Mixed Signal Oscilloscopes
300 MHz | 400 MHz | 500 MHz
HMO3000 Series
High sensitivity, multi-functionality and a great price – that’s what distinguishes the HAMEG HMO3000 oscilloscope series.

**Key facts**
- 4 GS/s real time, 8 MPts memory
- Automatically or manually adjustable memory depth, segmented memory option (HMO14)
- MSO functionality included as standard (H03508/H03516 logic probe with 8/16 channels required)
- Trigger modes: slope (A/B), pulse width, video, logic, risetime, runt, serial buses (optional), hold-off
- Serial bus trigger and hardware accelerated decode incl. list view. Options: I2C + SPI + UART/RS-232 (H0010/H0011), CAN + LIN (H0012)
- 28 auto-measurement parameters plus statistics, formula editor, ratio cursor
- 6-digit hardware counter
- FFT up to 64 kPts (dBm, dBV, Vrms)
- Pass/fail test based on masks, automatic search for user-defined events
- Display: 12 div. x-axis, 20 div. y-axis (Virtual Screen)
- 2x USB for mass storage, Ethernet/USB dual interface for remote control

**Application** How the HAMEG HMO3000 meets your needs
- **Engineering lab**
  - Adjustable memory depth
  - Advanced math functions available as standard, math on math possible
  - Automeasurement for 28 user-defined parameters
  - High performance oscilloscope/MSO input plus 16 digital channels
  - Virtual Screen technology
  - Superb FFT functionality
- **Analog circuit design**
  - Low-noise amplifier and A/D converter
  - 1 mV/div. sensitivity
  - 50 Ω/1 MΩ input impedance, switchable
  - Bandwidth upgrades via software options
- **Embedded debugging**
  - Mixed signal option (MSO) with 16 logic channels
  - Serial bus trigger and hardware-accelerated decode
  - 6-digit hardware counter
- **Production environment**
  - Remote control for automated data acquisition
  - Pass/fail tests based on defined limits with automatic output signal
  - Superb signal measurement at the push of a button
  - USB/RS-232, Ethernet or GPIB (IEEE 488) interfaces
- **General purpose and education**
  - Fast boot time
  - Intelligent temperature management
  - Superb signal measurement at the push of a button
  - Superb signal measurement at the push of a button
  - External display through Virtual Screen technology
  - DVI-D output for external display
Precise Signal Analysis

An excellent sampling rate in combination with a large memory depth is the key for precise signal analysis. The highly resolved measurement data and the powerful zoom function expose even minor signal details.

Depending on their requirements users can choose between three 2-channel-versions and three 4-channel-versions with bandwidths between 300 and 500 MHz.

<table>
<thead>
<tr>
<th>4 channel</th>
<th>2 channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMO3054</td>
<td>HMO3052</td>
</tr>
<tr>
<td>HMO3044</td>
<td>HMO3042</td>
</tr>
<tr>
<td>HMO3034</td>
<td>HMO3032</td>
</tr>
</tbody>
</table>

Bandwidth Upgrade

Should your requirements change, then so does the HMO3000, as the 300 and 400 MHz models can be extended to 500 MHz bandwidth via software upgrades whenever required. This is done with option upgrade vouchers available at your dealer.

- For 300 MHz models with options HV352 (2 channel) and HV354 (4 channel).
- For 400 MHz models with options HV452 (2 channel) and HV454 (4 channel).

The voucher number and the serial number of your instrument enable you to generate the respective licence key directly on our dedicated web page http://voucher.hameg.com.

Key Facts

<table>
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<th>Feature</th>
<th>300 MHz</th>
<th>400 MHz</th>
<th>500 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling rate per analog channel</td>
<td>500 Msa/s</td>
<td>1 Gsa/s</td>
<td>2 Gsa/s</td>
</tr>
<tr>
<td>Memory sample rate</td>
<td>360 Mps</td>
<td>1 Gps</td>
<td>2 Gps</td>
</tr>
<tr>
<td>Memory depth per channel</td>
<td>512 Kpts</td>
<td>2 Mpts</td>
<td>4 Mpts</td>
</tr>
<tr>
<td>Maximum memory</td>
<td>10 Mpts</td>
<td>4 Mpts</td>
<td>8 Mpts</td>
</tr>
<tr>
<td>Maximum number of logic channels</td>
<td>50</td>
<td>80</td>
<td>160</td>
</tr>
<tr>
<td>Input impedance (1 MΩ/50 Ω)</td>
<td>1 MΩ/50 Ω</td>
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Upgrade at any time

HMO3000 Series

300 MHz | 400 MHz | 500 MHz
Always a MSO

The mixed signal functionality is always included in the HMO3000 series with no software option being necessary to unlock it.

HAMEG is offering the new HMO3000 series exclusively as a mixed-signal oscilloscope. The great advantages of these instruments are best illustrated by taking a look at how ADCs (Analog Digital Converters) or DACs (Digital Analog Converters) are integrated. These transformer modules include an analog signal on the one side and a digital signal on the other side. As with HAMEG’s new HMO3000 series, MSOs allow developers the assessment of the time component for both signal types on one monitor. As shown in the image below the latency time of a DAC can be determined with one simple cursor measurement. Therefore a MSO allows developers to devote their full attention to the circuit without having to waste energy on the measurement setup.

Specifications HO3508

- Channels: 8
- Memory depth per channel: 4 MPts. (HMO3000 series) 1 MPts. (HMO compact series)
- Input impedance: 100 kΩ || <4 pF
- Max. input frequency: 350 MHz
- Max. input voltage: 40 V (DC + peak AC)
- Measuring category: CAT I
- Cable length: approx. 1 m

HAMEG is focusing resolutely on the increasing significance of the mixed-signal oscilloscopes. Consequently, all HAMEG HMO oscilloscopes are full-scale MSOs, even the smaller models with a bandwidth as low as 70 MHz. As a result, HAMEG customers will not need to speculate if they should purchase an instrument with or without logic connectors. As the MSO functionality is invariably included, all instruments correspondingly offer a secure future. It is also unnecessary to initially activate the mixed-signal functions via software options, as is the case with other suppliers.

Logic probe HO3508 fits to all HMO series oscilloscopes

- No hardware lock to a specific device
- 8 logic channels available on each logic probe
- Signal threshold adjustable for each logic pod
Frequency Analysis

Due to the outstanding FFT functionality of the HMO series oscilloscopes signals can also be analysed in the frequency domain with up to 65,536 points. Additional practical tools such as cursor measurement as well as peak-detect functions are also available. They allow engineers to complete their analysis significantly faster, also in the frequency domain.

Easy analysis in frequency domain

Quite often the distortion of input signals cannot be detected with the naked eye. For instance, the sine wave signal displayed in figure 1 appears to be undistorted. Only the frequency spectrum (figure 2) - available with just one touch of a button - clearly displays additional harmonics that occur as harmonic oscillations for multiples of the basic frequency.

For non-periodic input signals most instruments offer the option to trigger the spectrum at just the right moment to then check it in “STOP” mode at a later time. However, at that point, many oscilloscopes with FFT functionality calculate the spectrum only once and store the result in the memory. The base time signal will no longer be used for the calculation. Consequently, an investigation of all parts of the signal will no longer be possible.

HMO series oscilloscopes work differently: Since FFT is also active for previously stored signals, it is possible to subsequently analyze any sections of those signals captured in single shot mode or stop mode with an adjustable window width. Figure 3 shows a sine burst signal in the time domain. Pushing the FFT button will switch the oscilloscope into the frequency domain. Users can choose between various measurement windows like the “rectangular” type that has been used in figure 4. Although this window type captures frequencies at a high degree of accuracy, it is also accompanied by more noise. In order to suppress this disturbing interference users can for instance choose the Hanning window. The impact on the spectrum is visible in figure 5 (see device screen).

Figure 1: A sinusoid signal that at first sight appears undistorted
Figure 2: The frequency spectrum exposes the signal distortion
Figure 3
Figure 4
Figure 5
Segmented Memory

The segmented memory option H0014 enables you to divide the available memory of your HMO3000 into up to 1000 segments. This procedure allows sampling rates of 200,000 Wfm/s, which makes it possible to capture rare anomalies occurring during many short events in quick succession. For the analysis of the recorded signals, all measurement functions of the HMO are available, including the Pass/Fail function.

You can upgrade to option H0014 at any time with voucher HV114.

Specifications H0014

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<td>Divided into segments</td>
</tr>
<tr>
<td>Maximum segments</td>
<td>1000</td>
</tr>
<tr>
<td>Minimum segment size</td>
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<td>Segment Player</td>
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Serial Bus Analysis

I2C, SPI, CAN or LIN – in terms of interaction with the outside world for embedded systems, it is safe to say that these are the most commonly used communication protocols. The new HMO3000 series by HAMEG Instruments offers you hardware-accelerated signal triggering and decoding for all of these protocols. You can upgrade your instrument via software licence keys with these functions required to develop your application:

- H0010: Analysis of I2C, SPI and UART/RS-232 signals on analog and logic channels
- H0011: Analysis of I2C, SPI and UART/RS-232 signals on all analog channels
- H0012: Analysis of CAN and LIN signals on analog and logic channels

Serial Bus Trigger Types:
- I2C: Start, Stop, ACK, nACK, Address/Data
- SPI: Start, End, Serial Pattern (32Bit)
- UART/RS-232: Startbit, Frame Start, Symbol, Pattern
- LIN: Frame Start, Wake Up, Identifier, Data, Error
- CAN: Frame Start, Frame End, Identifier, Data, Error

Segment Player
Displays all recorded segments manually or automatically, all measurement functions including Pass/Fail can be used with recorded segments.

I2C bus ASCII and binary
SPI bus trigger setup
SPI bus decode on the analog channel
CAN bus configuration
CAN bus bus list index
CAN bus list display
PC bus ASCII and binary
HEX decoded CAN bus signal

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Segmented Memory Option

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### Technical Data

#### Connectors and Ports
- **USB-device/RS-232 dual-interface card**
- **USB-device/ethernet/USB (inluded in delivery)**
- **IEEE-488 (GPIB) interface**
- **HO740 interface: IEEE-488 (GPIB)**
- **HO730 Ethernet/USB dual-interface card, Line cord, printed operating manual, 2/4 probes (amount=number of channels), 10:1 with attenuation ID (HZ350 delivery)**
- **Accessories included:**
  - **HZ720 USB-device/RS-232 dual-interface card**
  - **HZ740 IEEE-488 (GPIB) interface card, galvanically isolated**
  - **HZ202 High voltage probe 1000V (400/300 MHz)**
  - **HZ255 500MHz passive probe 10:1 with automatic identification**
  - **HZ113 Accessories**
  - **HZ30 1GHz active probe (0.9 pF, 1 MΩ, including many accessories)**

**Recommended Accessories**

**HZ720**
- USB-device/RS-232 dual-interface card
- Printed operating manual and software (CD)

**HZ740**
- IEEE-488 (GPIB) interface card
- Galvanically isolated

**HZ202**
- High voltage probe 1000V (400/300 MHz)

**HZ255**
- 500MHz passive probe 10:1 with automatic identification

**HZ113**
- Accessories

**HZ30**
- 1GHz active probe (0.9 pF, 1 MΩ, including many accessories)

**HZ246**
- 4RU 19" rack mount kit

**HZ505**
- AC/DC current probe 30A, DC to 100MHz

**HZ501**
- AC/DC current probe 100/1000A, DC to 2MHz

**HZ15**
- Accessories

**HZ255DU**
- Upgrade from 2 x HZ250 to 2 x HZ255, only available when purchasing a HZO3000 (100MHz or 400MHz models).

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**Accessories**

- **HZ246**
- 4RU 19" rack mount kit
- **HZ505**
- AC/DC current probe 30A, DC to 100MHz
- **HZ501**
- AC/DC current probe 100/1000A, DC to 2MHz

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**Recommended Accessories**

**HZ255**
- 500MHz passive probe 10:1 with automatic identification

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