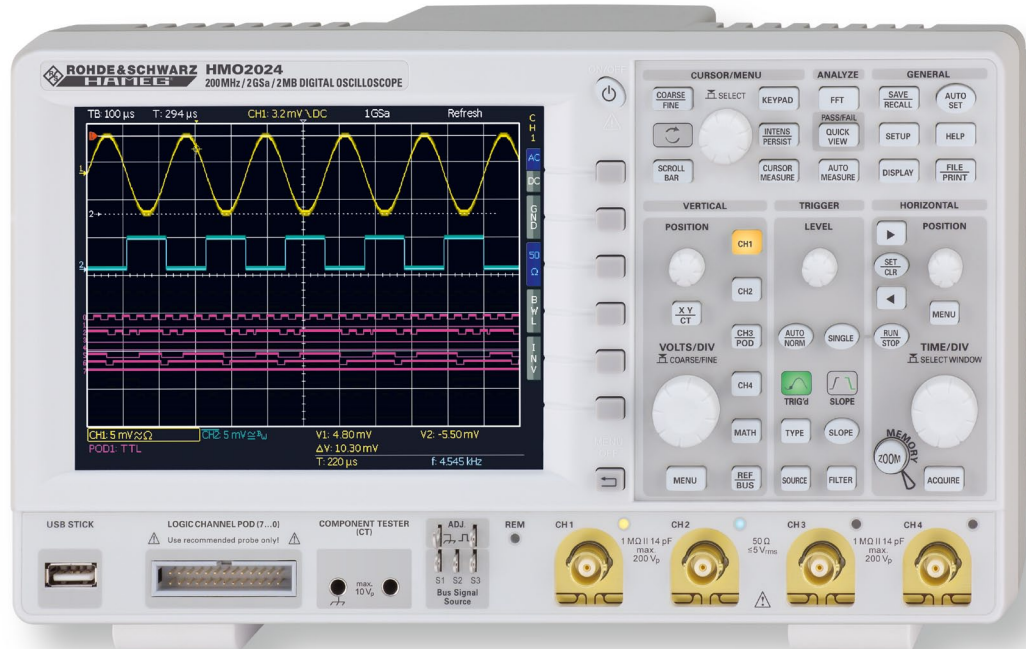


## 200MHz 2[4] Channel Digital Oscilloscope HMO2022 [HMO2024]



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 incl. List View. Options: I<sup>2</sup>C + SPI + UART/RS-232, CAN/LIN**
- ✓ **Automatic Search for User defined Events**
- ✓ **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**
- ✓ **Component Tester, 6 Digit Counter, Automeasurement: max. 6 Parameters incl. Statistic, Formula Editor, Ratiocursor, FFT: 64kPts**
- ✓ **Fan: Silence redefined**
- ✓ **3 x USB for Mass Storage, Printer and Remote Control**

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

Firmware: ≥4.522

All data valid at 23 °C after 30 minutes 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 traces:   |                               |
| 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)<br>[CH 1, CH 2, LCH 0...7, CH 4]<br>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...10V)/div.<br>100 MHz (1 mV, 2 mV)/div.                                        |
| Lower AC bandwidth:                | 2 Hz                                                                                          |
| Bandwidth limiter<br>[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....10V/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 [50 Ω switchable]                                                         |
| Coupling                           | DC, AC, GND                                                                                   |
| Max. input voltage                 | 200V (DC + peak AC), 50 Ω <5V <sub>rms</sub>                                                  |
| Measuring circuits:                | Measuring Category I (CAT I)                                                                  |
| Position range:                    | ±10 Divs                                                                                      |
| Offset control:                    |                                                                                               |
| 1 mV, 2 mV                         | ±0.2V - 10 div. x Sensitivity                                                                 |
| 5...50 mV                          | ±1V - 10 div. x Sensitivity                                                                   |
| 100 mV                             | ±2.5V - 10 div. x Sensitivity                                                                 |
| 200 mV...2V                        | ±40V - 10 div. x Sensitivity                                                                  |
| 5V...10V                           | ±100V - 10 div. x Sensitivity                                                                 |
| Logic Channels:                    | With Option HO3508                                                                            |
| Select. switching<br>thresholds    | TTL, CMOS, ECL, User -2...+8V                                                                 |
| Impedance                          | 100 kΩ    <4 pF                                                                               |
| Coupling                           | DC                                                                                            |
| Max. input voltage:                | 40V (DC + peak AC)                                                                            |

### Triggering

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Analog Channels:             |                                                                                                               |
| Automatic:                   | Linking of peak detection and trigger level                                                                   |
| 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/Buses optional                                                                       |
| Slope:                       | Rising, falling, both                                                                                         |
| Sources                      | CH 1, CH 2, Line, Ext., LCH 0...7<br>[CH 1...CH 4, Line, Ext., LCH 0...7]                                     |
| Coupling<br>(Analog Channel) | AC: 5 Hz...250 MHz<br>DC: 0...250 MHz<br>HF: 30 kHz...250 MHz<br>LF: 0...5 kHz<br>Noise rejection: selectable |
| Video:                       |                                                                                                               |
| Standards                    | PAL, NTSC, SECAM, PAL-M, SDTV 576i,<br>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, CH 1, CH 2 [CH 1...CH 4]                                       |
| State                         | LCH 0...7 X, H, L                                                         |
| Duration                      | 8 ns...2.147 s, resolution 8 ns                                           |
| Pulses:                       | Positive, negative                                                        |
| Modes                         | equal, unequal, less than, greater than,<br>within/without a range        |
| Range                         | Min. 32 ns, max. 17.179 s, resolution min. 1 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>                                  |
| 2 <sup>nd</sup> Trigger:      |                                                                           |
| Slope                         | Rising, falling, both                                                     |
| 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.                                                            |
| Operating modes               |                                                                           |
| after time                    | 32 ns...17.179 s, resolution 8 ns                                         |
| after incidence               | 1...2 <sup>16</sup>                                                       |
| Serial Buses:                 |                                                                           |
| Option H0010                  | I <sup>2</sup> C/SPI/UART/RS-232 on Logic Channels<br>and Analog Channels |
| Option H0011                  | I <sup>2</sup> C/SPI/UART/RS-232 on Analog Channels                       |
| Option H0012                  | CAN/LIN on Logic Channels and Analog<br>Channels                          |

### 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<br>[4 x 1 GSa/s, 2 x 2 GSa/s]<br>Logic Channels: 8 x 1 GSa/s |
| Memory:                    | 2 x 1 MPts, 1 x 2 MPts<br>[4 x 1 MPts, 2 x 2 MPts]                                    |
| Operation modes:           | Refresh, Average, Envelope, Peak-Detect<br>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 2,000 waveforms/s                                                               |
| Display:                   | Dots, vectors, 'persistence'                                                          |
| Reference memories:        | typ. 10 Traces                                                                        |

### Operation/Measuring/Interfaces

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operation:             | Menu-driven (multilingual), Autoset,<br>help functions (multilingual)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Save/Recall memories:  | typ. 10 complete instrument parameter<br>settings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Frequency counter:     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 0.5 Hz...250 MHz       | 6 Digit resolution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Accuracy               | 50 ppm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Auto measurements:     | Amplitude, standard deviation,<br>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> ,<br>frequency, period, pulse count,<br>t <sub>width+</sub> , t <sub>width-</sub> , t <sub>dutycycle+</sub> , t <sub>dutycycle-</sub> ,<br>t <sub>Rise10_90</sub> , t <sub>Fall10_90</sub> , t <sub>Rise20_80</sub> , t <sub>Fall20_80</sub> ,<br>pos. edge count, neg. edge count,<br>pos. pulse count, neg. pulse count,<br>trigger frequency, trigger period,<br>phase, delay |
| Measurement statistic: | Min., max., mean, standard deviation,<br>number of measurements for up to<br>6 Functions                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Cursor measurements:   | ΔV, Δt, 1/Δt (f), V to Gnd, Vt related to<br>Trigger point, ratio X and Y, pulse count,<br>peak to peak, peak+, peak-, mean value,<br>RMS value, standard deviation                                                                                                                                                                                                                                                                                                                                                                                 |
| Search functions:      | Search- and Navigation functions for<br>specific signal parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Interface:             | Dual-Interface USB type B/RS-232 (HO720),<br>2 x USB type A (front- and rear side<br>each 1 x) max. 100 mA,<br>DVI-D for ext. Monitor                                                                                                                                                                                                                                                                                                                                                                                                               |
| Optional:              | IEEE-488 (GPIB) (HO740),<br>Dual-Interface Ethernet/USB (HO730)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Display functions |                                                                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Marker:           | up to 8 user definable marker for easy navigation; automatic marker using search criteria                                                                                           |
| 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; Table view of the decoded data |

| 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, Low-, 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:          | 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     |                                                             |
|-------------------------|-------------------------------------------------------------|
| Component tester:       |                                                             |
| Test voltage:           | 10 V <sub>P</sub> (open) typ.                               |
| Test current:           | 10 mA <sub>P</sub> (short) typ.                             |
| Test frequency:         | 50 Hz/200 Hz typ.                                           |
| Reference Potential:    | Ground (safety earth)                                       |
| Probe ADJ Output:       | 1 kHz/1 MHz square wave signal ~1V <sub>pp</sub> (ta <4 ns) |
| Bus Signal Source:      | SPI, I <sup>2</sup> C, UART, Parallel (4 Bit)               |
| Internal RTC            |                                                             |
| (Realtime clock):       | Date and time for stored data                               |
| Line voltage:           | 100...240 V, 50...60 Hz, CAT II                             |
| Power consumption:      | Max. 45 W, typ. 25 W [max. 55 W, typ. 35 W]                 |
| Protective system:      | Safety class I (EN61010-1)                                  |
| Operating temperature:  | +5...+40 °C                                                 |
| Storage temperature:    | -20...+70 °C                                                |
| Rel. humidity:          | 5...80 % (non condensing)                                   |
| Theft protection:       | Kensington Lock                                             |
| Dimensions (W x H x D): | 285 x 175 x 140 mm                                          |
| Weight:                 | <2.5 kg                                                     |

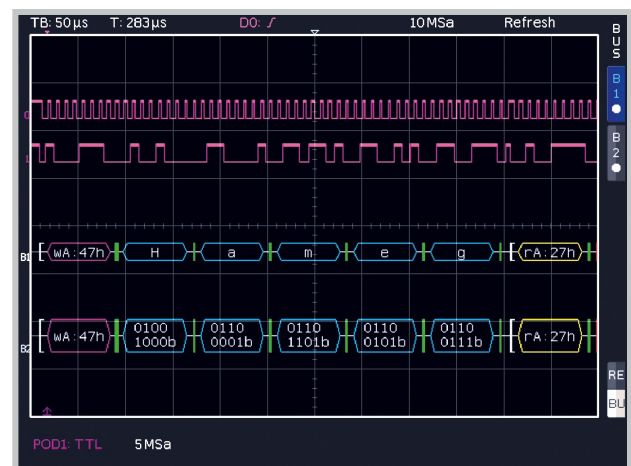
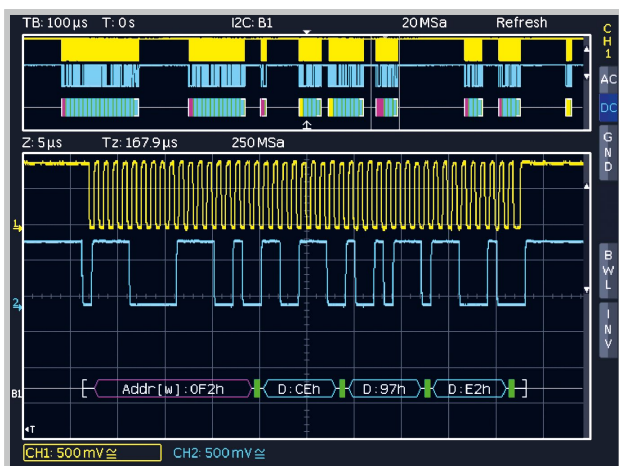
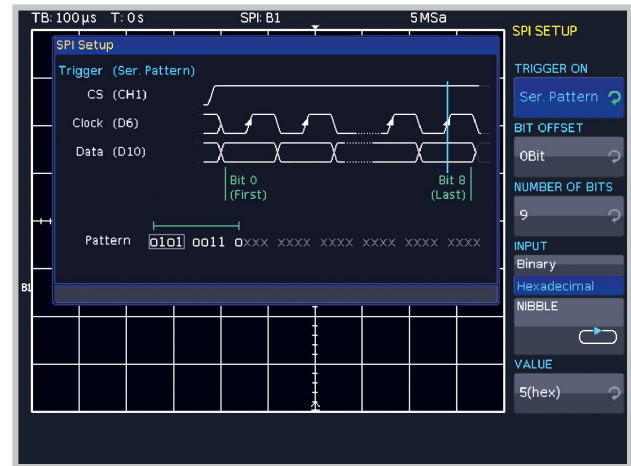
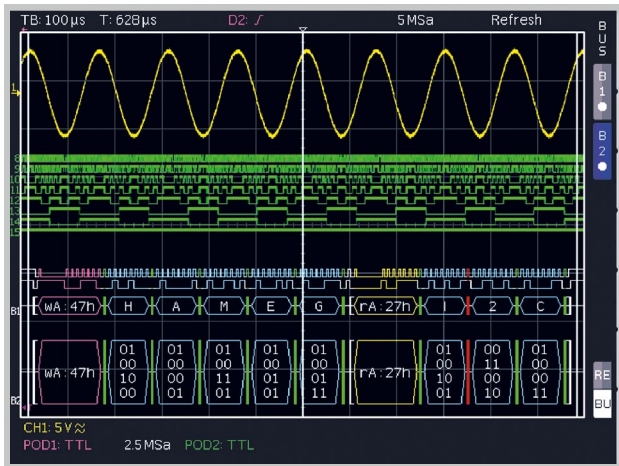
**Accessories supplied:** Line cord, Operating manual, 2 [4] Probes, 10:1 with attenuation ID (HZO10), CD, Software

**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                    |
| H0012  | Serial bus trigger and hardware accelerated decode, CAN, LIN on Logic Channels and 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 1,000:1 (400 MHz, 1,000V <sub>rms</sub> )                                                                 |
| HZ030  | Active probe 1 GHz (0.9 pF, 1 MΩ, including many accessories)                                                                |
| HZ040  | Active differential Probe 200 MHz (10:1, 3.5 pF, 1 MΩ)                                                                       |
| HZ041  | Active differential Probe 800 MHz (10:1, 1 pF, 200 kΩ)                                                                       |
| HZ050  | AC/DC Current probe 30 A, DC...100 kHz                                                                                       |
| HZ051  | AC/DC Current probe 100/1,000 A, DC...20 kHz                                                                                 |

## H0010/H0011 Serial Bus

for all Oscilloscopes of the HMO Series



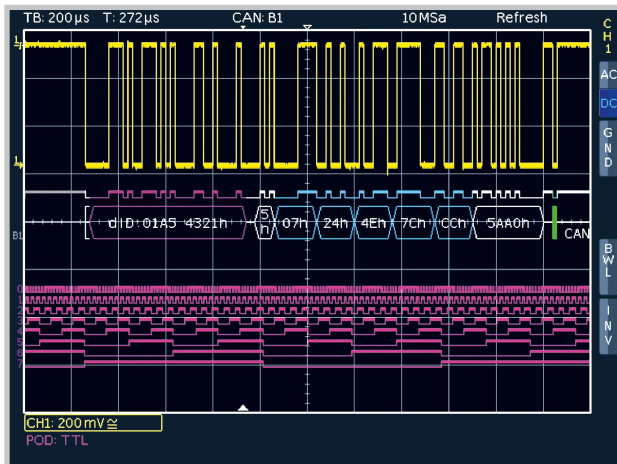
- ✓ H0010 via Analog Channels and/or Logic Channels, H0011 via Analog Channels
- ✓ I2C, SPI, UART/RS-232 Bus Trigger and Decode
- ✓ Hardware accelerated Decode in Real Time
- ✓ Color Coded Display of the Content for intuitive Analysis and easy Overview
- ✓ More Details of the decoded Values become visible with increasing Zoom Factor
- ✓ Bus Display with synchronous Display of the Data and, if selected, Clock Signal
- ✓ Decode into ASCII, Binary, Hexadecimal or Decimal Format
- ✓ Up to four Lines to comfortably show the decoded Values
- ✓ Powerful Trigger to isolate specific Messages
- ✓ Option for all Oscilloscopes of the HMO Series, retrofittable

| H0010/H0011 I <sup>2</sup> C, SPI, UART/RS-232 Bus Analysis |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                         |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I <sup>2</sup> C Bus                                        |                                                                                                                                                                                                                                                                                                    | SPI Bus                                                                                                                                                                                                                             | UART/RS-232 Bus                                                                                                                                                                                                         |
| <b>Bus Configuration</b>                                    |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                         |
| <b>Bit/Baud rate</b>                                        | up to 10 Mbit/s (HMO352x/2524),<br>up to 5 Mbit/s (HMO72x...202x)                                                                                                                                                                                                                                  | up to 25 Mbit/s (HMO352x/2524),<br>up to 12.5 Mbit/s (HMO72x...202x)                                                                                                                                                                | 300, 600, 1,200, 2,400, 4,800, 9,600,<br>19,200, 38,400, 57,600, 115,200 Baud,<br>up to 62.5 Mbit/s (HMO352x/2524),<br>up to 31 Mbit/s (HMO72x...202x)                                                                  |
| <b>Number of Bit's</b>                                      | 7 or 10 Bit for Address ID<br>8 Bit for Data                                                                                                                                                                                                                                                       | 32 Bit for Data                                                                                                                                                                                                                     | 8 Bit for Data<br>1, 1.5, 2 Bit for Stop Bit                                                                                                                                                                            |
| <b>Polarity</b>                                             | n/a                                                                                                                                                                                                                                                                                                | Chip Select, positive or negative,<br>or without Chip Select (2-wire SPI)<br>Clock rising or falling edge<br>Data High or Low active                                                                                                | High or Low active                                                                                                                                                                                                      |
| <b>Parity</b>                                               | n/a                                                                                                                                                                                                                                                                                                | n/a                                                                                                                                                                                                                                 | none, odd or even                                                                                                                                                                                                       |
| <b>Trigger</b>                                              |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                         |
| <b>Source</b>                                               | H0010:<br>digital Channels LCH 0...15 [Opt. H03508]<br>analog Channels CH 1...2 [CH 1...4]<br>H0011:<br>analog Channels CH 1...2 [CH 1...4]                                                                                                                                                        | H0010:<br>digital Channels LCH 0...15 [Opt. H03508]<br>analog Channels CH 1...2, external<br>Trigger Entry for Chip Select, [CH 1...4]<br>H0011:<br>analog Channels CH 1...2, external<br>Trigger Entry for Chip Select, [CH 1...4] | H0010:<br>digital Channels LCH 0...15 [Opt. H03508]<br>analog Channels CH 1...2 [CH 1...4]<br>H0011:<br>analog Channels CH 1...2 [CH 1...4]                                                                             |
| <b>Event</b>                                                | 7 or 10 Bit Address ID<br>7 or 10 Bit Address ID with 8 Bit Data<br>Start, Stop, Restart<br>missing Acknowledge<br>Address ID without Acknowledge                                                                                                                                                  | Data packets up to 32 Bit<br>with positive or negative Chip Select<br>or without Chip Select,<br>(2-wire SPI)                                                                                                                       | Data packets up to 8 Bit                                                                                                                                                                                                |
| <b>Input format</b>                                         | Hexadecimal or Binary                                                                                                                                                                                                                                                                              | Hexadecimal or Binary                                                                                                                                                                                                               | Hexadecimal or Binary                                                                                                                                                                                                   |
| <b>Hardware accelerated Decode</b>                          |                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                         |
| <b>Source</b>                                               | H0010:<br>digital Channels LCH 0...15 [Opt. H03508]<br>analog Channels CH 1...2 [CH 1...4]<br>H0011:<br>analog Channels CH 1...2 [CH 1...4]                                                                                                                                                        | H0010:<br>digital Channels LCH 0...15 [Opt. H03508]<br>analog Channels CH 1...2, external<br>Trigger Entry for Chip Select, [CH 1...4]<br>H0011:<br>analog Channels CH 1...2, external<br>Trigger Entry for Chip Select, [CH 1...4] | H0010:<br>digital Channels LCH 0...15 [Opt. H03508]<br>analog Channels CH 1...2 [CH 1...4]<br>H0011:<br>analog Channels CH 1...2 [CH 1...4]                                                                             |
| <b>Display</b>                                              | Bus display, color coded for<br><br>Read Address ID: Yellow<br>Write Address ID: Magenta<br>Data: Cyan<br>Start: White<br>Stop: White<br>ACK/NACK: Green/Red<br>Error: Red<br>Trigger Condition: Green<br><br><b>up to four lines for decoded values,<br/>synchronous display of the Bit lines</b> | Bus display, color coded for<br><br>Data: Cyan<br>Start: White<br>Stop: White<br><br>Error: Red<br>Trigger Condition: Green<br><br><b>up to four lines for decoded values,<br/>synchronous display of the Bit lines</b>             | Bus display, color coded for<br><br>Data: Cyan<br>Start: White<br>Stop: White<br><br>Error: Red<br>Trigger Condition: Green<br><br><b>up to four lines for decoded values,<br/>synchronous display of the Bit lines</b> |
| <b>Format</b>                                               | Address ID: hexadecimal<br>Data: ASCII, binary, decimal,<br>hexadecimal                                                                                                                                                                                                                            | n/a<br>Data: ASCII, binary, decimal,<br>hexadecimal                                                                                                                                                                                 | n/a<br>Data: ASCII, binary, decimal,<br>hexadecimal                                                                                                                                                                     |

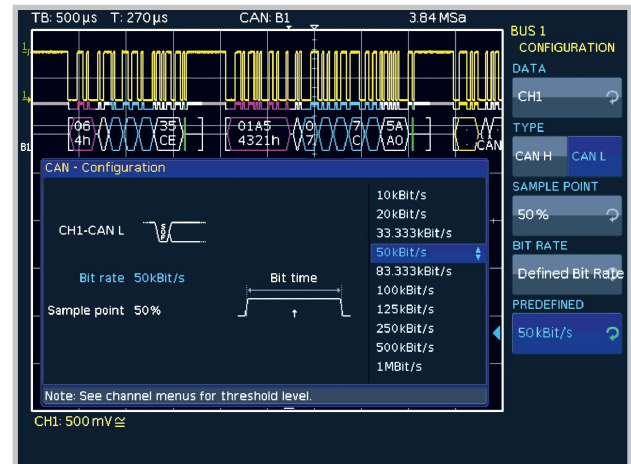
| Differences H0010/H0011                                                     |       |       |
|-----------------------------------------------------------------------------|-------|-------|
| Feature                                                                     | H0010 | H0011 |
| Logic Channels (LCH 0...LCH 15) as source for serial bus trigger and decode | x     | -     |
| Analog Channels (CH 1...CH 4) as source for serial bus trigger and decode   | x     | x     |
| Time synchronous decode of two serial busses                                | x     | -     |

## H0012 CAN/LIN Bus Analysis

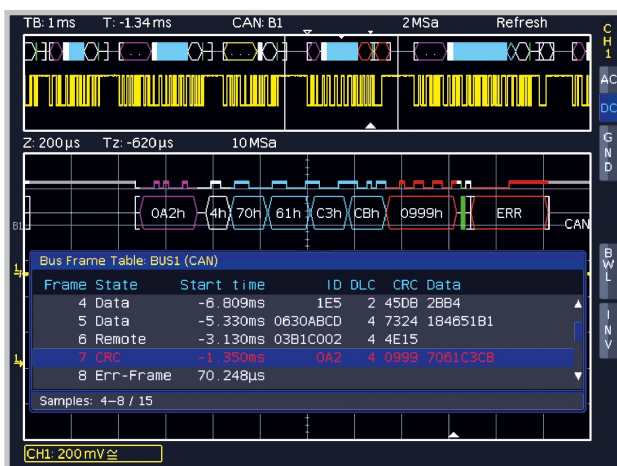
for all Oscilloscopes of the HMO Series



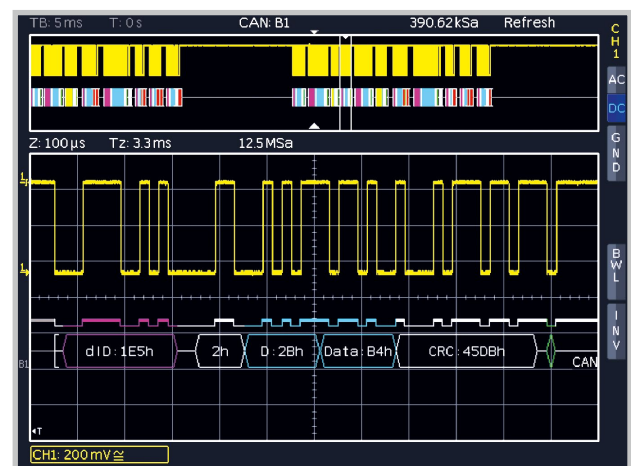
Mixed Signal and Bus Display



CAN Bus Configuration



CAN Bus List display



CAN Bus HEX

- ✓ CAN, LIN Bus Trigger and Decode
- ✓ Hardware accelerated Decode in Real Time
- ✓ 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 and List Display with synchronous Display of the Data
- ✓ Decode into ASCII, Binary, Hexadecimal or Decimal Format
- ✓ Up to four Lines to show the decoded Values
- ✓ Powerful Trigger to isolate specific Messages
- ✓ Option for all Oscilloscopes of the HMO Series, retrofittable

## H0012 CAN/LIN Bus Analysis

| CAN Bus                            |                                                                                                                                                                                                                                                                                                                                                                                                         | LIN Bus                                                                                                                                                                                                                                                                                                                     |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bus Configuration</b>           |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                             |
| <b>Bit rates</b>                   | Pre-Defined or User-Select,<br>100 Bit/s...4 Mb/s (HM0352x/2524),<br>100 Bit/s...2 Mb/s (HM072x...202x)                                                                                                                                                                                                                                                                                                 | Pre-Defined or User-Select,<br>100 Bit/s...4 Mb/s (HM0352x/2524),<br>100 Bit/s...2 Mb/s (HM072x...202x)                                                                                                                                                                                                                     |
| <b>Signal Type</b>                 | CAN-L or CAN-H, Single Ended or Differential Probe<br>(Analog Channels only)                                                                                                                                                                                                                                                                                                                            | n/a                                                                                                                                                                                                                                                                                                                         |
| <b>Sample Point Range</b>          | 25...90%                                                                                                                                                                                                                                                                                                                                                                                                | n/a                                                                                                                                                                                                                                                                                                                         |
| <b>Threshold</b>                   | Pre-Defined or User-Select                                                                                                                                                                                                                                                                                                                                                                              | Pre-Defined or User-Select                                                                                                                                                                                                                                                                                                  |
| <b>Polarity</b>                    | n/a                                                                                                                                                                                                                                                                                                                                                                                                     | High or Low Active                                                                                                                                                                                                                                                                                                          |
| <b>Protocol Version</b>            | n/a                                                                                                                                                                                                                                                                                                                                                                                                     | 1.x, 2.x, J2602, 1.x or 2.x                                                                                                                                                                                                                                                                                                 |
| <b>Trigger</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                             |
| <b>Source</b>                      | digital Channel LCH 0...15 [Opt. H03508],<br>analog Channel CH 1...2 [CH 1...4]                                                                                                                                                                                                                                                                                                                         | digital Channel LCH 0...15 [Opt. H03508],<br>analog Channel CH 1...2 [CH 1...4]                                                                                                                                                                                                                                             |
| <b>Event</b>                       | Start of Frame (SOF),<br>End of Frame (EOF)<br>Error Frame<br>Error condition:<br>Stuff Bit Error, CRC Error,<br>Not Acknowledge, Form Error<br>Overload Frame<br>Data Frame (11 or 29 Bit ID)<br>Remote Frame (11 or 29 Bit ID)<br>Identifier:<br>0, 1, X (Don't Care) Pattern,<br>Trigger when =, ≠, <, ><br>Identifier and Data:<br>ID and 64 Bit data pattern (0, 1, X),<br>trigger when =, ≠, <, > | Start of Frame (SOF),<br>Wake Up Frame<br>Error Frame<br>Error condition:<br>Checksum Error, Parity Error<br>Synchronisation Error<br>Identifier:<br>0, 1, X (Don't Care) Pattern,<br>Trigger when =, ≠, <, ><br>Identifier and Data:<br>ID and 64 Bit data pattern (0, 1, X),<br>trigger when =, ≠, <, >                   |
| <b>Input format</b>                | Hexadecimal or Binary                                                                                                                                                                                                                                                                                                                                                                                   | Hexadecimal or Binary                                                                                                                                                                                                                                                                                                       |
| <b>Hardware accelerated Decode</b> |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                             |
| <b>Source</b>                      | digital Channel LCH 0...15 [Opt. H03508],<br>analog Channel CH 1...2 [CH 1...4]                                                                                                                                                                                                                                                                                                                         | digital Channel LCH 0...15 [Opt. H03508],<br>analog Channel CH 1...2 [CH 1...4]                                                                                                                                                                                                                                             |
| <b>Display Bus</b>                 | <b>color coded for</b><br><br>Start and End of Frame: White brackets<br>Data ID: Magenta,<br>Remote ID: Yellow<br>DLC: White,<br>Data: Cyan,<br>CRC: White<br>ACK: Green,<br>Overload: White,<br>Error: Red<br><br><b>up to four lines for decoded values,<br/>synchronous display of the Bit lines</b>                                                                                                 | <b>color coded for</b><br><br>Start and End of Frame: White brackets<br>Break: Magenta,<br>Synchronisation: White<br>Identifier: Yellow,<br>Parity: Green,<br>Data: Cyan<br>Checksum: White,<br>Error: Red,<br>Wake Up: Magenta<br><br><b>up to four lines for decoded values,<br/>synchronous display of the Bit lines</b> |
| <b>Table</b>                       | <b>Display of Bus 0 or 1</b><br><br>Frame Number<br>State (Frame Type or Error Description)<br>Start Time,<br>Identifier,<br>DLC,<br>CRC,<br>Data                                                                                                                                                                                                                                                       | <b>Display of Bus 0 or 1</b><br><br>Frame Number<br>State (Frame Type or Error Description)<br>Start Time,<br>Identifier,<br>Length,<br>Checksum,<br>Data                                                                                                                                                                   |
| <b>Format</b>                      | Identifier & other: hexadecimal<br>Data: ASCII, binary, decimal, hexadecimal                                                                                                                                                                                                                                                                                                                            | Identifier & other: hexadecimal<br>Data & Checksum: ASCII, binary, decimal, hexadecimal                                                                                                                                                                                                                                     |