HMO2022 (HMO2024)
150MHz 2(4) Channel Digital Oscilloscope HMO1522 (HMO1524)
All data valid at 23°C after 30 minute warm-up.

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 H03508
Auxiliary input:
- Frontside [Rear side]
Function:
- Ext. Trigger
Impedance:
- 1 MO | 14pF ±2pF
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):
- HMO2022x: 200 MHz (5mV...5V/div, 100 MHz (1mV, 2mV/div)
- HMO1525x: 150 MHz (5mV...5V/div, 100 MHz (1mV, 2mV/div)
Lower AC bandwidth:
- 2 Hz
Bandwidth limiter (switchable):
- approx. 20 MHz
Rise time (calculated):
- HMO2022x: <1.75 ns
- HMO1525x: <2.4 ns
DC gain accuracy:
- 2 %
Input sensitivity:
- 12 calibrated steps
  - 1mV/div…5V/div. (1–2–5 Sequence)
Variable:
- Between calibrated steps

Inputs CH 1, CH 2 [CH 1...CH 4]:
- Impedance:
  - 1 MO | 14pF ±2pF [50Ω switchable]
Coupling:
- DC, AC, GND
Max. input voltage:
- 200V (DC ± peak AC), 500 ±5 Vrms

Measuring circuits:
- Measuring Category I (CAT I), UL 61010B-1
Position range:
- ±10 Divs
Offset control:
- ±0.2V…-10 divs ± sensitivity
1 mV, 2 mV
5...50 mV
100 mV, 200 mV…2 V
5 V
Logic channels:
- With Option H03508
Select. switching thresholds:
- TTL, CMOS, ECL, User -2...+8 V
Impedance:
- 100xΩ | ±4pF
Coupling:
- DC
Max. input voltage:
- 40V (DC ± peak AC)

Triggering
Automatic:
- Linking of peakdetection and triggerlevel
Min. signal height:
- 0.8 div., 0.5 div. typ. (1.5 Div at ± 2mDiv/Div)
Frequency range:
- HMO2022x: 5 Hz...250 MHz (5Hz...120 MHz at ± 2mDiv/Div)
- HMO1525x: 5 Hz...200 MHz (5Hz...120 MHz at ± 2mDiv/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 ± 2mDiv/Div)
Frequency range:
  - HMO2022x: 0...250 MHz (10Hz...120 MHz at ± 2mDiv/Div)
  - HMO1525x: 0...200 MHz (10Hz...120 MHz at ± 2mDiv/Div)
Level control range:
  - -10...10 divs 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 (Analog Channel):
- AC [HMO2022x]: 5 Hz…250 MHz
- [HMO1525x]: 5 Hz…200 MHz
- DC [HMO2022x]: 0...250 MHz
- [HMO1525x]: 0...200 MHz
- HF [HMO2022x]: 50 kHz…250 MHz
- [HMO1525x]: 50 kHz…200 MHz
LF: 0.5 kHz
Noise rejection:
- switchable

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 580 Pixel (8 x 10 div.)
Color depth:
- 256 colors
Intensity steps per trace:
- 0...31

Pulses:
- Positive, negative
- equal, unequal, less than, greater than, within/without a range
Range:
- min. 32 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

2nd Trigger:
Slope:
- Rising, falling, both
Min. signal height:
- 0.8 div., 0.5 div. typ. (1.5 Div at ± 2mDiv/Div)
Frequency range:
- HMO2022x: 0...250 MHz (1.5 div at ±2mDiv/Div)
- [HMO1525x]: 0...200 MHz (1.5 div at ±2mDiv/Div)
Level control range:
- -10...10 div.
Operating modes:
- after time:
  - 32ns…10s
- after incidence:
  - 1…2 ns
Busses (Opt. H010):
- I²C/SPI/JART/RS-232
Sources:
- CH 1, CH 2, Ext. [CH 1...CH 4, Ext., LCH 0...7]

Busses (Opt. H011):
- I²C/SPI/JART/RS-232
Sources:
- CH 1, CH 2, Ext. [For Chip Select at SPI]
Format:
- hex/decimal, binary
SPI:
- Trigger on Start, Stop, Restart, NACK, Address (7 or 10 Bit), Data, Address and Data, up to 5 Mb/s
- up to 32 Bit Data, Chip select [CS] pos.
- or neg., without CS, up to 12.5 Mb/s
- up to 8 Bit Data, up to 31 Mb/s

Horizontal System
Domain representation:
- Time, Frequency [FFT], Voltage (XY)
Memory Zoom:
- Up to 50,000,1
Accuracy:
- 50 ppm
Time Base:
- 2 div/s…500 m/s/div.
Roll Mode:
- 50ms/div…50s/div.

Digital Storage
Sampling rate (real time):
- 2 x 10Gs/s, 1 x 20Gs/s [4 x 10Gs/s, 2 x 20Gs/s]
Logic channels:
- 8 x 1 GSa/s
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:
- 0, 50 ms...∞
Delay pretrigger:
- 0...8 Million x (1/sample rate)
posttrigger:
- 0...2 Million x (1/sample rate)
Display refresh rate:
- Up to 2000 waveforms/s
Display:
- Dots, vectors, “persistance”
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 [HMO2022x]: 6 Digit resolution
- [HMO1525x]: 6 Digit resolution
Accuracy:
- 50 ppm
Auto measurements:
- Amplitude, standard deviation, Vpp, Vpp, Vib, Vvib, Vtop, Vcenter, frequency, period, pulse count, neg. edge count, pos. edge count, neg. edge count, pos. pulse count, neg. pulse count, peak to peak, mean-, peak+, mean value, RMS value, standard deviation
Cursors measurement:
- ΔV, Δt, Δt/Δt t, V to t, V to t, Δt 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, D+V for each Monitor
Optional:
- IEEE-488 [HO740], Ethernet/USB [HO730]

Display functions
Marker:
- up to 8 user definable marker for easy navigation
Virtual Screen:
- virtual Display with 20 div. vertical for all Math-, Logic-, Bus- and Reference Signals
Bus display:
- 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
PC:
- color coded Read-, Write Address, Data, Start, Stop, acknowledge, missing acknowledge, Errors and Trigger condition
SPI:
- color coded Data, Start, Stop, Errors and Trigger condition
**Mathematical functions**

- **Number of formula sets**: 5
- **Sources**: All channels and math. memories
- **Functions**: ADD, SUB, 1/X, ABS, MUL, DIV, SQ, POS, NEG, INV, INTG, DIFF, SQRT, MIN, MAX, LOG, LN, LOG10, 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**: Rise time: approx. 20 MHz; 2 Hz
- **Input sensitivity**: 13 calibrated steps, DC gain accuracy: 2%
- **Max. input voltage**: 100V (DC + peak AC)
- **Frequency range**: CH 1, CH 2, Ext. [CH 1...CH 4] [for Chip Select at SPI]
- **Logic channels**: With Option H03508
- **Select. switching**: TTL, CMOS, ECL, User: -2...+8 V
- **Impedance**: 100Ω || 4pF
- **Coupling**: DC
- **Max. input voltage**: 40V (DC + peak AC)

**Triggering**

- **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**: CH 1, CH 2, Ext. [CH 1...CH 4] [for Chip Select at SPI]
- **Impedance**: 100Ω || 4pF
- **Coupling**: DC
- **Max. input voltage**: 40V (DC + peak AC)

**General Information**

- **Component tester**
  - **Test voltage**: 10V (open) typ.
  - **Test current**: 10mA, (short) typ.
  - **Test frequency**: 50Hz/200 Hz typ.
  - **Reference Potential**: Ground (safety earth)
  - **Probe ADJ Output**: 1kHz/1 MHz square wave signal ~1Vpp
  - **Internal RTC**: Date and time for stored data
  - **Max. input current**: 100 mA, DVI-D for ext. Monitor

**Accessories supplied**

- **Line cord, Operating manual, 2 [4] Probes, 10:1 with attenuation**

**Recommended accessories you can find at www.hameg.com/embedded**

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**100 MHz 2 [4] Channel Digital Oscilloscope HMO1022 [HMO1024]
70 MHz 2[4] Channel Digital Oscilloscope HMO722 [HMO724]**

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

**Display** see HMO2022 [HMO2024]

**Vertical System**

- **Channels**: DSO mode: CH 1, CH 2, CH 3, CH 4
- **MOS mode**: CH 1, CH 2, LCH 0...7 (logic channels) [CH 1, CH 2, LCH 0...7, CH 4] with Option H03508
- **Auxiliary input**: Ext. Trigger, Impedance: 1 MO || 13pF ±2pF
- **Coupling**: DC, AC
- **Max. input voltage**: 100V (DC + peak AC)

**XY-mode**: All analog channels on individual choice

**Invert**: CH 1, CH 2 [CH 1...CH 4]

**Y-bandwidth (-3 dB)**

- **HMO102x**: 100MHz [5mV...10V]/div., 20MHz [1mV, 2mV]/div. [5mV...10V]/div., 20MHz [1mV, 2mV]/div.
- **HMO72x**: 70MHz [5mV...10V]/div., 20MHz [1mV, 2mV]/div.

**Lower AC bandwidth**: approx. 20 MHz

**Bandwidth limit (switchable)** approx. 20 MHz

**Rise time** (calculated) HMO102x: ≤ 3.5ns

**DC gain accuracy**: ≤ 2%

**Input sensitivity**: 13 calibrated steps, CH 1, CH 2 [CH 1...CH 4]

**Variables**: Between calibrated steps

**Inputs CH 1, CH 2 [CH 1...CH 4]**

- **Impedance**: 1MO || 14pF ±2pF
- **Coupling**: DC, AC, 0ND
- **Max. input voltage**: 200V (DC + peak AC)

**Measuring circuits**: Measuring Category I (CAT I)

**Position range**: ±100Divs

**Logic channels**: With Option H03508

**Select. switching**: TTL, CMOS, ECL, User: -2...+8 V

**Impedance**: 100Ω || 4pF

**Coupling**: DC

**Max. input voltage**: 40V (DC + peak AC)

**Triggering**

- **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**: CH 1, CH 2, Ext. [CH 1...CH 4] [for Chip Select at SPI]
- **Impedance**: 100Ω || 4pF
- **Coupling**: DC
- **Max. input voltage**: 40V (DC + peak AC)

**General Information**

- **Standards**: PAL, NTSC, SECAM, PAL-M, SDTV 576i, HDTV 720p, HDTV 1080i, HDTV 1080p

**Fields**: Field 1, field 2, both

**Sync. Impulse**: All, selectable line number

**Logic**: AND, OR, TRUE, FALSE, LCH 0...7, X, H, L

**Pulses**: Positive, negative

**Modes**: equal, unequal, less than, greater than, within/without a range

**Range**: min. 32ns, max. 10s, resolution min. 8ns

**Indicator for trigger action**: LED

**Ext. Trigger via**: Auxiliary input 0.3V...10V

**Accuracy**: 50ppm

**Digital Storage** see HMO2022 [HMO2024]

**Operation/Measuring/Interfaces**

- **Event-driven (multilingual)**, Autoset, help functions (multilingual)
- **Save/Recall memories**: typ. 10 complete parameter settings
- **Frequency counter**: 0.5Hz...150MHz [HMO102x] 0.5Hz...100MHz [HMO72x]
- **Digital resolution**: 6 Digit resolution
- **Accuracy**: 6 Digit resolution
- **Auto measurements**: Amplitude, standard deviation, Vpp, Vmin, Vmax, Vpp, Vmin, Vmax, frequency, period, pulse count, twidth+, twidth-, tdutycycle+, tdutycycle, trise, tfall, pos. edge, neg. edge, count, pos. pulse count, neg. pulse count, trigger frequency, trigger period, phase, delay
- **Cursor measurements**: AV, At, Aat, LV, V to Gnd, Vt related to Trigger point, range X and Y, pulse count, peak to peak, peak+, peak-, mean value, RMS value, standard deviation
- **Interface**: Dual-Interface USB type B/RS-232 (H0720), 2x USB type A (front- and rear side each 1x) max. 100mA, DVI-D for ext. Monitor

**Optional**: IEEE-488 [H0740], Ethernet/USB [H0730]

**Display functions** see HMO2022 [HMO2024]

**Mathematical functions** see HMO2022 [HMO2024]

**Pass/Fail functions** see HMO2022 [HMO2024]

**General Information** see HMO2022 [HMO2024]

**Accessories supplied**: Line cord, Operating manual, 2 [4] Probes, 10:1/1:1 switchable [HZ154], CD

**Recommended accessories you can find at www.hameg.com/embedded**

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**UART/RS-232**

{Opt. H0010, H0011}
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<td>200 MHz</td>
<td>150 MHz</td>
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<td>1 MD/50 Q</td>
<td>1 MD/50 Q</td>
<td>1 MD/50 Q</td>
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<td>V/div. 1 MD</td>
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<td>1 mV/div....5 V/div.</td>
<td>1 mV/div....5 V/div.</td>
<td>1 mV/div....5 V/div.</td>
<td>1 mV/div....10 V/div.</td>
<td>1 mV/div....10 V/div.</td>
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<td>Probe Attenuation Sense</td>
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<td>Horizontal</td>
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<td>Sample Rate per Analog Channel</td>
<td>2 05a/s</td>
<td>1.25 05a/s</td>
<td>205a/s</td>
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<td>Max. Sample Rate</td>
<td>4 05a/s</td>
<td>2.5 05a/s</td>
<td>205a/s</td>
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<td>Trigger</td>
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<td>Trigger Modes</td>
<td>Edge, Pulse Width, Pattern, Video incl. HDTV, A/B Trigger</td>
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<td>Measurement</td>
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<td>Cursor measurement List</td>
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<td>Advanced Math, Math on Math</td>
<td>Standard</td>
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<td>Mixed Signal</td>
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<tr>
<td>Mixed Signal Functionality</td>
<td>via Option HO3508 (8 Channel) or HO3516 (16 Channel)</td>
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<td>Max. Number of Logic Channel</td>
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<td>1 05a/s</td>
<td>1,25 05a/s</td>
<td>105a/s</td>
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<td>1 Mpts.</td>
<td>2 Mpts.</td>
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<td>Serial Trigger and Decode</td>
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<td>Serial Trigger and Decode PC, SPI, UART/RS-232</td>
<td>H0010 via Analog Channels and/or Logic Channels, H0011 via Analog Channels</td>
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<td>Display</td>
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<td>Display Size</td>
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<td>USB Remote Interface</td>
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<td>Option HO730</td>
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<td>Option HO740</td>
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<tr>
<td>Miscellaneous</td>
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<tr>
<td>Fan noise</td>
<td>very low</td>
<td></td>
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<tr>
<td>Dimension (W x H x D)</td>
<td>28,5 x 17,5 x 22 cm</td>
<td>28,5 x 17,5 x 22 cm</td>
<td>28,5 x 17,5 x 14 cm</td>
<td>28,5 x 17,5 x 14 cm</td>
<td>28,5 x 17,5 x 14 cm</td>
<td>28,5 x 17,5 x 14 cm</td>
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<tr>
<td>Footprint</td>
<td>627 cm²</td>
<td>627 cm²</td>
<td>399 cm²</td>
<td>399 cm²</td>
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<tr>
<td>Weight</td>
<td>3,6 kg</td>
<td>3,6 kg</td>
<td>2,5 kg</td>
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<tr>
<td>Power</td>
<td>70W max.</td>
<td>70W max.</td>
<td>50W max.</td>
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<td>50W max.</td>
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<tr>
<td>Component Tester</td>
<td>N/A</td>
<td>N/A</td>
<td>Standard</td>
<td>Standard</td>
<td>Standard</td>
<td>Standard</td>
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<tr>
<td>Additional Bus Signal Source</td>
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<td>Languages</td>
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<tr>
<td>German, English, French, Spain</td>
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**H0010 / H0011 Serial Bus** for all Oscilloscopes of the HMO Series

- H0010 via Analog Channels and/or Logic Channels, H0011 via Analog Channels
- 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 Comfortably
- Powerful Trigger to isolate specific Messages
- Option for all Oscilloscopes of the HMO Series, retrofittable