Great Value in Test & Measurement

HAMEG Instruments – committed to medium sized companies

HAMEG Instruments GmbH prides itself on over 50 years of a successful company history. Since the company’s foundation in 1957, the name HAMEG stands for innovation, user friendliness, longevity, high quality of workmanship, and especially an excellent price/performance ratio. An independent company, a member of the Rohde & Schwarz Group since April 2005, HAMEG is located at Mainhausen near Frankfurt, Germany and develops and distributes its electronic measuring instruments via a global network of competent service and sales partners in more than 60 countries.

HAMEG customers come from industry, small businesses, science, schools and universities, service and last but not least, due to the good price/performance ratio, from the ambitioned hobbyists. Numerous generations of professional engineers, technicians and craftsmen used HAMEG Instruments during their basic training and also in advanced applications of measurement technology.

The enduring success of the HAMEG Instruments is based upon the principles of Sensitivity, Accuracy, Quality and, finally, Simplicity. The company’s philosophy is to design electronic measuring instruments which not only guarantee excellent performance and reliability but also offer the greatest possible flexibility, which is of equal importance in every day laboratory, test and production applications. HAMEG measuring instruments concentrate on the essentials. The operation of the instruments is intentionally kept as simple as possible while retaining important functions.

All HAMEG Instruments conform to a standard width, so stacks of several instruments are possible. Due to this feature and the compact sizes they require little space in the working area.
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Oscilloscopes

Spectrum Analysis

Power Supplies

Programmable Measuring Instruments Series 8100

Modular System Series 8000

Options

Accessories

Specifications
Without doubt, the oscilloscope is the most important measuring instrument for the characterization of signals in the time domain. HAMEG Instruments offers the most comprehensive portfolio for the diverse areas of application in industry, handcraft, science, education, training, and service as well as the private sector. In addition to our innovative DSO’s (Digital Storage Oscilloscopes) and MSO’s (Mixed Signal Oscilloscopes) the purely Analog Oscilloscope HM400 with the classical CRT (Cathode Ray Tube) are for the customers choice.

The demand for purely analog instruments has been diminishing for some time because DSO’s offer a host of advantages such as documentation, the ability to extensively analyze data, a compact package etc. MSO’s (Mixed-Signal Oscilloscopes) additionally allow the simultaneous display of analog and digital signals on several channels.

Modern electronic gear, as a rule, contains micro-processors, FPGA’s, serial interfaces such as I²C, SPI or UART. The HM0 series oscilloscopes, with the available options, feature triggering and decoding of these bus protocols in real time, which is very helpful and time-saving for debugging during the design phase. Modern semiconductor technologies generate signals with rise times of a few ns and thus demand higher bandwidths and sampling rates in order to minimize the measurement errors. The high sampling rate requires a deeper memory in order to acquire a given time window. HAMEG Instruments always offers a well balanced set of these three specifications in order to display a correct measurement result even in critical cases. Last but not least our experience of 50 plus years in oscilloscope technology stands for first-class trigger performance, extraordinary sensitivity, low-noise A/D converters, unexcelled longevity, and an excellent price/performance ratio.
HM03522 [HM03524]

- 4GSa/s Real Time, 50GSa/s Random Sampling, Low Noise Flash A/D Converter (Reference Class)
- 4MPts Memory, Memory Zoom up to 100,000:1
- MSO [Mixed Signal Opt. H03508 [H03516]] with 8 [16] 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
- 6 Digit Counter, Automeasurement, Formula Editor, Ratio Cursor, 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

See page 70 for technical specifications or www.hameg.com/HM03522 [www.hameg.com/HM03524]
250MHz 4 Channel Digital Oscilloscope
HMO2524

- 2.5GSa/s Real Time, 25GSa/s Random Sampling, Low Noise Flash A/D Converter (Reference Class)
- 4MPts Memory, Memory Zoom up to 100,000:1
- MSO [Mixed Signal Opt. H03508 [H03516]] with 8 [16] 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
- 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

See page 69 for technical specifications or www.hameg.com/HMO2524
150MHz/200MHz 2[4] Channel Digital Oscilloscope
HM01522 [HM01524]/HM02022 [HM02024]

- 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

See page 65 for technical specifications or www.hameg.com/HM01522 [www.hameg.com/HM01524]
See page 67 for technical specifications or www.hameg.com/HM02022 [www.hameg.com/HM02024]
70MHz/100MHz 2[4] Channel Digital Oscilloscope
HM0722 [HM0724]/HM01022 [HM01024]

- 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.
- 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

See page 62 for technical specifications or www.hameg.com/HM0722 [www.hameg.com/HM0724]
See page 64 for technical specifications or www.hameg.com/HM01022 [www.hameg.com/HM01024]
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 become visible with increasing Zoom Factor
- Bus Display with synchronous Display of the Data and maybe 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

See page 89 for technical specifications or www.hameg.com/H0010
40MHz Analog Oscilloscope
HM400

- Reference-Class in Sensitivity and Input Voltage Range
- 2 Channels with Deflection Coefficients 1mV/div....20V/div., variable up to 50V/div.
- Time Base 100ns/div....0.2s/div., with X Magnification to 10ns/div.
- Low Noise Measuring Amplifiers with high Pulse Fidelity and minimum Overshoot
- Peak to Peak Trigger for stable Triggering 0...50MHz at 0.5div. Signal Level (up to 80MHz at 1div.)
- Autoset, Save/Recall Memories for 6 Instrument Settings
- Yt- and XY-Mode with Z-Input for Intensity Modulation
- Component Characterisation with Component Tester (two Terminal Network Measurement)
- Low Power Consumption, no Fan

See page 62 for technical specifications or www.hameg.com/HM400
Oscilloscopes

Spectrum Analysis

Power Supplies

Programmable Measuring Instruments
Series 8100

Modular System Series 8000

Options

Accessories

Specifications
With the introduction of the modern HMS series spectrum analyzers, HAMEG started a change of paradigms in the design lab. Until a short time ago, this measurement technology was unaffordable for most users. HAMEG Instruments puts an end to this exclusivity by offering the HMS series – according to its tradition of delivering high performance measurement technology at a fair price. During the design, a practically oriented concept of instrument operation took highest priority so that the user can forget about the complex theory behind spectrum analysis. The increasing wide-spread use of wireless applications as well as the requirement for minimizing electromagnetic emissions from high performance digital systems caused a change of approach in design labs and test sites. While signal analysis in the time domain is well established, spectrum analysis is now starting to find its place on the lab bench.

The scope of applications of a spectrum analyzer in R & D, test sites, service and EMI testing is wide. Spectrum analyzers can display signals up into the GHz range. By employing the superhet receiver principle and using logarithmic signal processing and a logarithmically scaled display, their sensitivity exceeds that of oscilloscopes by more than 3 orders of magnitude and the dynamic range is markedly larger (>80 dB).

Caution – the sensitive measuring input is 50 ohms and easily destroyed! (Observe the maximum input power whenever measuring higher power signals!) It is hence recommended, whenever analysing unknown signals, to provide protective measures, e.g. to insert an attenuator of sufficient power rating at the input. When measuring signals with spectrum analyzers in the frequency domain, the phase information is lost, but in many practical applications this information is not required.

Spectrum analysis with HAMEG spectrum analyzers features a frequency range of up to 3GHz and a large dynamic range; for transmission measurements instruments with a tracking generator are available which are easy to operate. Integrated interfaces for fast data communication with an external pc including free software for EMI pre-compliance test measurement functions, as well as the availability of a vast range of optional accessories (e.g. near-field probes for diverse measurements) promote HAMEG spectrum analyzers to be the „ideal partners“ for a variety of applications including EMI tests and measurements on wireless systems such as UMTS, GSM, TETRA, DBV-T, Bluetooth, WLAN etc, ...
1GHz [3GHz] Spectrum Analyzer
HMS1000 [HMS3000]

- Frequency Range 100kHz...1GHz [3GHz]
- Tracking Generator HMS1010 [HMS3010] -20...0dBm
- Amplitude Measurement Range -114...+20dBm
- DANL -135dBm with Preamp. Option HO3011
- Sweep Time 20ms...1000s
- Resolution Bandwidth 100Hz...1MHz in 1–3 Steps,
  200kHz (-3dB); additional 200Hz, 9kHz, 120kHz, 1MHz (-6dB)
- Spectral Purity <-100dBc/Hz (@100kHz)
- Video Bandwidth 10Hz...1MHz in 1–3 Steps
- Integrated AM and FM Demodulators (Phone and int. Speaker)
- Detectors: Auto-, Min-, Max-Peak, Sample, RMS, Quasi-Peak
- 8 Markers with Delta Marker, miscellaneous Peak Functions
- Crisp 16.5cm (6.5”) TFT VGA Display, DVI Output
- 3 x USB for Mass-Storage, Printer and Remote Control
  optional IEEE-488 (GPIB) or Ethernet/USB Interface

See page 73 for technical specifications or www.hameg.com/HMS1010 [www.hameg.com/HMS3010]
1GHz Spectrum Analyzer
HMS1000E

- Frequency Range 100kHz...1GHz
- Amplitude Measurement Range -104...+20 dBm
- Sweep Time 20ms...1000s
- Resolution Bandwidth 10kHz...1MHz in 1–3 Steps, 200kHz (-3dB)
- Spectral Purity <-100dBc/Hz (@100kHz)
- Video Bandwidth 1kHz...1MHz in 1–3 Steps
- Integrated AM and FM Demodulator (Phone and int. Speaker)
- Detectors: Auto-, Min-, Max-Peak, Sample, RMS
- 8 Marker with Delta Marker, miscellaneous Peak Functions
- Crisp 16.5cm (6.5”) TFT VGA Display
- 3 x USB for Mass-Storage, Printer and Remote Control, optional IEEE-488 (GPIB) or Ethernet/USB Interface

See page 72 for technical specifications or www.hameg.com/HMS1000E
Pre-Compliance Software (HM Explorer)

- Screenshot of the free Pre-Compliance EMI PC Software (not available for HMS1000E)
Line Impedance Stabilization Network
HM6050-2

- Measurement of Line-conducted Interference within the Range from 9kHz...30MHz (CISPR 16)
- Selectable Transient Limiter
- Artificial Hand Connector

Technical Specifications at 23°C ±2°C

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>9kHz...30MHz</td>
</tr>
<tr>
<td>Impedance Characteristics</td>
<td>( Z = 500 \parallel (50,\mu H + 5,\Omega) ), Error &lt;20% under terms of VDE 876T1</td>
</tr>
<tr>
<td>Max. Current</td>
<td>16A</td>
</tr>
<tr>
<td>Line Voltage/Frequency</td>
<td>230V/50...60Hz, CAT II</td>
</tr>
<tr>
<td>Artificial Hand</td>
<td>220pF + 511Ω</td>
</tr>
<tr>
<td>PE (selectable)</td>
<td>50,\mu H</td>
</tr>
</tbody>
</table>

Transient Limiter

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>150kHz...30MHz</td>
</tr>
<tr>
<td>Transmission Loss</td>
<td>10dB [+1.5/-0.5dB]</td>
</tr>
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</table>

Connectors

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Output</td>
<td>50Ω BNC</td>
</tr>
<tr>
<td>Power Supply Socket for DUT</td>
<td>Standard German (UK, US) wall outlets</td>
</tr>
<tr>
<td>Artificial Hand</td>
<td>4mm banana socket</td>
</tr>
<tr>
<td>Line Cord</td>
<td>fixed</td>
</tr>
</tbody>
</table>

Miscellaneous

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>10…40°C</td>
</tr>
<tr>
<td>Power Supply</td>
<td>HM6050-2D [DE Version] 230V ±10%, 50…60Hz</td>
</tr>
<tr>
<td></td>
<td>HM6050-2K [UK Version] 230V ±10%, 50…60Hz</td>
</tr>
<tr>
<td></td>
<td>HM6050-2S [US Version] 115V ±10%, 50…60Hz</td>
</tr>
<tr>
<td>Safety Class</td>
<td>Safety class I (IEC1010-1/VDE 0411)</td>
</tr>
<tr>
<td>Dimensions and Weight</td>
<td>285 x 125 x 380mm (W x H x D), approx. 6kg</td>
</tr>
</tbody>
</table>

Spectrum Analysis/Accessories
HZ540 and HZ550 EMI-Near Field Probe Sets

The HZ540/550 are the ideal toolkits for the investigation of RF electromagnetic fields. They are indispensable for EMI pre-compliance testing during product development, prior to third party testing. The sets include 3 or 5 hand-held probes with built-in pre-amplifier covering the frequency range from <1MHz to approx. 3000MHz.

The probes of the basic set HZ540 include one magnetic field probe, one electric field probe, and a high impedance probe. In addition to the HZ550 features an optional μ-magnetic field probe and an antenna. All probe outputs are matched to the 500 inputs of spectrum analyzers or RF-receivers.

HZ540 and HZ550 EMV Near-Field Probe Set up to 3GHz

HZ540 = HZ540 (without HZ553) + HZ555 Low Capacitance Probe
HZ550L = HZ550 (without HZ553) + HZ555 Low Capacitance Probe

HZ540 consists of:
1 HZ540 Basic Set
1 HZ554 Magnetic Field Probe
1 HZ555 High Impedance Probe
1 SMA to N-Cable 1.2m
1 Case
1 Manual

HZ550 consists of:
1 HZ540 Basic Set
1 HZ554 Magnetic Field Probe
1 HZ555 Active antenna
1 SMA to N-Cable 1.2m
HZ530 EMV Near-Field Probe Set up to 1 GHz

Technical specifications at 23°C ±2°C

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>100kHz...1GHz</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>6Vdc from Spectrum</td>
</tr>
<tr>
<td></td>
<td>Analyzer or batteries, 4 x Mignon/AA, not included</td>
</tr>
<tr>
<td>Supply Current</td>
<td>approx. 10...24mA dc</td>
</tr>
<tr>
<td>Probe Dimensions</td>
<td>40 x 90 x 195mm (W x H x D)</td>
</tr>
<tr>
<td>Cases</td>
<td>plastic, internal electrical shielding</td>
</tr>
<tr>
<td>Set includes</td>
<td>1 E-field probe, 1 H-field probe, 1 high-impedance probe, 1 BNC cable 1.5m, 1 power cable, Operator’s Manual, Robust carrying case</td>
</tr>
</tbody>
</table>

The HZ530 Probe Set consists of three active broadband probes for EMI diagnosis. The probes are designed for connection to a HAMEG spectrum analyzer with input impedance of 50Ω. The probes can be powered by the spectrum analyzer or batteries. The slim format ensures easy access to the test object even in cramped test environments.

The H-field probe provides a signal that is proportional to the magnetic field strength to the spectrum analyzer. This makes it possible to localize sources of interference with relatively high precision.

The high-impedance probe can be used to determine interference levels on contacts, lines and printed circuit boards.

The E-field probe is the most sensitive of the three probes. It can be used to assess the total effect of shielding and filtering in a tested unit.
Power Supplies

Oscilloscopes

Spectrum Analysis

Power Supplies

Programmable Measuring Instruments
Series 8100

Modular System Series 8000

Options

Accessories

Specifications
The power supplies market is highly partitioned. The user is faced with a seemingly unlimited number of models with diverse specifications, the result being the accumulation of a whole assembly of power supplies in the design lab or test site, the better part of which are rarely used.

HAMEG Instruments’ two types of power supplies (HM8143 and HMP4040) cover numerous applications; each type excels by being universally applicable, simple to operate, its compactness, and an unexcelled price/performance ratio. Test sites especially value this advantage because universal instruments minimize set-up times. The power supply portfolio consists in total of 6 types in order to also care for smaller budgets.

In the HMP series there are two 200 W and two 400 W types available which cover the range of 0...32 V and up to 10 A, depending on the number of channels required. This series is based on a classical concept with a mains transformer, high efficiency electronic pre regulators and linear post regulators. This concept yields the high power in the smallest space with the highest efficiency. The HMP series further excels by its intelligent power management which allows higher currents (e.g. up to 10 A) at medium voltages (e.g. up to 16 V) to be made available. Excellent low residual ripple voltages ($150 \mu V_{rms}$) are realized even at full power output.

The high adjustment and back-reading resolution of up to 1 mV/0.1 mA fulfills even the strictest requirements. Last but not least there is the EasyArb function available on all channels which allows you to program simple arbitrary voltage and current waveforms.

The HM8143 resides in the 130 W class and is unique in its class with its two 0...32 V/2 A two-quadrant outputs which can operate as source and sink outputs. It also features an arbitrary function, and its output voltage may be modulated via an external input. In the past 20 years, literally thousands of users, predominately in test sites, used this type and its predecessor, the HM8142, taking advantage of its flexibility to realize numerous applications.

The HM7042-5 with 2 x 0...32 V/2 A and 0...5.5 V/5 A is our best selling power supply for many years and became indispensable in many labs.

All power supplies feature galvanically isolated floating overload and short-circuit proof outputs and may be connected in series or in parallel, thus making very high currents and voltages available. A precondition is the common electronic fuse which disconnects all channels simultaneously in case of a fault. The HMP series also provides an extended FuseLink system which allows individual logic combinations.
HMP4030 [HMP4040]

- 3 x 0...32V/0...10A 384W max.
  [4 x 0...32V/0...10A 384W max.]
- 384W Output Power realized by intelligent Power Management
- Low Residual Ripple: <150μV_{rms} due to linear Post Regulators
- High Setting- and Read-Back Resolution of 1mV up to 0.2mA
- Keypad for direct Parameter Entry
- Galvanically isolated, earth-free and short circuit protected Output Channels
- Advanced Parallel- and Serial Operation via V/I Tracking
- EasyArb Function for free definable V/I Characteristics
- FuseLink: Individual Channel Combination of Electronic Fuses
- Free adjustable Overvoltage Protection (OVP) for all Outputs
- All Parameters clearly displayed via LCD/Illuminated Buttons
- Rear Connectors for all Channels including Sense
- USB/RS-232 Interface, optional Ethernet/USB or IEEE-488 (GPIB)

See page 76 for technical specifications or www.hameg.com/HMP4030 [www.hameg.com/HMP4040]
Programmable 2[3] Channel
High-Performance Power Supply
HMP2020 [HMP2030]

- 1 x 0...32V/0...10A 1 x 0...32V/0...5A 188W max.
  [3 x 0...32V/0...5A 188W max.]
- 188W Output Power realized by intelligent Power Management
- Low Residual Ripple: <150μVRms due to linear Post Regulators
- High Setting- and Read-Back Resolution of 1mV up to 0.1mA
- Galvanically isolated, earth-free and short circuit protected Output Channels
- Advanced Parallel- and Serial Operation via V/I Tracking
- EasyArb Function for free definable V/I Characteristics
- FuseLink: Individual Channel Combination of Electronic Fuses
- Free adjustable Overvoltage Protection (OVP) for all Outputs
- All Parameters clearly displayed via LCD/Illuminated Buttons
- Rear Connectors for all Channels including Sense
- USB/RS-232 Interface, optional Ethernet/USB or IEEE-488 (GPIB)

See page 75 for technical specifications or www.hameg.com/HMP2020 [www.hameg.com/HMP2030]
Triple Power Supply
HM7042-5

- 2 x 0...32V/0...2A  1 x 0...5.5V/0...5A
- High-Performance and inexpensive Laboratory Power Supply
- Floating, overload and short-circuit proof Outputs
- Separate Voltage and Current Displays for each Output
  4 Digits at Channel 1+3; 3 Digits at Channel 2
- Display Resolution:
  10mV/1mA at Channel 1+3; 10mV/10mA at Channel 2
- Protection of sensitive Loads by Current Limit or Electronic Fuse
- Pushbutton for activating/deactivating all Outputs
- Low Residual Ripple, high Output Power, very good Regulation
- Parallel (up to 9A) and Series (up to 69.5V) Operation
- Temperature-controlled Fan

See page 74 for technical specifications or www.hameg.com/HM7042
Arbitrary Power Supply
HM8143

- 2 x 0...30V/0...2A  1 x 5V/0...2A
- Display Resolution 10mV/1mA
- Parallel (up to 6A) and Series (up to 65V) Operation
- Electronic Load up to 60W per Channel (max. 2A)
- Arbitrary Waveform Power Supply (4096 Points, 12 Bit):
  Creation of customized Waveforms
- Software for Remote Control and for Creation of Arbitrary Waveforms
- Electronic Fuse and Tracking Mode for 30V Outputs
- External Modulation of Output Voltages:
  Input Voltage 0...10V, Bandwidth 50kHz
- SENSE Lines for Compensation of the Voltage drop across the Cables
- Multimeter Mode for all adjustable Outputs
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)

See page 74 for technical specifications or www.hameg.com/HM8143
Oscilloscopes

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Programmable Measuring Instruments Series 8100

Modular System Series 8000

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Specifications
HAMEG Programmable Measuring Instruments Series 8100

...are ideally suited for test installations in production and automated tests in laboratories. They support either an USB/RS-232, or an IEEE-488 (GPIB) interface and thus may be easily integrated in any test system. In combination with other HAMEG remote controlled instruments high performance test systems may be easily and cost effectively set up. Of course, any of these instruments can be operated manually and used in laboratories.

The 6½ Digit Precision Multimeter HM8112-3, the 8kW Power Meter HM8115-2, the LCR Bridge HM8118, the 3GHz Universal Counter HM8123 as well as the new 25MHz and 50MHz Arbitrary Function Generators Series HMF are high performance precision measuring instruments for research and development labs, industry, universities, test and production facilities as well as for service. The RF signal generators HM8134-3 and HM8135 are high precision synthesizers with a frequency range of 1Hz to 1.2GHz respectively 3GHz. The 12.5MHz Function Generator HM8150 uses direct digital frequency synthesis (DDS) for the generation of stable low distortion signals and guarantees optimum performance.
25MHz [50MHz] Arbitrary Function Generator
HMF2525 [HMF2550]

- Frequency Range 10μHz...25MHz [50MHz]
- Output Voltage 5mVpp...10Vpp (into 50Ω) DC Offset ±5mV...5V
- Arbitrary Waveform Generator: 250MSa/s, 14Bit, 256kPts
- Sine, Square, Pulse, Triangle, Ramp, Arbitrary Waveforms incl. Standard Curves (white Noise, Cardiac etc.)
- Total harmonic Distortion 0.04% (f <100kHz)
- Burst, Sweep, Gating, external Trigger
- Rise Time <8ns, in Pulse Mode 8...500ns Variable-Edge-Time
- Pulse Mode: Frequency Range 100μHz...12.5MHz [25MHz], Pulse Width 15ns...999s, Resolution 5ns
- Modulation Modes AM, FM, PM, PWM, FSK (int. and ext.)
- 10MHz Timebase: ±1ppm TCXO, rear I/O BNC Connector
- Front USB Connector: Save and Recall of Waveforms and Settings
- 8.9cm (3.5”) TFT: crisp Representation of the Waveform and all Parameters
- USB/RS-232 Dual-Interface, optional Ethernet/USB or IEEE-488 (GPIB)

See page 83 for technical specifications or www.hameg.com/HMF2525 [www.hameg.com/HMF2550]
6½-Digit Precision Multimeter
HM8112-3

- 6½-Digit Display (1,200,000 Counts)
- Resolution: 100nV, 100pA, 100μΩ, 0.01°C/F
- DC Basic Accuracy 0.003%
- 2-Wire/4-Wire Measurements
- Measurement Intervals adjustable from 0.1...60s
- Up to 100 Measurements per Second transmitted to a PC
- True RMS Measurement, AC and DC+AC
- Mathematic Functions: Limit Testing, Minimum/Maximum, Average and Offset
- Temperature Measurements with Platinum (PT100/PT1000) and Ni (K and J types) Sensors
- Internal Data Logger for up to 32,000 Measurement Results
- Offset Correction
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)
- Optional: Scanner Card (8+1 Channels each 2- and 4-Wire)

See page 76 for technical specifications or www.hameg.com/HM8112
8kW Power Meter
HM8115-2

- Wide Measurement Range 1mW...8kW
- Voltage Range 100mV...500V, Current Range 1mA...16A
- Frequency Range DC...1kHz
- Simultaneous Voltage, Current and Power Display
- Display of apparent, active and reactive Power
- Power Factor Display
- Autoranging, simple Operation
- Monitor Output (BNC) representing the instantaneous Power
- Suitable for Measurements on Frequency Converters
- Software for Remote Control and Data Acquisition included
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)

See page 77 for technical specifications or www.hameg.com/HM8115
Programmable Measuring Instruments Series 8100

200kHz LCR-Bridge
HM8118

- Basic Accuracy 0.05%
- Test Frequencies 20Hz...200kHz
- Up to 12 Measurements per Second
- Parallel and Series Mode
- Binning Interface HO118 (optional) for automatic Sorting of Components
- Internal programmable Voltage and Current Bias
- Transformer Parameter Measurement
- External Capacitor Bias up to 40V
- Kelvin Cable and 4-Wire SMD Test Adapter included in Delivery
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)

See page 78 for technical specifications or www.hameg.com/HM8118
Programmable Measuring Instruments Series 8100

3GHz Programmable Counter
HM8123

- Measurement Range 0Hz...3GHz
- 2 Measurement Inputs DC...200MHz,
  1 Measurement Input 100MHz...3GHz
- Input Impedance A/B: 1MΩ/50Ω (switchable), Sensitivity 25mV\text{rms}
- Input Impedance C: 50Ω, Sensitivity 30mV\text{rms}
- 400MHz Time Base with 0.5ppm Stability
- 10-Digit Resolution at 10s Gate Time
- 9 Measurement Functions, external Gate and Arming
- Input for external Time Base (10MHz)
- Standard: TCXO (Temperature Stability: ±0.5 x 10^{-6})
  Optional: OCXO (Temperature Stability: ±1 x 10^{-8})
- Intuitive One-Pushbutton Operation each Function directly addressable
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)

See page 79 for technical specifications or www.hameg.com/HM8123
1.2GHz RF-Synthesizer  
HM8134-3

- Frequency Range 1Hz...1.2GHz
- Output Power -127...+13 dBm
- Frequency Resolution 1Hz (Accuracy 0.5 ppm)
- Input for external Time Base (10MHz)
- Modulation Modes: AM, FM, Pulse, Φ, FSK, PSK
- Rapid Pulse Modulation: typ. 200ns
- Internal Modulator (Sine Wave, Square Wave, Triangle, Sawtooth) 10Hz...150kHz
- High spectral Purity
- 10 Configuration Memories including Turn-On Configuration
- Standard: TCXO (Temperature Stability: ±0.5 x 10^{-6})
  Optional: OCXO (Temperature Stability: ±1 x 10^{-8})
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)

See page 80 for technical specifications or www.hameg.com/HM8134
**3GHz RF-Synthesizer**

**HM8135**

- Frequency Range 1Hz...3GHz
- Output Power -135...+13dBm
- Frequency Resolution 1Hz (Accuracy 0.5ppm)
- Input for external Time Base (10MHz)
- Modulation Modes: AM, FM, Pulse, FSK, PSK
- Rapid Pulse Modulation: typ. 200ns
- Internal Modulator (Sine Wave, Square Wave, Triangle, Sawtooth) 10Hz...200kHz
- High spectral Purity
- 10 Configuration Memories including Turn-On Configuration
- Standard: TCXO (Temperature Stability: ±0.5 x 10^{-6})
  Optional: OCXO (Temperature Stability: ±1 x 10^{-8})
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)

See page 81 for technical specifications or www.hameg.com/HM8135
12.5MHz Arbitrary Function Generator

HM8150

- Frequency Range 10mHz...12.5MHz
- Output Voltage 10mV_{pp}...10V_{pp} (into 50Ω)
- Waveforms: Sine Wave, Square Wave, Triangle, Pulse, Sawtooth, Arbitrary
- Rise and Fall Time <10ns
- Pulse width Adjustment: 100ns...80s
- Arbitrary Waveform Generator 40MSa/s
- Burst, Gating, External Triggering, Sweep
- Software for Remote Control and for Creation of Arbitrary Waveforms
- External Amplitude Modulation (Bandwidth 20kHz)
- Intuitive Operation with one touch of a Button – quick Change of Signals
- Galvanically isolated USB/RS-232 Interface, optional IEEE-488 (GPIB)

See page 82 for technical specifications or www.hameg.com/HM8150
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Modular System Series 8000

In many years of practical application...

...the HAMEG Modular System Series 8000 has proven its value to the customer. The advantages of this Modular System have been demonstrated by several 100,000 modules sold. The unexcelled price-performance ratio and the enormous flexibility of the plug-in system allow you to adapt your measurement setups quickly and cost effectively to changing requirements. You save space by stacking up to 5 instruments. This will offer you 10 instruments in a minimum of space. The top covers of the instruments feature receptacles for the feet of the instrument above. The mainframes thus cannot move and may also be stacked together with other HAMEG instruments like power supplies, spectrum analyzers and oscilloscopes.

The blank module HM800 is available for your own designs to be integrated with the other measuring instruments. The power supply voltages necessary are available from the mainframe. Especially for schools and training centers the Modular System Series 8000 offers a cost effective flexible alternative to conventional measuring equipments. As the mainframe HM8001-2 allows the simultaneous operation of two modules in any combination most often a single such basic unit will be all that is needed for a student in a laboratory. The modules necessary will be issued to the students depending on the requirements of the specific exercise.

The Modular System Series 8000 offers, in addition to the mainframe HM8001-2 and the blank module HM800, the 4¾-Digit Programmable Multimeter HM8012, the 25kHz LCR-Meter HM8018, the 1.6GHz Universal Counter HM8021-4, the 10MHz Function Generator HM8030-6 and the Triple Power Supply HM8040-3.
Mainframe
HM8001-2

The Mainframe is supplied without the Modules shown in the Illustration.

- Basic Unit for Modules of the Modular System Series 8000
- Power Supply for 2 Modules
- DC Voltages electronically regulated, floating and short-circuit proof
- Power Transformer with thermal Fuse
- Up to 5 Mainframes can be stacked
- Module HM800 for customized Instrument Construction available
- 4 BNC Connectors on the Rear Panel of the HM8001-2 (Option HO801) provide for Signal Transmission to or from HM8021-4 and HM8030-6 Modules

See page 84 for technical specifications or www.hameg.com/HM8001
4¾-Digit Programmable Multimeter
HM8012

- 4¾-Digit Display with 50,000 Counts
- Basic Accuracy 0.05%
- Max. Resolution: 10μV, 0.01dBm, 10nA, 10mΩ, 0.1°C
- Offset Function/Relative Value Measurement
- RS-232 Interface and Software included

See page 85 for technical specifications or www.hameg.com/HM8012

25kHz LCR-Meter
HM8018

- Basic Accuracy 0.2%
- 5 Measurement Frequencies:
  100Hz, 120Hz, 1kHz, 10kHz, 25kHz
- Max. Resolution: 0.001Ω, 0.001pF, 0.01μH
- 2- and 4-Wire Measurement, parallel and series Mode

See page 86 for technical specifications or www.hameg.com/HM8018
1.6GHz Universal Counter
HM8021-4

- Measurement Range 0Hz...1.6GHz
- 10MHz Time Base with 1ppm Stability (TCXO)
- Input A: Input Impedance 1MΩ, Sensitivity 20mV\text{rms}
  Input C: Input Impedance 50Ω, Sensitivity 30mV\text{rms}
- 8-Digit Resolution for 10s Measuring Time
- Time Interval Resolution up to 10ps
- External Gate Input (with Option HO801)

See page 86 for technical specifications or www.hameg.com/HM8021

10MHz Function Generator
HM8030-6

- Frequency Range 50mHz...10MHz, Output Voltage up to 10V\text{pp} (into 50Ω)
- Waveforms: Sine Wave, Triangle, Square Wave, Pulse, DC
- Distortion Factor <0.5% up to 1MHz, Rise and Fall Time typ. 15ns
- Internal and external Sweep, FM (with Option HO801)
- Surge- and short-circuit-proof Output

See page 87 for technical specifications or www.hameg.com/HM8030
Triple Power Supply
HM8040-3

- 2 x 0...20V/0.5A
- 3-Digit switchable Displays (Display Resolution 0.1V/1mA)
- Pushbutton for Activating/Deactivating all Outputs
- Adjustable Current Limiting and Electronic Fuse
- Low Residual Ripple and Low Noise

See page 87 for technical specifications or www.hameg.com/HM8040

Blank Module
HM800

- Module for customized Instrument Construction
- Guide Rails for Mounting Circuit Boards at 4 different Levels
- Plastic Front Panel for easy mechanical Processing
- Power is supplied by the Mainframe HM8001-2
- Available Supply Voltages, Load Capability

see Manual of HM800

www.hameg.com/HM800
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Specifications
The binning interface option HO118 within the HM8118 enables the LCR bridge to control an external binning hardware in order to physically sort components according to the measurement result and the user defined limits. Data lines for eight sorting bins are provided, as well as output and input control lines (ALARM, INDEX, EOM, and TRIG). This option is useful for production testing, component matching or other tests where similar components must be compared to each other. The binning feature is an automatic process which simplifies the sorting, eliminating the need to manually compare the parameters. A maximum of 9 binning configurations can be set using the store/recall feature. Binning configurations can also be entered using the communication interface.

**Technical Specifications**

<table>
<thead>
<tr>
<th>I/O Connector:</th>
<th>D-Sub 25 socket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal:</td>
<td>Negative TRUE, DC (open collector), opto-isolated, selectable pull-ups. $I_{out} \leq 15mA &amp; V_{out} &lt; 1V$, $V_{max} = 40V$</td>
</tr>
<tr>
<td>Pass bins:</td>
<td>BIN 0..5 for primary parameter</td>
</tr>
<tr>
<td>Fail bins:</td>
<td>BIN 6 for secondary parameter</td>
</tr>
<tr>
<td>BIN 7</td>
<td>for general failure bin</td>
</tr>
<tr>
<td>Index:</td>
<td>Analog measurement complete</td>
</tr>
<tr>
<td>EOM:</td>
<td>Full measurement complete</td>
</tr>
<tr>
<td>Alarm:</td>
<td>Notification that an error was detected</td>
</tr>
<tr>
<td>TRIG:</td>
<td>External opto-isolated trigger input, selectable pull-up, $V_{max} = 15V$, falling edge, pulse width $&gt;10\mu s$</td>
</tr>
</tbody>
</table>

**Specifications HO3508**

- **Channels:** 8
- **Input Impedance:** $100k\Omega \ll 4pF$
- **Max. Input Frequency:** $350\text{ MHz}$
- **Max. Input Voltage:** $40V \text{ DC + peak AC}$
- **Measuring Category:** CAT II
- **Cable Length:** approx. 1 m

**HO3508 [HO3516] Logic Probe** for all Oscilloscopes of the HM0 Series

- Logic Probe HO3508 for MSO Extension, also available in a double Package as HO3516 (2 x HO3508)
- With the Logic Probe HO3508, 8 Logic Channels (LCH 0...LCH 7 or LCH 8...LCH 15) are available in MSO Mode
- The Display on the Oscilloscope will be either as individual Channels or as a Bus Display
- Decoding may be in the ASCII, Binary, Decimal or Hexadecimal Formats
- The Threshold can be adjusted for 8 Logic Channels as a Group at the Oscilloscope
- The Activation of the Logic Channels is indicated by a LED on the Logic Probe
**H 0 3 0 1 1 P r e a m p l i f i e r**

- Preamplifier Option for HMS1000, HMS1010, HMS3000, HMS3010 (Licence Key)
- DANL -135dBm typ. (100Hz RBW)

**H 0 0 1 0 / H 0 0 1 1 S e r i a l B u s**

- 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 become visible with increasing Zoom Factor
- Bus Display with synchronous Display of the Data and maybe 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

See page 89 for technical specifications or www.hameg.com/H0010 [www.hameg.com/H0011]
HO730 Dual Ethernet/USB Interface

- Ethernet 10/100 MBit/s
- Additionally integrated Web Server
- Screenshot Function using Web Server
- USB 2.0 standard, USB Type B Connector
- For mounting into Oscilloscopes HM1008, HM1508, HM1008-2, HM1500-2, HM1508-2, HM2005-2, HM2008, Series HMF, HMO, HMP and HMS

HO740 IEEE-488 (GPIB) Interface

- 24-pin Connection in accordance with IEEE-488 (GPIB) (Socket)
- Galvanic Separation of Test Device and Interface
- For mounting into Oscilloscopes HM1008, HM1508, HM1008-2, HM1500-2, HM1508-2, HM2005-2, HM2008, Series HMF, HMO, HMP and HMS

HO880 IEEE-488 (GPIB) Interface

- 24-pin Connection in accordance with IEEE-488 (GPIB) (Socket)
- Galvanic Separation of Test Device and Interface
- Up to 15 Devices on one IEEE-488 (GPIB) Bus
- For installation in Programmable Measuring Instruments Series 81XX
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<table>
<thead>
<tr>
<th><strong>HZ10 Silicone Test Lead</strong></th>
<th>Silicone test lead with stackable banana plugs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Length:</strong> 1.0m</td>
</tr>
<tr>
<td></td>
<td><strong>Packaging unit:</strong> set of 5</td>
</tr>
<tr>
<td>HZ10R color: red</td>
<td></td>
</tr>
<tr>
<td>HZ10B color: blue</td>
<td></td>
</tr>
<tr>
<td>HZ10S color: black</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ15 PVC Test Lead</strong></th>
<th>PVC test lead with test probes and sheathed banana plugs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Color:</strong> black and red</td>
</tr>
<tr>
<td></td>
<td><strong>Length:</strong> 1.0m</td>
</tr>
<tr>
<td></td>
<td><strong>Packaging unit:</strong> 1 piece per color</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ16 Test Cable with micro-clamps</strong></th>
<th>Silicone test lead with BNC plug to miniature clamp probe.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Packaging unit:</strong> 1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ17 Kelvin Test Lead</strong></th>
<th>Kelvin test lead [4-wire] with test probe, 5-pin DIN connector for HM8018.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Packaging unit:</strong> 1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ18 Kelvin Test Lead</strong></th>
<th>Kelvin test lead [4-wire] with gold-plated alligator clip, 5-pin DIN connector and shielding mass, for HM8018.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Packaging unit:</strong> 1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ19 SMD Test Tweezers</strong></th>
<th>Kelvin test lead [4-wire] with SMD test tweezers, 5-pin DIN connector for HM8018.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Packaging unit:</strong> 1 piece</td>
</tr>
<tr>
<td><strong>HZ31 Test Cable 50Ω</strong></td>
<td>Test cable 50Ω, BNC to BNC angle connector.</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td><strong>Length:</strong></td>
<td>1.0m</td>
</tr>
<tr>
<td><strong>Packaging unit:</strong></td>
<td>1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ32 Test Cable</strong></th>
<th>Test cable, BNC to 4 mm banana plug.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length:</strong></td>
<td>1.0m</td>
</tr>
<tr>
<td><strong>Packaging unit:</strong></td>
<td>1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ33/HZ34 Test Cable 50Ω</strong></th>
<th>Test cable 50Ω, BNC to BNC, BNC straight plug.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length:</strong> 0.5m – HZ33</td>
<td>1 piece</td>
</tr>
<tr>
<td><strong>Length:</strong> 1.0m – HZ34</td>
<td>1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ33S/HZ34S Test Cable 50Ω</strong></th>
<th>Test cable 50Ω, BNC to BNC socket, insulated.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length:</strong> 0.5m – HZ33S</td>
<td>1 piece</td>
</tr>
<tr>
<td><strong>Length:</strong> 1.0m – HZ34S</td>
<td>1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ20 Adapter Plug</strong></th>
<th>Adapter BNC plug/4 mm banana socket.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>BNC plug with 2 x 4 mm sockets</td>
</tr>
<tr>
<td><strong>Packaging unit:</strong></td>
<td>1 piece</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ21 Adapter Plug</strong></th>
<th>Adapter N male to BNC female.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>N male to BNC female</td>
</tr>
<tr>
<td><strong>Packaging unit:</strong></td>
<td>1 piece</td>
</tr>
</tbody>
</table>
**HZ22 Feed-Through Termination 50Ω**

50Ω feed-through termination, 1GHz, 2 Watt.

<table>
<thead>
<tr>
<th>Description:</th>
<th>BNC plug BNC socket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging unit:</td>
<td>1 piece</td>
</tr>
</tbody>
</table>

**HZ24 Attenuators 50Ω**

One set of 50Ω attenuators with 3/6/10/20dB attenuation (1GHz, 1 Watt) and 1 HZ22.

| Packaging unit:        | 1 set               |

**HZ26 BNC-T-Adapter**

BNC-T-Adapter UG274, 50Ω.

<table>
<thead>
<tr>
<th>Description:</th>
<th>1 BNC plug to 2 BNC sockets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging unit:</td>
<td>1 piece</td>
</tr>
</tbody>
</table>

**HZ72 IEEE-488 (GPIB) Interface Cable**

IEEE-488 (GPIB) bus interface cable double-shielded 90° angle, stackable.

<p>| Length:                | 2.0m                      |</p>
<table>
<thead>
<tr>
<th><strong>HZ154 Probe 1:1/10:1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attenuation ratio:</strong></td>
</tr>
<tr>
<td><strong>Switchable:</strong></td>
</tr>
<tr>
<td><strong>Bandwidth:</strong></td>
</tr>
<tr>
<td><strong>Rise time:</strong></td>
</tr>
<tr>
<td><strong>Input impedance:</strong></td>
</tr>
<tr>
<td><strong>Max. Voltage:</strong></td>
</tr>
<tr>
<td><strong>LF compensation:</strong></td>
</tr>
<tr>
<td><strong>RF compensation:</strong></td>
</tr>
<tr>
<td><strong>Cable length:</strong></td>
</tr>
<tr>
<td><strong>Measuring category:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ355 Probe 10:1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attenuation ratio:</strong></td>
</tr>
<tr>
<td><strong>Bandwidth:</strong></td>
</tr>
<tr>
<td><strong>Rise time:</strong></td>
</tr>
<tr>
<td><strong>Input impedance:</strong></td>
</tr>
<tr>
<td><strong>Max. Voltage:</strong></td>
</tr>
<tr>
<td><strong>LF compensation:</strong></td>
</tr>
<tr>
<td><strong>RF compensation:</strong></td>
</tr>
<tr>
<td><strong>Cable length:</strong></td>
</tr>
<tr>
<td><strong>Probe factor identification:</strong></td>
</tr>
<tr>
<td><strong>Measuring category:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ350 Probe 10:1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attenuation ratio:</strong></td>
</tr>
<tr>
<td><strong>Bandwidth:</strong></td>
</tr>
<tr>
<td><strong>Rise time:</strong></td>
</tr>
<tr>
<td><strong>Input impedance:</strong></td>
</tr>
<tr>
<td><strong>Max. Voltage:</strong></td>
</tr>
<tr>
<td><strong>LF compensation:</strong></td>
</tr>
<tr>
<td><strong>RF compensation:</strong></td>
</tr>
<tr>
<td><strong>Cable length:</strong></td>
</tr>
<tr>
<td><strong>Probe factor identification:</strong></td>
</tr>
<tr>
<td><strong>Measuring category:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ200 Probe 10:1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attenuation ratio:</strong></td>
</tr>
<tr>
<td><strong>Bandwidth:</strong></td>
</tr>
<tr>
<td><strong>Rise time:</strong></td>
</tr>
<tr>
<td><strong>Input impedance:</strong></td>
</tr>
<tr>
<td><strong>Max. Voltage:</strong></td>
</tr>
<tr>
<td><strong>LF compensation:</strong></td>
</tr>
<tr>
<td><strong>RF compensation:</strong></td>
</tr>
<tr>
<td><strong>Cable length:</strong></td>
</tr>
<tr>
<td><strong>Probe factor identification:</strong></td>
</tr>
<tr>
<td><strong>Measuring category:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HZ51 Probe 10:1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attenuation ratio:</strong></td>
</tr>
<tr>
<td><strong>Bandwidth:</strong></td>
</tr>
<tr>
<td><strong>Rise time:</strong></td>
</tr>
<tr>
<td><strong>Input impedance:</strong></td>
</tr>
<tr>
<td><strong>Max. Voltage:</strong></td>
</tr>
<tr>
<td><strong>LF compensation:</strong></td>
</tr>
<tr>
<td><strong>RF compensation:</strong></td>
</tr>
<tr>
<td><strong>Cable length:</strong></td>
</tr>
<tr>
<td><strong>Measuring category:</strong></td>
</tr>
</tbody>
</table>
### HZ52 Probe 10:1

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attenuation ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>250MHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>&lt;1.4 ns</td>
</tr>
<tr>
<td>Input impedance</td>
<td>10MΩ II 10pF</td>
</tr>
<tr>
<td>Max. Voltage</td>
<td>600V (DC + peak AC)</td>
</tr>
<tr>
<td>LF compensation</td>
<td>1 Trimmer</td>
</tr>
<tr>
<td>RF compensation</td>
<td>2 Trimmer</td>
</tr>
<tr>
<td>Cable length</td>
<td>1.2m</td>
</tr>
<tr>
<td>Measuring category</td>
<td>CAT I</td>
</tr>
</tbody>
</table>

### HZ53 Probe 100:1

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attenuation ratio</td>
<td>100:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>100MHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>&lt;3.5 ns</td>
</tr>
<tr>
<td>Input impedance</td>
<td>100MΩ II 4.5pF</td>
</tr>
<tr>
<td>Max. Voltage</td>
<td>1200V (DC + peak AC)</td>
</tr>
<tr>
<td>LF compensation</td>
<td>1 Trimmer</td>
</tr>
<tr>
<td>Cable length</td>
<td>1.2m</td>
</tr>
<tr>
<td>Measuring category</td>
<td>CAT I</td>
</tr>
</tbody>
</table>

### HZ020 Probe 1000:1

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attenuation ratio</td>
<td>1000:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>400MHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>&lt;700 ps</td>
</tr>
<tr>
<td>Input impedance</td>
<td>50MΩ II 7.5pF</td>
</tr>
<tr>
<td>Max. Voltage</td>
<td>1000Vrms</td>
</tr>
<tr>
<td>LF compensation</td>
<td>1 Trimmer</td>
</tr>
<tr>
<td>RF compensation</td>
<td>1 Trimmer</td>
</tr>
<tr>
<td>Cable length</td>
<td>1.3m</td>
</tr>
<tr>
<td>Probe factor identification</td>
<td>automatically after connection</td>
</tr>
<tr>
<td>Measuring category</td>
<td>CAT II</td>
</tr>
</tbody>
</table>

### HZ030 Active Probe 10:1

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attenuation ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>1GHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>600ps</td>
</tr>
<tr>
<td>Input impedance</td>
<td>1MΩ II 0.9pF</td>
</tr>
<tr>
<td>Max. Input Voltage</td>
<td>20V</td>
</tr>
<tr>
<td>Input Dynamic Range</td>
<td>±8V</td>
</tr>
<tr>
<td>Cable length</td>
<td>1.3m</td>
</tr>
<tr>
<td>Oscilloscope Input Coupling</td>
<td>500Ω</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>included</td>
</tr>
</tbody>
</table>

### HZ010 Probe 10:1

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attenuation ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>250MHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>&lt;1.4 ns</td>
</tr>
<tr>
<td>Input impedance</td>
<td>10MΩ II 15pF</td>
</tr>
<tr>
<td>Max. Voltage</td>
<td>400V (DC + peak AC)</td>
</tr>
<tr>
<td>LF compensation</td>
<td>1 Trimmer</td>
</tr>
<tr>
<td>RF compensation</td>
<td>2 Trimmers</td>
</tr>
<tr>
<td>Cable length</td>
<td>1.2m</td>
</tr>
<tr>
<td>Probe factor identification</td>
<td>automatically after plugging</td>
</tr>
<tr>
<td>Measuring category</td>
<td>CAT I</td>
</tr>
</tbody>
</table>
### HZ100 Differential Probe 20:1/200:1 Technical specifications at 23°C ±2°C

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential input voltage (DC + peak AC) max.</td>
<td>±700 V</td>
</tr>
<tr>
<td>Max. input voltage per input</td>
<td>600 V₉ms</td>
</tr>
<tr>
<td>Attenuation ratio</td>
<td>20:1</td>
</tr>
<tr>
<td>Selectable</td>
<td>200:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>30/40 MHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>12/9ns</td>
</tr>
<tr>
<td>Input impedance</td>
<td>8MΩ II 1.2pF</td>
</tr>
<tr>
<td>Output impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Max. output Voltage</td>
<td>±3.5V at 1MΩ</td>
</tr>
<tr>
<td>Max. noise</td>
<td>2mV</td>
</tr>
<tr>
<td>Accuracy after 1min</td>
<td>±3% (18...30°C)</td>
</tr>
<tr>
<td>Common mode rejection DC/AC 1MHz</td>
<td>70dB/50dB</td>
</tr>
<tr>
<td>Inputs [CAT III]</td>
<td>2 safety connectors</td>
</tr>
<tr>
<td>Input leads</td>
<td>2 test leads 50cm with spring hooks</td>
</tr>
<tr>
<td>Battery operation</td>
<td>9V battery 6LR61</td>
</tr>
<tr>
<td>Input for an external power supply</td>
<td>12...14Vₑc/30mA</td>
</tr>
</tbody>
</table>

### HZ109 Differential Probe 1:1/10:1 Technical specifications at 23°C ±2°C

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential input voltage (DC + peak AC) max.</td>
<td>±3,5V/35V</td>
</tr>
<tr>
<td>Max. input voltage per input</td>
<td>100V₉ms</td>
</tr>
<tr>
<td>Attenuation ratio</td>
<td>1:1</td>
</tr>
<tr>
<td>Selectable</td>
<td>10:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>30/40 MHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>12/9ns</td>
</tr>
<tr>
<td>Input impedance</td>
<td>8MΩ II 1.2pF</td>
</tr>
<tr>
<td>Output impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Max. output Voltage</td>
<td>±3.5V at 1MΩ</td>
</tr>
<tr>
<td>Max. background noise at x1:</td>
<td>&lt;8mV₉ms</td>
</tr>
<tr>
<td>at x10:</td>
<td>&lt;2mV₉ms</td>
</tr>
<tr>
<td>Accuracy after 1min</td>
<td>±3% (18...30°C)</td>
</tr>
<tr>
<td>Common mode rejection DC/AC 1MHz</td>
<td>70dB/50dB</td>
</tr>
<tr>
<td>Inputs [CAT III]</td>
<td>2 safety connectors</td>
</tr>
<tr>
<td>Input leads</td>
<td>2 test leads 50cm with spring hooks</td>
</tr>
<tr>
<td>Battery operation</td>
<td>9V battery 6LR61</td>
</tr>
<tr>
<td>Input for an external power supply</td>
<td>12...14Vₑc/30mA</td>
</tr>
</tbody>
</table>

### HZ115 Differential Probe 100:1/1000:1 Technical specifications at 23°C ±2°C

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential input voltage (AC₉rms):</td>
<td>1000V</td>
</tr>
<tr>
<td>(DC + peak AC) max.</td>
<td>±1400V¹</td>
</tr>
<tr>
<td>Max. input voltage per input</td>
<td>±1400V¹</td>
</tr>
<tr>
<td>Attenuation ratio</td>
<td>100:1</td>
</tr>
<tr>
<td>Selectable</td>
<td>1000:1</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>20/30 MHz</td>
</tr>
<tr>
<td>Rise time</td>
<td>17/12ns</td>
</tr>
<tr>
<td>Input impedance</td>
<td>60MΩ II 1.5pF</td>
</tr>
<tr>
<td>Output impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Max. output Voltage</td>
<td>±1.5V at 1MΩ</td>
</tr>
<tr>
<td>Max. background noise at x1:</td>
<td>2mV</td>
</tr>
<tr>
<td>Accuracy after 1min</td>
<td>±3% (18...30°C)</td>
</tr>
<tr>
<td>Common mode rejection DC/AC 1MHz</td>
<td>70dB/50dB</td>
</tr>
<tr>
<td>Inputs [CAT III]</td>
<td>2 safety connectors</td>
</tr>
<tr>
<td>Input leads</td>
<td>2 test leads 75cm with safety test clips</td>
</tr>
<tr>
<td>Battery operation</td>
<td>9V battery 6LR61</td>
</tr>
<tr>
<td>Input for an external power supply</td>
<td>12...14Vₑc/30mA</td>
</tr>
</tbody>
</table>

¹) due to test clip 1000V CAT III
### HZO40 Differential Probe 10:1

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>200 MHz</td>
</tr>
<tr>
<td>Attenuation ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Rise time (10...90%)</td>
<td>1.75 ns</td>
</tr>
<tr>
<td>Gain accuracy</td>
<td>±1 %</td>
</tr>
<tr>
<td>Max. Input Voltage per Input</td>
<td>±60 V</td>
</tr>
<tr>
<td>Max. Differential Input Voltage (DC + peak AC)</td>
<td>±20 V</td>
</tr>
<tr>
<td>Max. Common Mode Input Voltage</td>
<td>±60 V</td>
</tr>
<tr>
<td>Input impedance Between Inputs</td>
<td>1 MΩ II 3.5 pF</td>
</tr>
<tr>
<td>Each Input to Ground</td>
<td>500 kΩ II 7 pF</td>
</tr>
<tr>
<td>Output Voltage (into 50Ω)</td>
<td>±2 V</td>
</tr>
<tr>
<td>Offset (typical)</td>
<td>±2 mV</td>
</tr>
<tr>
<td>CMRR (typical)</td>
<td>-80 dB at 60 Hz</td>
</tr>
<tr>
<td></td>
<td>-50 dB at 10 MHz</td>
</tr>
<tr>
<td>Battery operation</td>
<td>9V battery 6LR61</td>
</tr>
<tr>
<td>Battery life (typical)</td>
<td>7.5 h</td>
</tr>
<tr>
<td>Input for an external power supply</td>
<td>USB Power adapter cable</td>
</tr>
<tr>
<td></td>
<td>(5...9 Vdc/200 mA)</td>
</tr>
</tbody>
</table>

### HZO41 Differential Probe 10:1

<table>
<thead>
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<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>800 MHz</td>
</tr>
<tr>
<td>Attenuation ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Rise time (10...90%)</td>
<td>437 ps</td>
</tr>
<tr>
<td>Gain accuracy</td>
<td>±2 %</td>
</tr>
<tr>
<td>Max. Input Voltage per Input</td>
<td>±40 V</td>
</tr>
<tr>
<td>Max. Differential Input Voltage (DC + peak AC)</td>
<td>±15 V</td>
</tr>
<tr>
<td>Max. Common Mode Input Voltage</td>
<td>±30 V</td>
</tr>
<tr>
<td>Input impedance Between Inputs</td>
<td>200 kΩ II 1 pF</td>
</tr>
<tr>
<td>Each Input to Ground</td>
<td>100 kΩ II 2 pF</td>
</tr>
<tr>
<td>Output Voltage (into 50Ω)</td>
<td>±1.5 V</td>
</tr>
<tr>
<td>Offset (typical)</td>
<td>±5 mV</td>
</tr>
<tr>
<td>CMRR (typical)</td>
<td>-60 dB at 60 Hz</td>
</tr>
<tr>
<td></td>
<td>-15 dB at 500 MHz</td>
</tr>
<tr>
<td>Battery operation</td>
<td>9V battery 6LR61</td>
</tr>
<tr>
<td>Battery life (typical)</td>
<td>4.5 h</td>
</tr>
<tr>
<td>Input for an external power supply</td>
<td>USB Power adapter cable</td>
</tr>
<tr>
<td></td>
<td>(5...9 Vdc/300 mA)</td>
</tr>
</tbody>
</table>
### HZ050 AC/DC Current Probe 30A

This AC/DC current probe is used to measure currents from 1mA to 30A over a broad frequency range. The measurement principle is based on the Hall Effect that registers the magnetic field generated by the current flow. Even for complex waveforms a high degree of measurement accuracy is achieved. The output voltage is proportional to the measured current and well suited to be displayed on an oscilloscope. The current probe complies with the safety standards defined in IEC/EN 61010.

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>±20A&lt;sub&gt; rms &lt;/sub&gt;/30A&lt;sub&gt; p &lt;/sub&gt;</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1% from measurement value ±2mA</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>DC...100kHz (0.5dB)</td>
</tr>
<tr>
<td>Resolution</td>
<td>±1mA</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>100mV/A</td>
</tr>
<tr>
<td>Load impedance</td>
<td>&gt;100kΩ II ≤100pF</td>
</tr>
<tr>
<td>Max. Voltage</td>
<td>300V&lt;sub&gt; rms &lt;/sub&gt; (AC or DC)</td>
</tr>
<tr>
<td>Output cable/Connector</td>
<td>2m (50Ω)/BNC</td>
</tr>
<tr>
<td>Measuring category</td>
<td>CAT III</td>
</tr>
</tbody>
</table>

### HZ051 AC/DC Current Probe 100A/1000A

This AC/DC current probe is used to measure currents from 100mA to 1000A over a broad frequency range. The measurement principle is based on the Hall Effect that registers the magnetic field generated by the current flow. Even for complex waveforms a high degree of measurement accuracy is achieved. The output voltage is proportional to the measured current and well suited to be displayed on an oscilloscope. The current probe complies with the safety standards defined in IEC/EN 61010.

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>±100A&lt;sub&gt; rms &lt;/sub&gt;/1000A&lt;sub&gt; p &lt;/sub&gt;</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1% from measurement value ±0.1A/±0.5A</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>DC...20kHz</td>
</tr>
<tr>
<td>Resolution</td>
<td>±100mA/±500mA</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>10mA/1mV/A</td>
</tr>
<tr>
<td>Load impedance</td>
<td>&gt;100kΩ II ≤100pF</td>
</tr>
<tr>
<td>Max. Voltage</td>
<td>300V&lt;sub&gt; rms &lt;/sub&gt; (AC or DC)</td>
</tr>
<tr>
<td>Output cable/Connector</td>
<td>2m (50Ω)/BNC</td>
</tr>
<tr>
<td>Measuring category</td>
<td>CAT III</td>
</tr>
</tbody>
</table>

### HZ525 Termination

Frequency range: DC...6GHz  
Impedance: 500  
VSWR:  
- 1.05 [DC...1GHz]  
- 1.1 [1...4GHz]  
- 1.2 [4...6GHz]  
Power: 1W aver.  
Connection: N-male
HZ575 Converter

HZ575 is a 75Ω to 50Ω converter enabling measurement in 75Ω systems in connection with 50Ω input impedance spectrum analyzers. The 75Ω input is a 75Ω BNC socket which is AC coupled internally. The output is a 50Ω N male connector which is DC coupled. HZ575 can also be used for reverse operation converting 50Ω to 75Ω.

Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>5MHz...1.2GHz</td>
</tr>
<tr>
<td>Insertion loss</td>
<td>less than 1dB</td>
</tr>
<tr>
<td>Max. Level/Voltage</td>
<td></td>
</tr>
<tr>
<td>at 75Ω connector</td>
<td>+10dBm/±20Vdc</td>
</tr>
<tr>
<td>at 50Ω connector</td>
<td>+10dBm/0Vdc</td>
</tr>
<tr>
<td>Dimensions</td>
<td>25 x 25 x 58mm (W x H x D)</td>
</tr>
<tr>
<td>Weight</td>
<td>100g</td>
</tr>
</tbody>
</table>

HZ812/HZ887 PT100 Temperature Probe

The HZ812 and HZ887 Temperature Probes are immersion sensors with PT100 sensing resistors. They ensure excellent precision over a broad temperature range. The probes are of robust construction, waterproof and also suitable for use in air or dusty environments. The technical specifications apply for immersion depths of at least 60mm.

The probe is connected to the measuring instrument either with a 2-pin connection using a safety plug (HZ812) or with a 4-pin connection via a 4mm banana plug (HZ887). The length of the connector cable is 1.2m for both probes.

HZ812 is suitable for use in combination with HM8012
HZ887 is suitable for use in combination with HM8112

Technical specifications in accordance with EN60751 (formerly IEC751)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe diameter</td>
<td>4mm</td>
</tr>
<tr>
<td>Measurement range</td>
<td>-50°C to +400°C</td>
</tr>
<tr>
<td>Accuracy, Class A</td>
<td>±(0.2% of the reading + 0.15°C)</td>
</tr>
<tr>
<td>(t_{99}) [s]:</td>
<td>12s [time required to display 99% of the temperature change]</td>
</tr>
<tr>
<td>Connection HZ812</td>
<td>Safety plug, 4mm, 1.2m PVC cable</td>
</tr>
<tr>
<td>Connection HZ887</td>
<td>4mm banana plug, 1.2m PVC cable</td>
</tr>
<tr>
<td>Accuracy, HZ812 in combination with HM8012:</td>
<td></td>
</tr>
<tr>
<td>-50°C &lt; T° &lt; 200°C</td>
<td>±(0.2% of reading +0.25°C)</td>
</tr>
<tr>
<td>200°C &lt; T° &lt; 400°C</td>
<td>±(0.2% of reading +0.45°C)</td>
</tr>
</tbody>
</table>
### HZ181 4 Terminal Test Fixture including Shorting Plate

4 Terminal Test Fixture including Shorting Plate (for HM8118) for evaluation of lead type devices.

### HZ184 4 Terminal Kelvin Test Cable

The 4 Terminal Kelvin Test Cable with Kelvin clips (for HM8118, included in delivery) makes it possible to measure odd-shaped components that cannot be measured with conventional fixtures.

### HZ186 4 Terminal Transformer Test Cable

Transformer Test Cable (for HM8118) for transformer measurements.

### HZ188 4 Terminal SMD Component Test Fixture

4 Terminal SMD Component Test Fixture (for HM8118, included in delivery) for evaluation of SMD components.

### HZ809 Test Adapter for Modular System Series 8000

Test adapter for the testing and repair of insert modules for Modular System Series 8000 outside the mainframe HM8001-2. The module connection terminals in the basic unit are led through 1 to 1. The modules can then be operated outside the mainframe while the housing is open.

### HZ815 Power Adapter for HM8115-2

Adapter for simplified measurement of power consumption, line voltage and current consumption of mains operated gear (3-wire safety plug or European standard plug) using the HM8115-2 Power Meter.
HZ520 Plug-in Antenna

Telescopic Antenna for RF reception
BNC connector

HZ547 VSWR Bridge

This unit is used to measure the voltage standing wave ratio (VSWR) and the reflection coefficient of a device under test with an impedance of 50Ω.

Typical test objects include attenuators, terminations, frequency switches, amplifiers, cables and mixers.

**Frequency range:** 100kHz...3GHz
**Impedance:** 50Ω
**Directivity:**
- >28dB (100…300kHz)
- >35dB (300kHz…1GHz)
- >30dB (1…3GHz)

**Reflection loss at DUT port:** >20dB
**Insertion loss**
- \( \text{IN} \rightarrow \text{OUT}: \) 20dB (100…300kHz)
- \( \text{IN} \rightarrow \text{OUT}: \) 18dB (300kHz…3GHz)
- \( \text{IN} \rightarrow \text{DUT}: \) 1.7dB
- \( \text{DUT} \rightarrow \text{OUT}: \) 16dB
**Max. Power Dissipation:** +26dBm
**Connectors:** N (female)
**Dimensions:** 150 x 68 x 29.5mm (W x H x D), without connectors
**Weight:** approx. 650g
**Temperature range:** +10…+45°C
**Accessories supplied:** HZ525 (Termination 50Ω 1W), N male to N male (2 pcs.), Carrying case 265 x 225 x 50mm (W x H x D)

Technical specifications: [typical values] see www.hameg.com/HZ547

HZ560 Transient Limiter

The HZ560 Transient Limiter protects the input circuits of spectrum analyzers and test receivers.

The input of the Transient Limiter is connected via BNC cable to the signal source. The output can be connected directly to the spectrum analyzer.

**Frequency range:** 150kHz…30MHz
- \( a = 10\text{dB} + 1.5/-0.5\text{dB} \)
- at \( f < 1\text{kHz} \) a ≥90dB
- at \( f < 10\text{kHz} \) a ≥50dB

**Insertion loss:** 10dB (+1.5/-0.5dB)
**Max. input level:** +33dBm (2W, average)
**Max. input voltage:** ±50Vdc
**VSWR:** 1.5:1 or better
**Connections:** BNC (input and output)
**Dimensions:** 67 x 32 x 32mm (W x H x D)

Technical specifications at 23°C ±2°C
<table>
<thead>
<tr>
<th>Rackmount Kit</th>
<th>Description</th>
<th>Dimensions (W x D)</th>
<th>Overhang</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HZ42 2RU 19” Rackmount Kit</strong></td>
<td>For mounting HAMEG instruments with a case height of 75mm (for Series B100, HM8143, HM7042-5, HM8001-2, HMP2020, HMP2030 and HMF Series).</td>
<td>440 x 360mm plus overhang of the instrument</td>
<td>88mm</td>
<td>Please order instruments, which are installed into HZ42, with note “without housing feet”, as otherwise the feet must be dismounted before installation.</td>
</tr>
<tr>
<td><strong>HZ43 3RU 19” Rackmount Kit</strong></td>
<td>For mounting HAMEG instruments with a case height of 125mm (for HM2005, HM303-6, HM504-2, HM507, HM5510, HM5014-2, HM5530, HM6050-2, HM7044, HMP4030*, HMP4040*).</td>
<td>440 x 360mm plus overhang of the instrument</td>
<td>132.5mm</td>
<td>When ordering instruments which are to be used with the HZ43 option installed, please state expressly “without feet”, because, if space is at a premium, those might have to be dismantled before the instrument can be placed.</td>
</tr>
<tr>
<td><strong>HZ45 4RU 19” Rackmount Kit</strong></td>
<td>For mounting HAMEG instruments with a case height of 125mm (for HM400, HM1000, HM1000-2, HM1008, HM1008-2, HM1500, HM1500-2, HM1508, HM1508-2, HM2005-2, HM2008).</td>
<td>440 x 360mm plus overhang of the instrument</td>
<td>177mm</td>
<td>* For reasons of stability and weight, if the space available in the rack permits, we recommend the HZP91. It allows to install and remove the instrument even with the feet in place.</td>
</tr>
<tr>
<td><strong>HZ46 4RU 19” Rackmount Kit</strong></td>
<td>For mounting HAMEG instruments with a case height of 175mm (for HMO3522/24, HMO2524 and HMS Series).</td>
<td>440 x 170mm plus overhang of the instrument</td>
<td>177mm</td>
<td></td>
</tr>
</tbody>
</table>
We recommend the HZO90 Carrying Case for protection and transport of oscilloscopes (HMO series). The instruments can be transported conveniently and safely in the case. An extra pocket provides space for test gear and accessories. Running the device inside the case is not permitted. (HMO72x, HMO102x, HMO152x, HMO202x)

HZ99 Carrying Case
We recommend the HZ99 Carrying Case for protection and transport of oscilloscopes (HMO series) and spectrum analyzers (HMS series). The instruments can be transported conveniently and safely in the case. An extra pocket provides space for test gear and accessories. Running the device inside the case is not permitted. (HMO2524, HMO352x, HMS)

HZP91 4RU 19" Rackmount Kit
For mounting HAMEG instruments with a case height of 125mm (for HMP4030, HMP4040).
Dimensions (W x D): 440 x 360mm plus overhang of the instrument
4 RU: 177mm

HZ090 Carrying Case
We recommend the HZ090 Carrying Case for protection and transport of oscilloscopes (HMO series). The instruments can be transported conveniently and safely in the case. An extra pocket provides space for test gear and accessories. Running the device inside the case is not permitted. (HMO72x, HMO102x, HMO152x, HMO202x)
Oscilloscopes

Spectrum Analysis

Power Supplies

Programmable Measuring Instruments
Series 8100

Modular System Series 8000

Options

Accessories

Specifications
### Specifications

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</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>350 MHz</td>
<td>250 MHz</td>
<td>200 MHz</td>
<td>150 MHz</td>
<td>100 MHz</td>
<td>70 MHz</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>1 MΩ/50 Ω</td>
<td>1 MΩ/50 Ω</td>
<td>1 MΩ/50 Ω</td>
<td>1 MΩ/50 Ω</td>
<td>1 MΩ/50 Ω</td>
<td>1 MΩ</td>
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<td>V/div. 1 MΩ</td>
<td>1 mV/div...5V/div.</td>
<td>1 mV/div...5V/div.</td>
<td>1 mV/div...5V/div.</td>
<td>1 mV/div...5V/div.</td>
<td>1 mV/div...10V/div.</td>
<td>1 mV/div...10V/div.</td>
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<tr>
<td>Max. Input voltage 1 MΩ</td>
<td>200 Vpk</td>
<td>200 Vpk</td>
<td>200 Vpk</td>
<td>200 Vpk</td>
<td>200 Vpk</td>
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<td>Horizontal</td>
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<tr>
<td>Sample Rate per Analog Channel</td>
<td>2 GSa/s</td>
<td>1.25 GSa/s</td>
<td>1 GSa/s</td>
<td>1 GSa/s</td>
<td>1 GSa/s</td>
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<tr>
<td>Max. Sample Rate</td>
<td>4 GSa/s</td>
<td>2.5 GSa/s</td>
<td>2 GSa/s</td>
<td>2 GSa/s</td>
<td>2 GSa/s</td>
<td>2 GSa/s</td>
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<tr>
<td>Memory Depth per Ch.</td>
<td>2 MPts.</td>
<td>2 MPts.</td>
<td>1 MPts.</td>
<td>1 MPts.</td>
<td>1 MPts.</td>
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<tr>
<td>Max. Memory</td>
<td>4 MPts.</td>
<td>4 MPts.</td>
<td>2 MPts.</td>
<td>2 MPts.</td>
<td>2 MPts.</td>
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<tr>
<td>Timebase Accuracy</td>
<td>15 ppm</td>
<td>15 ppm</td>
<td>50 ppm</td>
<td>50 ppm</td>
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<tr>
<td>Trigger</td>
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<tr>
<td>Trigger Modes</td>
<td>Edge, Pulse Width, Pattern, Video inl., HDTV, A/B Trigger</td>
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<tr>
<td>Measurement</td>
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<tr>
<td>Cursormeasurement List</td>
<td>ΔV, Δt, 1/Δt (t/t0), V to Gnd, Vt related to Trigger point, ratio X and Y, pulse count, peak to peak, peak+, peak-</td>
<td>Frequency, Period, pulse count, Vpp, Vp+, Vp-, Vrms, Vavg, Vtop, Vbase, V+peak, V-peak, twidth+, twidth-, tpeak+, tpeak-, pos. edge count, neg. edge count, pos. pulse count, neg. pulse count, etc.</td>
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<td>HW Counter</td>
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<tr>
<td>Advanced Math, Math on Math</td>
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<td>Math Functions std.</td>
<td>ADD, SUB, 1/X, ABS, MUL, DIV, SQ, POS, NEG, INV, INTO, DIFF, SQR, MIN, MAX, LOG, LN, Filter [low-pass, high-pass]</td>
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<td>Pass/Fail Mask testing</td>
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<tr>
<td>Mixed Signal</td>
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<tr>
<td>Mixed Signal Functionality</td>
<td>via Option H03508 [8 Channel] or H03516 [16 Channel]</td>
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<tr>
<td>Max. Number of Logic Channel</td>
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<td>16</td>
<td>8</td>
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<tr>
<td>Sample Rate of the Digital Channel</td>
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<td>1.25 GSa/s</td>
<td>1 GSa/s</td>
<td>1 GSa/s</td>
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<td>Memory Depth of the Digital Channel</td>
<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 I²C, SPI, UART/RS-232</td>
<td>H0010 via Analog Channels and/or Logic Channels</td>
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<td>Display</td>
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<td>Display Size</td>
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<tr>
<td>Monitor Output</td>
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<td>USB Remote Interface</td>
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<td>RS-232 Remote Interface</td>
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<td>Ethernet Remote Interface</td>
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<td>GPIB Remote Interface</td>
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<tr>
<td>Miscellaneous</td>
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<tr>
<td>Fan noise</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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<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>
<td>2.5 kg</td>
<td>2.5 kg</td>
<td>2.5 kg</td>
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<tr>
<td>Power</td>
<td>70 W max.</td>
<td>70 W max.</td>
<td>55 W max.</td>
<td>55 W max.</td>
<td>55 W max.</td>
<td>55 W 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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<td>German, English, French, Spain</td>
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</tbody>
</table>
Specifications

40 MHz Analog Oscilloscope HM400

**External Trigger:**
- LED Trigger Indicator:
- Test Voltage: adjustable on front panel

**Save and Recall:**
- automatic signal related parameter settings

**Autoset:**
- Manual: via controls and buttons

**Rise Time (calculated):**
- DC, 50 Ω: 62 ns (5 mV/div…20 V/div.)
- AC, 1 MΩ || 15 pF: 35 ns (1…2 mV/div.)
- ±3 % (5 mV/div…20 V/div.)

**Triggering:**
- Automatic: Linking of peak detection and trigger level
- Min. signal height: 0.5 div.
- Frequency range: 5 Hz…50 MHz
- Level control range: From peak- to peak+

**Deflection Coefficient:**
- Normal (without peak): 1–2–5 Sequence
- Variable [uncalibrated]: >2.5:1 to >50:div.
- Input Impedance:
  - DC, AC, GND (ground):
    - 1 MΩ || 15 pF ±2 pF
  - Input Impedance:
    - DC, AC, GND (ground):
      - 1 MΩ || 15 pF ±2 pF

**Inputs:**
- CH 1, CH 2 [CH 1…CH 4]
- Input sensitivity:
  - Between calibrated steps
  - Variable
- Max. Input Voltage:
  - 100 V (DC + peak AC)
  - 400 V (DC + peak AC)

**Trigger Indicator:**
- LED

**Horizontal System:**
- Time Base:
  - 100 ns/div….0.2 s/div (1–2–5 Sequence)
  - Accuracy: ±3 %
  - Variable [uncalibrated]: >2.5:1 to >12.5:1/div.
- X Magnification x10:
  - up to 10ns/div.
  - Accuracy: ±5 %
- Hold-Off Time:
  - variable to approx. 10:1
- XY
  - Bandwidth X amplifier:
    - 0…2.5 MHz [3 dB]
  - XY Phase shift <3°:
    - <120 kHz

**Operation/Readout/Control:**
- Manual:
  - via controls and buttons
- Autoset:
  - automatic signal related parameter settings
- Save and Recall:
  - 6 instrument parameter settings

**Component Tester:**
- Test Voltage:
  - approx. 7 V<sub>max</sub> [open circuit]
- Test Current:
  - approx. 7 mA<sub>max</sub> [short-circuit]
- Test Frequency:
  - approx. 50 Hz
- Test Connection:
  - 2 banana jacks 4 mm Ø

**Miscellaneous:**
- CRT:
  - D14-3636Y, 8 x 10 div. with internal graticule
- Acceleration Voltage:
  - approx. 2 kV
- Trace Rotation:
  - adjustable on front panel
- Z-Input (intens. modulation):
  - max. +5 V [TTL], 10 kHz

**Probe ADJ Output:**
- 1 kHz/1 MHz Square Wave Signal approx. 0.2 V<sub>pp</sub> [tr <5ns] for probe adjustment

**Power Supply (Mains):**
- 105…253 V, 50…60 Hz ±10 %, CAT II
- Safety class: I [EN61010-1]
- Operating temperature: +5…+40 °C
- Storage temperature: -20…+70 °C

**Recommended accessories:**
- HZ20 Adapter, BNC to 4 mm banana
- HZ33 Test cable 500, BNC/BNC, 0.5 m
- HZ34 Test cable 500, BNC/BNC, 1 m
- HZ45 19”-Rackmount Kit ARU
- HZ51 Probe 10:1 (150 MHz)
- HZ52 Probe 10:1 RF (250 MHz)
- HZ53 Probe 100:1 (1000 MHz)
- HZ100 Differential probe 20:1/200:1
- HZ109 Differential probe 1:1/10:1
- HZ115 Differential probe 1:1/100:1
- HZ200 Probe 10:1 with auto attenuation ID (250 MHz)
- HZ350 Probe 10:1 with automatic identification (350 MHz)
- HZ355 Stimline probe 10:1 with automatic identification [500 MHz]
- HZ200 High voltage probe 1000:1 (400 MHz, 1000 Vrms)
- HZ50 Active probe 100:1 (0.9 pF, 1 MΩ, including many accessories)
- HZ50 AC/DC Current probe 20 A, DC…100 kHz

**70 MHz 2 [4] Channel Digital Oscilloscope HM0722 [HM0724]**

**Display:**
- 16.5 cm (6.5") VGA Color TFT
- Resolution: 640 x 480 Pixel
- Backlight:
  - LED 400 cd/m²

**Display area for traces:**
- with menu:
  - 400 x 600 Pixel (8 x 12 div.)
  - 400 x 500 Pixel (8 x 10 div.)
- Color depth:
  - 256 colors
  - Variable (uncalibrated): <5 mV, <5 ns)

**Vetical System:**
- Channels:
  - DSO mode: CH 1, CH 2 [CH 1…CH 4]
  - MSO mode: CH 1, CH 2, CH 0…7 (logic channels) [CH 1, CH 2, CH 0…7, CH 4]
  - with Option HO3508
- Auxiliary input:
  - Frontside [Rear side]

**Auxiliary trigger:**
- Ext. Trigger
- Impedance:
  - 1 MΩ || 13 pF ±2 pF
- Coupling:
  - DC, AC
- Max. input voltage:
  - 100 V (DC + peak AC)

**Operation/Readout/Control:**
- Manual:
  - via controls and buttons
- Autoset:
  - automatic signal related parameter settings
- Save and Recall:
  - 6 instrument parameter settings

**Component Tester:**
- Test Voltage:
  - approx. 7 V<sub>max</sub> [open circuit]
- Test Current:
  - approx. 7 mA<sub>max</sub> [short-circuit]
- Test Frequency:
  - approx. 50 Hz
- Test Connection:
  - 2 banana jacks 4 mm Ø

**Miscellaneous:**
- CRT:
  - CRT4-3636Y, 8 x 10 div. with internal graticule
- Acceleration Voltage:
  - approx. 2 kV
- Trace Rotation:
  - adjustable on front panel
- Z-Input (intens. modulation):
  - max. +5 V [TTL], 10 kHz

**Probe ADJ Output:**
- 1 kHz/1 MHz Square Wave Signal approx. 0.2 V<sub>pp</sub> [tr <5ns] for probe adjustment

**Power Supply (Mains):**
- 105…253 V, 50…60 Hz ±10 %, CAT II
- Safety class: I [EN61010-1]
- Operating temperature: +5…+40 °C
- Storage temperature: -20…+70 °C
- Rel. humidity: 5…80 % [non condensing]

**Dimensions (W x H x D):**
- 285 x 125 x 380 mm
- Weight:
  - approx. 4.8 kg

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

**70 MHz 2 [4] Channel Digital Oscilloscope HM0722 [HM0724]**

**Display:**
- 16.5 cm (6.5") VGA Color TFT
- Resolution: 640 x 480 Pixel
- Backlight:
  - LED 400 cd/m²

**Display area for traces:**
- without menu:
  - 400 x 600 Pixel (8 x 12 div.)
  - 400 x 500 Pixel (8 x 10 div.)
- Color depth:
  - 256 colors
- Intensity steps per channel:
  - 0..31

**Vetical System:**
- Channels:
  - DSO mode: CH 1, CH 2 [CH 1…CH 4]
  - MSO mode: CH 1, CH 2, CH 0…7 (logic channels) [CH 1, CH 2, CH 0…7, CH 4]
  - with Option HO3508
- Auxiliary input:
  - Frontside [Rear side]

**Auxiliary trigger:**
- Ext. Trigger
- Impedance:
  - 1 MΩ || 13 pF ±2 pF
- Coupling:
  - DC, AC
- Max. input voltage:
  - 100 V (DC + peak AC)

**Operation/Readout/Control:**
- Manual:
  - via controls and buttons
- Autoset:
  - automatic signal related parameter settings
- Save and Recall:
  - 6 instrument parameter settings

**Component Tester:**
- Test Voltage:
  - approx. 7 V<sub>max</sub> [open circuit]
- Test Current:
  - approx. 7 mA<sub>max</sub> [short-circuit]
- Test Frequency:
  - approx. 50 Hz
- Test Connection:
  - 2 banana jacks 4 mm Ø

**Miscellaneous:**
- CRT:
  - CRT4-3636Y, 8 x 10 div. with internal graticule
- Acceleration Voltage:
  - approx. 2 kV
- Trace Rotation:
  - adjustable on front panel
- Z-Input (intens. modulation):
  - max. +5 V [TTL], 10 kHz

**Probe ADJ Output:**
- 1 kHz/1 MHz Square Wave Signal approx. 0.2 V<sub>pp</sub> [tr <5ns] for probe adjustment

**Power Supply (Mains):**
- 105…253 V, 50…60 Hz ±10 %, CAT II
- Safety class: I [EN61010-1]
- Operating temperature: +5…+40 °C
- Storage temperature: -20…+70 °C
- Rel. humidity: 5…80 % [non condensing]

**Dimensions (W x H x D):**
- 285 x 125 x 380 mm
- Weight:
  - approx. 4.8 kg

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

Max. input voltage: 200 V (DC + peak AC)
Measuring circuits: Measuring Category I (CAT I)
Position range: ±10 Divs
Logic channels: With Option H03508
Select. switching thresholds: TTL, CMOS, ECL, User -2...+8 V
Impedance: 100 kΩ || 4 pF
Coupling: DC
Max. input voltage: 40 V (DC + peak AC)

Triggering
Analog channels:
Automatic: Linking of peak detection and trigger level
Min. signal height: 0.8 divider, 0.5 divider, typ. |1.5 divider at ±2 mV/div.
Frequency range: 5 Hz...100 MHz [5 Hz...30 MHz at ±2 mV/div.]
Level control range: From peak- to peak-
Normal (without peak): 0.8 divider, 0.5 divider, typ. |1.5 divider at ±2 mV/div.
Frequency range: 0 Hz...100 MHz [0 Hz...30 MHz at ±2 mV/div.]
Level control range: -10...+10 divider.
Operating modes: Slope/Video/Lock/Pulse/Buses [optional]
Slope: Rising, falling, both
Sources: CH 1, CH 2, Line, Ext., LCH 0...7
(Change 1...CH 4, Line, Ext., LCH 0...7)
Coupling: AC: 5 Hz...100 MHz
(Digital Channel): DC: 0...100 MHz
(HF): 30 kHz...100 MHz
(LF): 0...5 kHz
Noise rejection: selectable

Video:
Standards: PAL, NTSC, SECAM, PAL-M, SDTV 576i, 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
State: LCH 0...7 X, H, L
Pulses: Positive, negative
Modes: 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
Auxiliary input 0.3 V...10 V
Ext. Trigger via: Slope/Video/Lock/Pulse/Buses [optional]
Slope: Rising, falling, both
Min. signal height: 0.8 divider, 0.5 divider, typ. |1.5 divider at ±2 mV/div.
Frequency range: 0 Hz...100 MHz [0 Hz...30 MHz at ±2 mV/div.]
Level control range: -10...+10 divider
Operating modes: after time
after incidence
Sources: CH 1, CH 2, Ext. (CH 1...CH 4)
Sources: CH 1, CH 2, Ext. [for Chip Select at SPI]
Format: hexadecimal, binary
1/C: Trigger on Start, Stop, Restart, NACK, Address (7 or 10 Bit), Data, Address and Data, up to 5 Mb/s
SPI: up to 32 Bit Data, Chip select [CS] pos. or neg., without CS, up to 12.5 Mbit/s
UART/RS-232: up to 8 Bit Data, up to 31 Mbit/s

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 [4 x 1 GSa/s, 2 x 2 GSa/s]
Logic channels: 8 x 1 GSa/s

Memory:
2 x 1 Mpts, 1 x 2 Mpts
[4 x 1 Mpts, 2 x 2 Mpts]

Operation modes:
Refresh, Average, Envelope, Peak-Detect
Roll: Free run/triggered, Filter, HiriEs
Resolution (vertical): 8 Bit, [HiriEs 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/sample rate]
posttrigger: 0...2 Million x [1/sample rate]
Display refresh rate: Up to 2000 waveforms/s
Display:
Dots, vectors, persistence
Reference memories: typ. 10 Traces

Operation/Measuring/interfaces
Operation:
Menu-driven [multilingual], Autoset, help functions [multilingual]
Save/Recall memories:
typ. 10 complete instrument parameter settings
Frequency counter:
0.5 Hz...100 MHz
6 Digit resolution
Accuracy: 50 ppm
Auto measurements:
Amplitude, standard deviation,
Vpp, Vp+, Vp-, Vrms, Vavg, Vtop, Vbase,
frequency, period, pulse count,
pos. edge count, neg. edge count,
pos. pulse count, neg. pulse count, trigger
frequency, trigger period, phase, delay
Cursor measurements:
ΔV, Δt, 1/Δt (f), V to Gnd, Vt 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),
2 x USB type A [front- and rear side
each 1 x] max. 100 mA,
DVI-D for ext. Monitor
Optional:
IEEE-488 (GPIB) (HO740),
Ethernet/USB (HO730)

Display functions
Marker:
up to 8 user definable marker for easy navigation
Virtual Screen:
virtual Display with 20div. vertical for
all Math-, Logic-, Bus- and Reference Signals
Busdisplay:
up to 2 buses, user definable, parallel or
serial buses [option], decode of the bus
value in ASCII, binary, decimal or hexa-
decimal, up to 4 lines
Parallel:
logic channels can also be used as source
for bus definition
I/C:
ocolor coded Read-, Write Address, Data,
Start, Stop, acknowledge, missing
acknowledge, Errors and Trigger condition
color coded Data, Start, Stop, Errors and
Trigger condition
SPI:
ocolor coded Data, Start, Stop, Errors and
Trigger condition
UART/RS-232:
color coded 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, SQRT, 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 output to printer for pass or fail,
event counting up to 4 billion, including
the number and the percentage of pass
and fail events
Specifications

General Information

Component tester
Test voltage: 10V, [open] typ.
Test current: 10mA, [short] typ.
Test frequency: 50Hz/200Hz typ.
Reference Potential: Ground (safety earth)
Probe ADJ Output: 1kHz/1 MHz square wave signal -1Vp...1Vp (ta < 4ns)

Bus Signal Source
Internal RTC
[Realtime clock]: Date and time for stored data
Line voltage: 100...240V, 50...60Hz, CAT II
Power consumption: Max. 45 W, typ. 25 W (max. 55 W, typ. 35 W)
Protective system: Safety class I (EN61010-1)
Storage temperature: +5...+40 °C
Operating temperature: 5...80 % (non condensing)
Rel. humidity: < 4 ns)

Weight:
Dimensions (W x H x D):
5 x 175 x 140 mm
Approx. 2.5 kg

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

Accessories supplied:
- Line cord
- Operating manual, 2 [4] Probes, 10:1/1:1 switchable [H2154], CD, Software
- Recommended accessories:
  - H0010 Serial bus trigger and hardware accelerated decode, I2C, SPI, UART/RS-232 on Logic channels and Analog channels
  - H0011 Serial bus trigger and hardware accelerated decode, I2C, SPI, UART/RS-232 on Analog channels
  - H03508 Active 8 Channel Logic Probe
  - H0730 Dual-Interface Ethernet/USB
  - H0740 Interface IEEE-488 [SPI/Parallel] galvanically isolated
  - HZ01 4RU 19” Rackmount Kit
  - HZ09 Carrying Case for protection and transport
  - HZ020 High voltage probe 1000:1 (400 MHz, 1000 Vrms)
  - HZ030 Active probe 1000 V (0.9 pF, 1 MD, including many accessories)
  - HZ050 AC/DC Current probe 20 A, DC...100 kHz
  - HZ051 AC/DC Current probe 1000 A, DC...20 kHz

100 MHz 2 [4] Channel Digital Oscilloscope
HM01022 [HM01024]

Product description, page 9

Display

- Display: 16.5cm (6.5”) VGA Color TFT
- Resolution: 640 x 480 Pixel
- backlight: LED 400 cd/m²
- 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: 265 colors
- Intensity steps per channel: 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) [CH 1, CH 2, LCH 0...7, CH 4]
  - with Option H03508
- Auxiliary input:
  - Frontside [Rear side]
- Function:
  - Ext. Trigger
- Impedance:
  - 1 MO [13 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]:
  - 100 MHz [5mV...10V/div.]
  - 20 MHz [1mV, 2mV/div.]
- Lower AC bandwidth:
  - 2 Hz
- Bandwidth limiter:
  - switchable, approx. 20 MHz
- Rise time (calculated):
  - 2.5 ns
- DC gain accuracy:
  - 2 %
- Input sensitivity:
  - 13 calibrated steps

CH 1, CH 2 [CH 1...CH 4]:
- Variable:
  - Between calibrated steps
- Inputs CH 1, CH 2 [CH 1...CH 4]:
  - Impedance:
    - 1 MO [14 pF ± 2 pF]
  - Coupling:
    - DC, AC, GND
  - Max. input voltage:
    - 200V [DC + peak AC]
  - Measuring circuits:
    - Measuring Category [CAT I]
  - Position range:
    - ±10 div
  - Logic channels:
    - With Option H03508
  - Select. switching thresholds:
    - TTL, CMOS, ECL, User -2...+8V
  - Impedance:
    - 100kΩ [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...150 MHz [5 Hz...30 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...150 MHz [0 Hz...30 MHz at ±2 mV/div.]
  - Level control range:
    - -10...+10 div.
- Operating modes:
  - Slope: Rising, falling, both
- Sources:
  - CH 1, CH 2, Line, Ext., LCH 0...7 [CH 1...CH 4, Line, Ext., LCH 0...7]
  - Coupling:
    - AC: 5Hz...150 MHz
  - Analog Channel:
    - DC: 0...150 MHz
    - HF: 30kHz...150 MHz
    - LF: 0...5kHz
- Noise rejection: selectable

Video:

- Standards:
  - PAL, NTSC, SECAM, PAL-M, SDTV 576i, 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
- State:
  - LCH 0...7 X, H, L
- Pulses:
  - Positive, negative
  - Modes:
    - 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 ±2 mV/div.]]
- Frequency range:
  - 0 Hz...150 MHz [0 Hz...30 MHz at ±2 mV/div.]
- Level control range:
  - -10...+10 div.
- Operating modes:
  - after time: 32 ns...10 s
  - after incidence: 1...2µs
- Buses (Opt. H0010):
  - I2C/SPI/UART/RS-232
  - Sources:
    - CH 1, CH 2, Ext., LCH 0...7 [CH 1...CH 4, Ext., LCH 0...7]
- Buses (Opt. H0011):
  - I2C/SPI/UART/RS-232
  - Sources:
    - CH 1, CH 2, Ext. [for Chip Select at SPI] [CH 1...CH 4, Ext.] [for Chip Select at SPI]
- Format:
  - hexadecimal, binary
- I2C:
  - Trigger on Start, Stop, Restart, NACK, Address (7 or 10Bit), Data, Address and Data, up to 5Mbps/s
- SPI:
  - up to 32Bit Data, Chip select [CS] pos. or neg., without CS, up to 12.5Mbps/s
- UART/RS-232:
  - up to 8Bit Data, up to 31Mbps/s

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:
  - 2ns/div...50s/div.
### Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Information</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Test voltage:</strong></td>
<td>10V, open-circuit type</td>
</tr>
<tr>
<td><strong>Test current:</strong></td>
<td>10mA (short-circuit type)</td>
</tr>
<tr>
<td><strong>Test frequency:</strong></td>
<td>50Hz / 200Hz typ.</td>
</tr>
<tr>
<td><strong>Reference Potential:</strong></td>
<td>Ground (safety earth)</td>
</tr>
<tr>
<td><strong>Probe ADJ Output:</strong></td>
<td>1kHz / 1MHz square wave signal (~1V) (via 4 wires)</td>
</tr>
<tr>
<td><strong>Bus Signal Source:</strong></td>
<td>SPI, I2C, UART, Parallel (4 Bit)</td>
</tr>
<tr>
<td><strong>Internal RTC:</strong></td>
<td>Realtime clock: Date and time for stored data</td>
</tr>
<tr>
<td><strong>Line voltage:</strong></td>
<td>100…240V, 50…60Hz, CAT II</td>
</tr>
<tr>
<td><strong>Power consumption:</strong></td>
<td>Max. 45W, typ. 25W (max. 55W, typ. 35W)</td>
</tr>
<tr>
<td><strong>Protective system:</strong></td>
<td>Safety class II (EN61010-1)</td>
</tr>
<tr>
<td><strong>Operating temperature:</strong></td>
<td>+5…+40°C</td>
</tr>
<tr>
<td><strong>Storage temperature:</strong></td>
<td>-20…+70°C</td>
</tr>
<tr>
<td><strong>Rel. humidity:</strong></td>
<td>5…80% (non condensing)</td>
</tr>
<tr>
<td><strong>Dimensions:</strong></td>
<td>285 x 175 x 140mm</td>
</tr>
<tr>
<td><strong>Weight:</strong></td>
<td>&lt;2.5kg</td>
</tr>
</tbody>
</table>

### Accessories supplied:

### Recommended accessories:
- HZO10 Serial bus trigger and hardware accelerated decode, PC, SPI, UART/RS-232 on Logic channels and Analog channels
- HZO11 Serial bus trigger and hardware accelerated decode, PC, SPI, UART/RS-232 on Analog channels
- HZO30 Active Channel Logic Probe
- HZO730 Dual-Interface Ethernet/USB
- HZO740 Interface IEEE-488 (GPIB) galvanically isolated
- HZO91 4RU 19” Rackmount Kit
- HZO90 Carrying Case for protection and transport
- HZO20 High voltage probe 1000:1 400MHz, 1000Vrms |
- HZO30 Active probe 1GHz (0.99 pF, 150Ω, included many accessories) |
- HZO50 AC/DC Current probe 20A, DC…100kHz |
- HZO51 AC/DC Current probe 1000A, DC…20kHz |

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### 150 MHz 2 [4] Channel Digital Oscilloscope

**Product description, page 8**

**Display**
- **Display:** 16.5 cm (6.5”) VGA Color TFT
- **Resolution:** 640 x 480 Pixel
- **Backlight:** LED 400 cd/m²
- **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, CH 3, 4
- **Auxiliary input:** Frontside (Rear side)
- **Function:** Ext. Trigger
- **Impedance:** 1MΩ ± 14 Ω ± 2 PF
- **Coupling:** DC, AC
- **Max. input voltage:** 100V [DC + peak AC]
- **XY2-mode:** All analog channels on individual choice
- **Invert:** CH 1, CH 2 (CH 1…CH 4)
- **Y-bandwidth (-3dB):**
  - 150 MHz (5mV, 10V/div)
  - 100 MHz (1mV, 2mV/div)
### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower AC bandwidth</td>
<td>2 Hz</td>
</tr>
<tr>
<td>Bandwidth limiter</td>
<td>approx. 20 MHz</td>
</tr>
<tr>
<td>Rise time (calculated)</td>
<td>≤2.4 ns</td>
</tr>
<tr>
<td>-rise time</td>
<td></td>
</tr>
<tr>
<td>DC gain accuracy</td>
<td>2 %</td>
</tr>
<tr>
<td>Input sensitivity</td>
<td>12 calibrated steps</td>
</tr>
<tr>
<td>CH 1, CH 2 [CH 1...CH 4]</td>
<td>1 mV/div...10 V/div. (1–2–5 Sequence)</td>
</tr>
<tr>
<td>Variable</td>
<td>Between calibrated steps</td>
</tr>
<tr>
<td>Inputs CH 1, CH 2 [CH 1...CH 4]</td>
<td></td>
</tr>
<tr>
<td>Impedance</td>
<td>1 MQ</td>
</tr>
<tr>
<td>Coupling</td>
<td>DC, AC, GND</td>
</tr>
<tr>
<td>Max. input voltage</td>
<td>200 V [DC + peak AC], 500 &lt; V&lt;sub&gt;ref&lt;/sub&gt;</td>
</tr>
<tr>
<td>Measuring circuits</td>
<td>Measuring Category (CAT I)</td>
</tr>
<tr>
<td>Position range</td>
<td>±10 DIVs</td>
</tr>
<tr>
<td>Offset control</td>
<td>1 mV, 2 mV</td>
</tr>
<tr>
<td>Logic channels</td>
<td>up to 32 Bit Data, Chip select [CS]</td>
</tr>
<tr>
<td>Operating modes</td>
<td>Trigger on Start, Stop, Restart, NACK, Address (7 or 10Bit), Data, Address and Data, up to 5MB/s</td>
</tr>
<tr>
<td>SPI</td>
<td>up to 32 Bit Data, Chip select [CS] pos. or neg., without CS, up to 12.5 MB/s</td>
</tr>
<tr>
<td>UART/RS-232</td>
<td>up to 8 Bit Data, up to 31 MB/s</td>
</tr>
<tr>
<td>Internal bus</td>
<td>I2C/SPI/UART/RS-232</td>
</tr>
<tr>
<td>Operation modes</td>
<td>Refresh, Average, Envelope, Peak-Detect Roll: free run/triggered, Filter, HiRes</td>
</tr>
<tr>
<td>Memory</td>
<td>2 x 1 MIPs, 1 x 2 MIPs</td>
</tr>
<tr>
<td>Resolution (horizontal)</td>
<td>40 ps</td>
</tr>
<tr>
<td>Interpolation</td>
<td>Sinc/s, Linear, Sample-hold</td>
</tr>
<tr>
<td>Persistence</td>
<td>Off, 50 ms…+∞</td>
</tr>
<tr>
<td>Delay pretrigger</td>
<td>0…8 Million x [1/samplerate]</td>
</tr>
<tr>
<td>posttrigger</td>
<td>0…2 Million x [1/samplerate]</td>
</tr>
<tr>
<td>Display refresh rate</td>
<td>Up to 2000 waveforms/s</td>
</tr>
<tr>
<td>Reference memories</td>
<td>typ. 10 Traces</td>
</tr>
<tr>
<td>Video</td>
<td>PAL, NTSC, SECAM, PAL-M, SDTV 576i, HDTV 720p, HDTV 1080i, HDTV 1080p</td>
</tr>
<tr>
<td>Fields</td>
<td>Field 1, field 2, both</td>
</tr>
<tr>
<td>Line</td>
<td>All, selectable line</td>
</tr>
<tr>
<td>Sync. Impulse</td>
<td>Positive, negative</td>
</tr>
<tr>
<td>Logic sources</td>
<td>CH 1, CH 2, Ext. (CH 1…CH 4)</td>
</tr>
<tr>
<td>Logic</td>
<td>AND, OR, TRUE, FALSE</td>
</tr>
<tr>
<td>Logic channels</td>
<td>8 x 1 GSa/s</td>
</tr>
<tr>
<td>State</td>
<td>LCH 0…7 X, H, L</td>
</tr>
<tr>
<td>Pulses</td>
<td>Positive, negative</td>
</tr>
<tr>
<td>Modes</td>
<td>equal, unequal, less than, greater than, within/without a range</td>
</tr>
<tr>
<td>Range</td>
<td>min. 32 ns, max. 10 s, resolution min. 8 ns</td>
</tr>
<tr>
<td>Sources</td>
<td>CH 1, CH 2, Ext. (CH 1…CH 4)</td>
</tr>
<tr>
<td>Indicator for trigger action</td>
<td>LED</td>
</tr>
<tr>
<td>Ext. Trigger via</td>
<td>Auxiliary input 0.3 V…10 V&lt;sub&gt;p&lt;/sub&gt;</td>
</tr>
<tr>
<td>2nd Trigger</td>
<td>Raising, falling, both</td>
</tr>
<tr>
<td>Slope</td>
<td>0.8 div., 0.5 div. typ. [1.5 div. at 2 mV/div.]</td>
</tr>
<tr>
<td>Frequency range</td>
<td>0 Hz…200 MHz</td>
</tr>
<tr>
<td>Level control range</td>
<td>-10…+10 div. from center of the screen</td>
</tr>
<tr>
<td>Operating modes</td>
<td>Slope, Video/Logic/Pulses/Buses optional</td>
</tr>
<tr>
<td>Interface</td>
<td>Dual-Interface USB type B/RS-232 [HO720], 2 x USB type A (front- and rear side each 1 x) max. 100 mA, DVI-D for ext. Monitor</td>
</tr>
<tr>
<td>Marker</td>
<td>up to 8 user definable marker for easy navigation</td>
</tr>
<tr>
<td>Virtual Screen</td>
<td>virtual Display with 20 div. vertical for all Math-, Logic-, Bus- and Reference Signals</td>
</tr>
<tr>
<td>Busdisplay</td>
<td>up to 2 buses, user definable, parallel or serial buses (option), decode of the bus value in ASCII, binary, decimal or hexadecimal, up to 4 lines</td>
</tr>
<tr>
<td>Parallel</td>
<td>logic channels can also be used as source for bus definition</td>
</tr>
<tr>
<td>I²C</td>
<td>color coded Read-, Write Address, Data, Start, Stop, acknowledge, missing acknowledge, Errors and Trigger condition</td>
</tr>
<tr>
<td>SPI</td>
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Specifications

Mathematic functions

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<th>Number of formula sets:</th>
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<tr>
<td>Display:</td>
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</table>

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: \(10\text{VP (open) typ.}\)
- Test current: \(10\text{mA} \text{[short] typ.}\)
- Test frequency: \(50\text{Hz}/200\text{Hz typical}\)
- Reference Potential: Ground (safety earth)
- Probe ADJ Output: \(1\text{kHz}/1\text{MHz square wave signal ~1V}_{pp} \text{[ta <4ns]}\)

Bus Signal Source

- SPI, I^2C, UART, Parallel (4 Bit)

Internal RTC

- Realtime clock: Date and time for stored data
- Line voltage: \(100\text{…}240\text{V}, 50\text{…}60\text{~Hz, CAT II}\)
- Power consumption: Max. 45 W, typ. 25 W (max. 55 W, typ. 35 W)
- Operating temperature: \(+5\text{…}+40\text{ °C}\)
- Storage temperature: \(-20\text{…}+70\text{ °C}\)
- Rel. humidity: \(5\text{…}80\text{ % (non condensing)}\)
- Dimensions (W x H x D): \(265\text{ x }175\text{ x }140\text{ mm}\)
- Weight: \(<2.5\text{ kg}\)

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

Accessories supplied:

- Line cord, Operating manual, 2 [4] Probes,
- 10:1 with attenuation ID (H2010), CD, Software


Product description, page 8

Display

- Display: \(16.5\text{cm (6.5’’ VGA Color TFT}\)
- Resolution: \(640 \times 480 \text{ Pixel}\)
- Backlight: \(400 \text{ cd/m}^2\)
- Display area for traces: without menu \(400 \times 600 \text{ Pixel \[8 x 12 div.\]}\)
- with menu \(400 \times 500 \text{ Pixel \[8 x 10 div.\]}\)
- Color depth: \(256\text{ colors}\)
- Intensity steps per trace: \(0…31\)

Vertical System

- Channels: \(DSO \text{ mode CH 1, CH 2 [CH 1…CH 4]}\)
- \(M50 \text{ mode CH 1, CH 2, LCH 0…7 (logic channels)[CH 1, CH 2, LCH 0…7, CH 4]}\)
  - with Option HO3508
- Auxiliary input: \(\text{Frontside [Rear side]}\)
- Function: Ext. Trigger
- Impedance: \(1 \text{M} \Omega \pm 4 \%\text{[200 ohm switchable]}\)
- Coupling: DC, AC
- Max. input voltage: \(\text{100V [DC + peak AC]}\)
- X/Y-mode: All analog channels on individual choice
- Invert: \(\text{CH 1, CH 2 [CH 1…CH 4]}\)
- Y-bandwidth (-3 dB): \(200\text{MHz \[5mV…10V/Div\]}, 100\text{MHz \[1mV, 2mV/Div\]}\)
- Lower AC bandwidth: \(2\text{Hz}\)
- Bandwidth limiter: \(\text{(with selectable)} \approx 20\text{MHz}\)
- Rise time (calculated): \(<1.75\text{ms}\)
- DC gain accuracy: \(2\%\)
- Input sensitivity: \(12 \text{calibrated steps}\)
- CH 1, CH 2 [CH 1…CH 4]: \(1\text{mV/div…10V/Div, [1-2-5 Sequence]}\)
- Variable: \(8\text{Between calibrated steps}\)
- Inputs CH 1, CH 2 [CH 1…CH 4]: \(1 \text{mV/div…10V/Div, [1-2-5 Sequence]}\)
- Measuring circuits: Measuring Category I [CAT I]
- Position range: \(<10\text{Divs}\)
- Offset control: \(1\text{mV, 2mV \pm0.2V \text{– 10 div. x Sensitivity}}\)
- \(5…50\text{mV \pm1V \text{– 10 div. x Sensitivity}}\)
- \(100\text{mV \pm2.5V \text{– 10 div. x Sensitivity}}\)
- \(200\text{mV…2V \pm40V \text{– 10 div. x Sensitivity}}\)
- \(5 \text{V \pm100V \text{– 10 div. x Sensitivity}}\)
- Logic channels: \(\text{With Option HO3508}\)
- Select. switching: \(\text{TTL, CMOS, ECL, User -2…+8V}\)
- Impedance: \(100\text{k} \Omega \ll 1\text{PF}\)
- Coupling: DC
- Max. input voltage: \(40\text{V [DC + peak AC]}\)

Triggering

Analog channels:

- Automatic: \(\text{Linking of peak detection and trigger level}\)
- Min. signal height: \(0.8\text{div.}, 0.5\text{div. typ. [1.5 div. at }\pm2\text{mV/div]}\)
- Frequency range: \(5\text{Hz…250MHz [5Hz…120MHz at }\pm2\text{mV/div]}\)
- Level control range: \(\text{From peak- to peak}\)
- Normal [with peak]: \(0.8\text{div., 0.5 div. typ. [1.5 div. at }\pm2\text{mV/div]}\)
- Frequency range: \(0\text{Hz…250MHz [10Hz…120MHz at }\pm2\text{mV/div]}\)
- Level control range: \(\pm10\text{div. from center of the screen}\)
- Operating modes: \(\text{Slope/Vide/Logic/Pulses/Buses [optional]}\)
- Slope: \(\text{Rising, falling, both}\)
- Sources: \(\text{CH 1, CH 2, Line, Ext., LCH 0…7 [CH 1…CH 4, Line, Ext., LCH 0…7]}\)
- Coupling: \(5\text{Hz…250MHz [5Hz…250MHz]}\)
- [Analog Channel]: \(\text{DC: 0…250MHz}\)
- \(\text{HF: 30kHz…250MHz}\)
- \(\text{LF: 0…5kHz}\)
- Noise rejection: selectable

Video:

- Standards: \(\text{PAL, NTSC, SECAM, PAL-M, SDTV 576i, HD720p, HDTV 1080i, HDTV 1080p}\)
- Fields: \(\text{Field 1, field 2, both}\)
- Line: \(\text{All, selectable line number}\)
- Sync. Impulse: \(\text{Positive}\)
- Sources: \(\text{CH 1, CH 2, Ext. [CH 1…CH 4]}\)
- Logic: \(\text{AND, OR, TRUE, FALSE}\)
- Sources: \(\text{LCH 0…7}\)
- State: \(\text{LCH 0…7, X, H, L}\)
- Pulses: \(\text{Positive, negative}\)
- Modes: \(\text{equal, unequal, less than, greater than, when/without a range}\)
- Range: \(\text{min. 32 ns, max. 10s, resolution min. 8ns}\)
- Sources: \(\text{CH 1, CH 2, Ext. [CH 1…CH 4]}\)
- Indicator for trigger action: \(\text{LED}\)
- Ext. Trigger via: \(\text{Auxiliary input 0.3V…10V}_{pp}\)
- 2nd Trigger:
  - Slope: \(\text{Rising, falling, both}\)
  - Min. signal height: \(0.8\text{div.}, 0.5\text{div. typ. [1.5 div. at }\pm2\text{mV/div]}\)
  - Frequency range: \(0\text{Hz…250MHz [0Hz…120MHz at }\pm2\text{mV/div]}\)
Specifications

Level control range: -10...+10 div.

Operating modes:

after time: 32ns...10s

after incidence: 1.2TH

Buses (Opt. H0010):

I²C/SP/IUART/RS-232

Sources:

CH 1, CH 2, Ext., LCH 0...7

[CH 1...CH 4, Ext.] for Chip Select at SPI

Format:

I²C Trigger on Start, Stop, Restart, NACK, Address (7 or 10Bit), Data, Address and Data, up to 5MB/s

SPI up to 32 Bit Data, Chip select (CS) pos. or neg, without CS, up to 12.5MB/s

UART/RS-232 up to 880KBit, up to 31MB/s

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 1Gs/s

Memory:

2 x 1Mpts, 1 x 2Mpts

[4 x 1Mpts, 2 x 2Mpts]

Operation modes: Refresh, Average, Envelope, Peak-Detect

Roll: free run/triggered, Filter, HiRes

Resolution (vertical): 8Bit, (HiRes up to 10Bit)

Resolution (horizontal): 40ps

Interpolation: Sine, linear, Sample-hold

Persistence: Off, 50 ms...

Delay prerelayer: 0...8 Million x (1/samplerate)

posttrigger: 0...2 Million x (1/samplerate)

Display refresh rate: Up to 2000 waveforms/s

Display: Dots, vectors, Persistence

Reference memories: typ. 10 Traces

Operation/Measuring/Interfaces

Operation: Menu-driven (multilingual), Autoset, help functions (multilingual)

Save/Recall memories: typ. 10 complete instrument parameter settings

Frequency counter:

50Hz...250MHz

6 Digit resolution

Accuracy: 50ppm

Auto measurements:

Amplitude, standard deviation, 

Vpp, Vp+, Vp-, Vrms, Vavg, Vtop, Vbase, freq., frequency, pulse count, 

edge, Errors and Trigger condition

Cursor measurements:

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 (H0720), 2 x USB type A (front- and rear side) each 1 x max. 100mA.

Optional: IEEE-488 (GPIB) (H0740), Ethernet/USB (H0730)

Parallel logic channels can also be used as source for bus definition

I²C (Opt. H0010, H0011)

color coded Read-, Write Address, Data, Start, Stop, acknowledge, missing acknowledge, Errors and Trigger condition

SPI (Opt. H0010, H0011)

color coded 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, SQ, POS, NEG, INW, INTG, Diff, SQR, MIN, MAX, LOG, LN, Low-, High-pass filter

Display: Up to 4 mathe. 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:

10V, [open], typ. 10mA [short], typ.

Test current:

Max. 85W, typ. 25W [max. 55W, typ. 35W]

Symbol: 100...240V, 50...60 Hz, CAT II

Power consumption:

Max. 45W, typ. 25W [max. 55W, typ. 35W]

Operating temperature:

-5...+40°C

Storage temperature:

-20...+70°C

Rel. humidity:

5...80% (non condensing)

Dimensions (W x H x D):

265 x 175 x 140 mm

Weight:

<2.5kg

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


Recommended accessories:

HO010 Serial bus trigger and hardware accelerated decode, I²C, SPI, UART/RS-232 on Logic channels and Analog channels

HO011 Serial bus trigger and hardware accelerated decode, I²C, SPI, UART/RS-232 on Analog channels

H03508 Active 8 Channel Logic Probe

H0740 Interface IEEE-488 (GPIB) galvanically isolated

HZ091 4RU 19" Rackmount Kit

HZ090 Carrying Case for protection and transport

HZ020 High voltage probe 1000:1 [400Mhz, 1000V, 1MHz]

HZ030 Active probe 1GHz 10.9pF, 1MO, including many accessories

HZ050 AC/DC Current probe 20A, DC...100kHz

HZ051 AC/DC Current probe 1000A, DC...20kHz
250 MHz 4 Channel Digital Oscilloscope HMO2524

Product description, page 7

**Specifications**

**Display**
- **Display:** 16.5 cm (6.5”) VGA Color TFT
- **Resolution:** 640 x 480 Pixel
- **Backlight:** LED 400 cd/m²
- **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:** 265 colors
- **Intensity steps per channel:** 0…31

**Vertical System**
- **Channels:**
  - **D50 mode**
  - **M50 mode**
- **Auxiliary input:** Rear side
- **Function:** Ext. Trigger
- **Impedance:** 1 MΩ || 13 pF ±2 pF
- **Max. input voltage:** 100 V [DC + peak AC]
- **XY-bandwidth (-3 dB):**
  - 250 MHz [5mV…5V]/div.
  - 100 MHz [1mV, 2mV]/div.
- **Lower AC bandwidth:** 2 Hz
- **Bandwidth limiter:** approx. 20 MHz
- **Rise time (calculated):** <1.5 ns
- **DC gain accuracy:** 2 %
- **Input sensitivity:** 12 calibrated steps
- **CH 1…CH4:**
  - CH 1…CH 3 LCH 0…7
  - (with 1x Option H0350B)
  - CH 1, CH 2, LCH 0…15
  - (with 2x Option H0350B)
- **Variable:** Between calibrated steps
- **Impedance:** 1 MΩ || 13 pF ±2 pF (500 switchable)
- **Max. input voltage:** 200 V [DC + peak AC], 500 ±5 V RMS
- **Measuring circuits:**
  - Measuring Category I (CAT I)
- **Position range:** ±10 Divs
- **Offset control:**
  - 1 mV, 2 mV ±0.2 V
  - 5…50 mV ±1 V
  - 100 mV…5 V ±20 V
- **Logic channels:**
  - With Option H0350B
  - Select. switching thresholds TTL, CMOS, ECL, 2x User -2…+8 V
  - Impedance 100 kΩ ±<4 pF
  - Coupling DC
  - Max. input voltage 40 V [DC + peak AC]

**Triggering**
- **Analog channels:**
  - **Automatic:** Linking of peak detection and trigger level
  - Min. signal height 0.8 div, 0.5 div typ.
  - Frequency range 5 Hz…300 MHz
  - Level control range From peak- to peak+
  - Normal [without peak]:
    - Min. signal height 0.8 div, 0.5 div typ.
    - Frequency range 0…300 MHz
    - Level control range -10…+10 div.
- **Operating modes:**
  - Slope/Video/Logic/Pulse/Buses (optional)
  - Sources:
    - CH 1…CH 4, Line, Ext., LCH 0…15
  - **Coupling:**
    - AC: 5 Hz…300 MHz
    - DC: 0…300 MHz
    - HF: 30 kHz…300 MHz
    - LF: 0…5 kHz
  - **Noise rejection:** 100 MHz LPF selectable
- **Video:**
  - Standards:
    - PAL, NTSC, SECAM, PAL-M, SDTV 576i, HDTV 720p, HDTV 1080i, HDTV 1080p
  - Fields:
    - Field 1, field 2, both

**Line**
- All, selectable line number

**Sync. Impulse**
- Positive, negative

**Source**
- CH 1…CH 4

**Logic**
- AND, OR, TRUE, FALSE

**Source**
- LCH 0…15

**State**
- LCH 0…15 X, H, L

**Pulse**
- Negative, positive

**Modes**
- equal, unequal, less than, greater than, with/without a range

**Range**
- min. 8 ns, max. 134,217 ms, resolution from 8 ns to 1 µs

**Sources:**
- CH 1, CH 2, Ext. [CH 1…CH 4]

**Indicator for trigger action:**
- LED

**Ext. Trigger via:**
- Auxiliary input 0.3 V…10 Vpp

**2nd Trigger:**
- Rising, falling, both

**Min. signal height**
- 0.8 div.; 0.5 div. typ.

**Frequency range**
- 0…300 MHz

**Level control range**
- -10…+10 div.

**Operating modes:**
- after time 20 ns…0.1 s
- after incidence 1…2 ns

**Buses (Opt. H0010):**
- I²C/SPI/JUART/RS-232

**Sources:**
- CH 1, CH 2, Ext., LCH 0…7
- [CH 1…CH 4, Ext., LCH 0…7]

**Buses (Opt. H0011):**
- I²C/SPI/JUART/RS-232
- [CH 1…CH 4, Ext. [for Chip Select at SPI]]

**Format**
- hexadecimal, binary

**I²C/SPI/UART/RS-232 Buses (Opt. H011):**
- Trigger on Start, Stop, Restart, NACK, Address (7 or 10 Bit), Data, Address and Data, up to 5 Mb/s

**SPI**
- 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]
- **Representation Time Base:** Main-window, main- and zoom-window
- **Memory Zoom:** Up to 100,000:1
- **Accuracy:** 15 ppm

**Time Base:**
- Refresh operating modes 2ns/div…20 ms/div.
- Roll operating modes 50 ms/div…50 s/div.

**Digital Storage**
- **Sampling rate (real time):**
  - 4 x 1.25 GSa/s, 2 x 2.5 GSa/s
- **Sampling rate (random):**
  - 25 GSa/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, Filter
- **Resolution (vertical):** 8 Bit
- **Resolution (horizontal):**
  - Yt Mode 50 Pts./div.
  - XY Mode 8 Bit
- **Interpolation:**
  - Sin(x) [CH 1…CH 4], Pulse [LCH 0…15]
- **Persistency:**
  - Off, 50 ms…∞
- **Delay pretrigger:**
  - 0.2 Million x [1/samplerate]
  - 0.8 Million x [1/samplerate]
- **Display refresh rate:**
  - Up to 2500 waveforms/s
- **Display:**
  - Dots, vectors, interpolation, persistence
- **Reference memories:**
  - typ. 10 Traces

**Operation/Measuring/Interfaces**
- **Operation:** Menu-driven (multilingual), Autoset, help functions (multilingual)
- **Save/Recall memories:**
  - typ. 10 complete instrument parameter settings
- **Frequency counter:**
  - 0.5 Hz…300 MHz
    - 4 Digit resolution
- **Accuracy:**
  - 15 ppm
- **Auto measurements:**
  - Amplitude, standard deviation, Vpp, Vp+, Vp-, Vrms, Vavg, Vtop, Vbase, frequency, period, pulse count, tmax, tmin, tavg, tmid, ttop, tbase, pos. edge count, neg. edge count, pos. pulse count, neg. pulse count, trigger frequency, trigger period, phase, delay
Specifications

**Interface:**
- Dual-Interface USB/RS-232 (H0720), USB-Stick (frontside)
- USB-Printer (rear side) for Postscript Printer, DVI-D for ext. monitor
- IEEE-488 (GPIB) (H0740), Ethernet/USB (H0730)

**Optional:**
- HO730 Dual-Interface Ethernet/USB
- HO740 Interface IEEE-488 (GPIB) galvanically isolated
- HO3516 2 x HO3508, active 8 Channel Logic Probes
- HO3522 [H03524] Product description, page 6
- HZ355 Slimline Probe 10:1 with automatic identification
- HZ350DU Upgrade from 2x HZ350 to 2x HZ355
- HZ020 High voltage probe 1000:1 [400MHz, 1000Vrms,]
- HZ030 Active probe 1GHz [0.5PF, 1MO, including many accessories]
- HZ050 AC/DC Current probe 20A, DC...100kHz
- HZ051 AC/DC Current probe 1000A, DC...20kHz

**Display functions**
- Marker: up to 8 user definable marker for easy navigation
- VirtualScreen: virtual Display with 20div vertical for all Math-, Logic-, Bus- and Reference Signals
- Busdisplay: up to 2 buses, user definable, parallel or serial buses (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
- I²C [Opt. H0010, H0011]: color coded Read-, Write Address, Data, Start, Stop, acknowledge, missing acknowledge, 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, 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), 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/1 MHz square wave signal approx.
- Bus Signal Source: SPI, I²C, UART, Parallel [4Bit]
- Internal RTC [Realtime clock]: Date and time for stored data
- Line voltage: 105...253V, 50...60Hz, CAT II
- Power consumption: Max. 70 W at 230 V, 50 Hz
- Protective system: Safety class I (EN61010-1)
- Operating temperature: +5...+40 °C
- Storage temperature: -20...+70 °C
- Rel. humidity: 5...80 % (non condensing)
- Dimensions [W x H x D]: 285 x 175 x 220 mm
- Weight: 3.6 kg

**Cursor measurements:** \(\Delta V, \Delta t, 1/\Delta t, V\) to 6Gnd, \(V\) to related to Trigger point, ratio X and Y, pulse count, peak to peak, peak+, peak-, mean value, RMS value, standard deviation

**Busdisplay:** up to 8 user definable marker for easy navigation

**Recommended accessories:**
- H0010 Serial bus trigger and hardware accelerated decode, I²C, SPI, UART/RS-232 on Logic channels
- H0011 Serial bus trigger and hardware accelerated decode, I²C, SPI, UART/RS-232 on Analog channels
- H03508 Active 8 Channel Logic Probe
- H03516 2 x H03508, active 8 Channel Logic Probes
- HZ730 Dual-Interface Ethernet/USB
- HZ740 Interface IEEE-488 (GPIB) galvanically isolated
- HZ46 4RU 19” Rackmount Kit

**Accessories supplied:** Line cord, Operating manual, 4 Probes, 10:1 with attenuation ID [H0350], CD, Software

**350 MHz 2 [4] Channel Digital Oscilloscope**

**Display**
- Display: 16.5 cm (6.5”) VGA Color TFT
- Resolution: 640 x 480 Pixel
- Backlight: LED 400 cd/m²
- 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 channel: 0...31

**Vertical System**
- Channels:
  - DSO mode: CH 1, CH 2 [CH 1...CH 4]
  - MSO mode: CH 1, CH 2, LCH 0...15
- Auxiliary input:
  - Frontside (optional)
- Function: Ext. Trigger
- Impedance: 1 MO [13 PF ±2 PF]
- Coupling: DC, AC
- Max. input voltage: 1000VDC + peak AC

**Auxiliary trigger**
- XYZ-mode: All analog channels on individual choice
- Invert:
  - CH 1, CH 2 [CH 1...CH 4]
- Y-bandwidth (1-3 dB):
  - 350MHz [5mV...5V] /div.
  - 100MHz [1mV, 2mV] /div.
- Lower AC bandwidth:
  - 2Hz
- Bandwidth limiter [switchable]: approx. 20MHz
- Rise time (calculated): <1ns
- DC gain accuracy: 2%
- Input sensitivity: 12 calibrated steps
- CH 1, CH 2 [CH 1...CH 4]
- 1mV/div...5V/div. (1-2-5 Sequence)
- Variable: Between calibrated steps
- Inputs CH 1, CH 2 [CH 1...CH 4]:
  - Impedance: 1 MO [13 PF ±2 PF switchable]
  - Coupling: DC, AC, GND
  - Max. input voltage: 200VDC + peak AC, 50D <5Vrms

**Measuring circuits:**
- Measuring Category I [CAT II]
- Position range: ±100Divs
- Offset control:
  - 1 mV, 2mV ±0.2V
  - 5...50mV ±1V
  - 100mV...5V ±20V
- Logic channels: With Option H03508
- Select. switching
  - TTL, CMOS, ECL, 2 x User -2...+8V
- Impedance: 100kΩ [±2 PF]
- Coupling: DC
- Max. input voltage: 40V (DC + peak AC)

**Triggering**
- Analog channels:
  - Linking of peak detection and trigger level
- Min. signal height: 0.8 div; 0.5 div typ.
- Frequency range: 5Hz...400MHz
- Level control range: From peak- to peak+

**Normal (without peak):**
- Min. signal height: 0.8 div; 0.5 div typ.
- Frequency range: 0...400MHz
- Level control range: -10...+10 div.

**Operating modes:** Slope/Vide/Logic/Pulse/Buses (optional)
- Slope:
  - Rising, falling, both
Specifications

Operation/Measuring/Interfaces

Operation: Menu-driven (multilingual), Autoset, help functions (multilingual)

Save/Recall memories: typ. 10 complete instrument parameter settings

Frequency counter: 0.5Hz...350MHz

Accuracy: 15ppm

Auto measurements: Amplitude, standard deviation, $V_{pp}$, $V_{pp}$, $V_{rms}$, frequency, period, pulse count, $t_{width+}$, $t_{width-}$, $t_{dutycycle+}$, $t_{dutycycle}$, $t_{rise}$, $t_{fall}$, pos. edge count, neg. edge count, pos. pulse count, neg. pulse count, trigger frequency, trigger period, phase, delay

Cursor measurements: Trigger point, ratio X and Y, pulse count, peak to peak, peak+, peak-, mean value, RMS value, standard deviation

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 (GPIB) [HO740], Ethernet/USB (HO730)

Display functions

Marker: up to 8 user definable marker for easy navigation

VirtualScreen: virtual Display with 20 div. vertical for all Math-, Logic-, Bus- and Reference Signals

Busdisplay: up to 2 buses, user definable, parallel or serial buses (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: (Opt. HO010, HO011) color coded Read-, Write Address, Data, Start, Stop, acknowledge, missing acknowledge, Errors and Trigger condition

SPI: (Opt. HO010, HO011) color coded Data, Start, Stop, Errors and Trigger condition

UART/RS-232: color coded 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, SQRT, 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

Probe ADJ Output: 1kHz/1 MHz square wave signal approx $V_{pp}$ (ta < 4ns)

Bus Signal Source: SPI, PC, UART, Parallel [4 Bit]

Internal RTC (realtime clock) Date and time for stored data

Line voltage: 105...253V, 50...60Hz, CAT II

Power consumption: Max. 70W at 230V, 50Hz

Protective system: Safety class I (EN61010-1)

Operating temperature: +5...+40 °C

Storage temperature: -20...+70 °C

Rel. humidity: 30%...80% (non condensing)

Dimensions (W x H x D): 285 x 175 x 220mm

Weight: 3.6 kg
### Specifications

**Aging:**
- Spectral purity, SSB phase noise: 0 Hz (zero span) and 1 MHz…1 GHz
- Span setting range:
- Intermodulation free range:
- HZ50 AC/DC Current probe 20 A, DC…100 kHz
- HZ20 Adapter, BNC to 4 mm banana
- HZ34 Test cable 50 Ω, BNC/BNC, 1 m
- HZ13 Interface cable (USB) 1.8 m
- HO740 Interface IEEE-488 (GPIB), galvanically isolated

**Frequency**

| Frequency range: | ±2 ppm (0…30 °C) |
| Temperature stability: | ±1 ppm/year |
| Aging: | 66 dB typ. (typ. +13 dBm TOI) |
| Span setting range: | ≤ 30 MHz, ≤ 100 kHz |
| Spectral purity, SSB phase noise: | ≤ 100 kHz (carrier offset) |
| 100 kHz from carrier | ≤ 100 dB/Hz |
| [500 MHz, +20…30 °C] | < 100 dB/Hz |
| 1 MHz from carrier | ≤ 120 dB/Hz |
| [500 MHz, +20…30 °C] | < 120 dB/Hz |
| Sweep time: | ≤ 20 ms…100 s, min. 20 ms/600 MHz |
| Resolution bandwidths (3-dB): | 1 kHz…1 MHz in 1–3 steps, 200 kHz |
| Tolerance: | ±300 kHz |
| ≤ 1 MHz | ±5 % typ. |
| ≥ 1 MHz | ±10 % typ. |
| Video bandwidths: | 1 kHz…1 MHz in 1–3 steps |

**Amplitude**

| Display range: | Average noise level displayed up to +20 dBm |
| Amplitude measurement range: | Typ. -104...+20 dBm |
| Max. permissible DC at HF input: | 80 V |
| Max. power at HF input: | 20 dBm, 30 dBm for max. 3 Min. |
| Intermodulation free range: | 100 dB, 50 dB, 20 dB, 10 dB |
| Logarithmic display: | dBM, dBμV, dBmV |
| Measured curves: | 1 curve and 1 memory curve |
| Trace mathematics: | A-B (curve-stored curve), B-A |
| Detectors: | Auto-, Min-, Max-Peak, Sample, RMS, Average |
| Failure of level display: | < 1.5 dB, typ. 0.5 dB |
| Marker/Deltamarker | Number of marker: 8 |
| Marker functions: | Peak, next peak, minimum, center = marker, frequency, reference level = marker level, all marker on peak |
| Marker displays: | Normal (level & log.), delta marker, noise marker |

**Inputs/Outputs**

| HF Input: | N socket |
| Input Impedance: | 50Ω |
| VSWR (10 MHz...1 GHz): | < 1.5 typ. |
| Trigger input: | BNC female |
| Trigger voltage: | TTL |
| Ext. reference input/output: | BNC female |
| Reference frequency: | 10 MHz |
| Essential level (50Ω): | 10 dBm |
| Supply output for field probes: | 6 V, max. 100 mA (2.5 mm DIN jack) |
| Audio output (Phone): | 3.5 mm DIN jack |
| Demodulation: | AM and FM (internal speaker) |

**Miscellaneous**

| Display: | 16.5 cm (6.5") TFT Color VGA Display |
| Save/Recall memory: | 10 complete device settings |
| Trigger: | Free run, Single Trigger, external Trigger |
| Interfaces: | Dual-Interface USB/RS-232 (HO720), USB-Stick (frontside), USB-Printer (rear side) |
| Power supply: | 105...253 V, 50...60 Hz, CAT II |
| Power consumption: | Max. 40 W at 230 V, 50 Hz |
| Protection class: | Safety class I (EN61010-1) |
| Operating temperature: | +5...+40°C |
| Storage temperature: | -20...+70°C |
| Rel. humidity: | 5...80% (non condensing) |
| Dimensions (W x H x D): | 285 x 175 x 220 mm |
| Weight: | 3.6 kg |

All data valid at 23 °C after 30 minute warm-up.
**1GHz Spectrum Analyzer HMS1000, HMS1010 (with TG)**

**3GHz Spectrum Analyzer HMS3000, HMS3010 (with TG)**

---

### Frequency

**Frequency range:**
- **HMS1000, HMS1010:** 100kHz...1GHz
- **HMS3000, HMS3010:** 100kHz...3GHz

**Temperature stability:** ±2 ppm (0...30°C)

**Aging:** ±1 ppm/year

**Level display:**
- Auto-
- Min-
- Max-
- Peak

**Reference level:** -50 dBm, 20...30°C

**Normal (level, lin. & log.), delta marker, noise marker, [frequency] counter**

---

### Inputs/Outputs

**HF Input:** N socket

**Input Impedance:** 100kΩ typ.

**VSWR:** 10 MHz...1 GHz (3 GHz): <1.5 typ.

**Output tracking generator:**
- **HMS1010/HMS3010:** N socket

**Output Impedance:** 50Ω

**Frequency range:** 5 MHz...1 GHz (3 GHz)

**Output level:** -20...0 dBm, in 1 dB steps

**Trigger input:** BNC female

**Trigger voltage:** TTL

**Ext. reference input/output:** BNC females

**Reference frequency:** 10 MHz

**Essential level (50Ω):** 10 dBm

**Supply output for field probes:** 2.5 V, max. 100 mA (2.5 mm DIN jack)

**Audio output (Phone):** 3.5 mm DIN jack

**Demodulation:** AM and FM (internal speaker)

---

### Miscellaneous

**Display:** 16.5 cm (6.5") TFT Color VGA Display

**Save/Recall memory:** 10 complete device settings

**Trigger:** Free run, Video Trigger*, Single Trigger, external Trigger

**Interfaces:**
- Dual-Interface USB/RS-232 (HO720),
- USB-Stick (frontside),
- USB-Printer (rear side),
- DVI-D (for external monitor)

**Power supply:** 100...253 V, 50...60 Hz, CAT II

**Power consumption:** Max. 40 W at 230 V, 50 Hz

**Recommended accessories:**
- Line cord, Operating manual, HZ21 Adapter plug,
- N-plug to BNC socket [2x HMS1010/3010], CD, Software

**Accessories supplied:**
- HO730 Dual-Interface Ethernet/USB
- HO740 Interface IEEE-488 (GPIB), galvanically isolated
- HO3011 Preamplifier -135 dBm DANL (100 Hz RBW)
- HZ13 Interface cable (USB) 1.8 m
- HZ14 Interface cable (serial) 1.1
- HZ20 Adapter, BNC to 4 mm banana
- HZ23 Test cable 50Ω, BNC/BNC, 0.5 m
- HZ34 Test cable 50Ω, BNC/BNC, 1 m
- HZ46 4RU 19'' Rackmount Kit
- HZ72 GPIB-Cable 2 m
- HZ99 Carrying Case for protection and transport
- HZ520 Plug-in Antenna with BNC connection
- HZ525 50Ω Termination, N plug
- HZ530 1.5 GHz Signal Generator, 50Ω
- HZ540/550 Near-Field Probe Set 3 GHz for EMC diagnostics
- HZ560 Near-Field Probe Set 3 GHz for EMC diagnostics
- HZ575 75/50 Ω Converter
- HZ580 1 GHz Active probe 1 GHz (9.9 Hz, 1 MHz, including many accessories)

---

### Accessories

**Accessories:**
- HO720 Adapter plug, N-plug to BNC socket [2x HMS1010/3010], CD, Software

---

### Specifications

**Frequency**

<table>
<thead>
<tr>
<th><strong>Frequency</strong></th>
<th><strong>HMS1000, HMS1010</strong></th>
<th><strong>HMS3000, HMS3010</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>100kHz...1GHz</td>
<td>100kHz...3GHz</td>
</tr>
</tbody>
</table>

**Temperature stability:** ±2 ppm (0...30°C)

**Aging:** ±1 ppm/year

**Level display:**
- Auto-
- Min-
- Max-
- Peak

**Reference level:** -50 dBm, 20...30°C

**Normal (level, lin. & log.), delta marker, noise marker, [frequency] counter**

**Inputs/Outputs**

**HF Input:** N socket

**Input Impedance:** 100kΩ typ.

**VSWR:** 10 MHz...1 GHz (3 GHz): <1.5 typ.

**Output tracking generator:**
- **HMS1010/HMS3010:** N socket

**Output Impedance:** 50Ω

**Frequency range:** 5 MHz...1 GHz (3 GHz)

**Output level:** -20...0 dBm, in 1 dB steps

**Trigger input:** BNC female

**Trigger voltage:** TTL

**Ext. reference input/output:** BNC females

**Reference frequency:** 10 MHz

**Essential level (50Ω):** 10 dBm

**Supply output for field probes:** 2.5 V, max. 100 mA (2.5 mm DIN jack)

**Audio output (Phone):** 3.5 mm DIN jack

**Demodulation:** AM and FM (internal speaker)

---

### Miscellaneous

**Display:** 16.5 cm (6.5") TFT Color VGA Display

**Save/Recall memory:** 10 complete device settings

**Trigger:** Free run, Video Trigger*, Single Trigger, external Trigger

**Interfaces:**
- Dual-Interface USB/RS-232 (HO720),
- USB-Stick (frontside),
- USB-Printer (rear side),
- DVI-D (for external monitor)

**Power supply:** 100...253 V, 50...60 Hz, CAT II

**Power consumption:** Max. 40 W at 230 V, 50 Hz

**Recommended accessories:**
- Line cord, Operating manual, HZ21 Adapter plug,
- N-plug to BNC socket [2x HMS1010/3010], CD, Software

**Accessories supplied:**
- HO730 Dual-Interface Ethernet/USB
- HO740 Interface IEEE-488 (GPIB), galvanically isolated
- HO3011 Preamplifier -135 dBm DANL (100 Hz RBW)
- HZ13 Interface cable (USB) 1.8 m
- HZ14 Interface cable (serial) 1.1
- HZ20 Adapter, BNC to 4 mm banana
- HZ23 Test cable 50Ω, BNC/BNC, 0.5 m
- HZ34 Test cable 50Ω, BNC/BNC, 1 m
- HZ46 4RU 19'' Rackmount Kit
- HZ72 GPIB-Cable 2 m
- HZ99 Carrying Case for protection and transport
- HZ520 Plug-in Antenna with BNC connection
- HZ525 50Ω Termination, N plug
- HZ530 1.5 GHz Signal Generator, 50Ω
- HZ540/550 Near-Field Probe Set 3 GHz for EMC diagnostics
- HZ560 Near-Field Probe Set 3 GHz for EMC diagnostics
- HZ575 75/50 Ω Converter
- HZ580 1 GHz Active probe 1 GHz (9.9 Hz, 1 MHz, including many accessories)

---

### Accessories

**Accessories:**
- HO720 Adapter plug, N-plug to BNC socket [2x HMS1010/3010], CD, Software

---

### Specifications

**Frequency**

<table>
<thead>
<tr>
<th><strong>Frequency</strong></th>
<th><strong>HMS1000, HMS1010</strong></th>
<th><strong>HMS3000, HMS3010</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>100kHz...1GHz</td>
<td>100kHz...3GHz</td>
</tr>
</tbody>
</table>

**Temperature stability:** ±2 ppm (0...30°C)

**Aging:** ±1 ppm/year

**Level display:**
- Auto-
- Min-
- Max-
- Peak

**Reference level:** -50 dBm, 20...30°C

**Normal (level, lin. & log.), delta marker, noise marker, [frequency] counter**

**Inputs/Outputs**

**HF Input:** N socket

**Input Impedance:** 100kΩ typ.

**VSWR:** 10 MHz...1 GHz (3 GHz): <1.5 typ.

**Output tracking generator:**
- **HMS1010/HMS3010:** N socket

**Output Impedance:** 50Ω

**Frequency range:** 5 MHz...1 GHz (3 GHz)

**Output level:** -20...0 dBm, in 1 dB steps

**Trigger input:** BNC female

**Trigger voltage:** TTL

**Ext. reference input/output:** BNC females

**Reference frequency:** 10 MHz

**Essential level (50Ω):** 10 dBm

**Supply output for field probes:** 2.5 V, max. 100 mA (2.5 mm DIN jack)

**Audio output (Phone):** 3.5 mm DIN jack

**Demodulation:** AM and FM (internal speaker)

---

### Miscellaneous

**Display:** 16.5 cm (6.5") TFT Color VGA Display

**Save/Recall memory:** 10 complete device settings

**Trigger:** Free run, Video Trigger*, Single Trigger, external Trigger

**Interfaces:**
- Dual-Interface USB/RS-232 (HO720),
- USB-Stick (frontside),
- USB-Printer (rear side),
- DVI-D (for external monitor)

**Power supply:** 100...253 V, 50...60 Hz, CAT II

**Power consumption:** Max. 40 W at 230 V, 50 Hz

**Protection class:** Safety class I (EN61010-1)

**Operating temperature:** 40...+40°C

**Storage temperature:** -20...+70°C

**Rel. humidity:** 5...80% (non condensing)

**Dimensions (W x H x D):** 285 x 175 x 220 mm

**Weight:** 3.6 kg

---

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

*from 02.2012
## Specifications

### Triple Power Supply HM7042-5

**Product description, page 24**

**Outputs**

- 2 x 0...32V/2A and 0...5.5V/5A
- ON/OFF pushbutton control, SMPS followed by a linear regulator, floating outputs for parallel/serial operation, current limit and electronic fuse.

**Channel 1+3 (32V)**

<table>
<thead>
<tr>
<th>Range</th>
<th>2 x 0...32V, continuously adjustable 2 knobs [coarse/fine]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ripple</td>
<td>≤100μVpp [3Hz–300kHz]</td>
</tr>
<tr>
<td>Current</td>
<td>max. 2A</td>
</tr>
<tr>
<td>Current limit/electronic fuse</td>
<td>0...2A, continuously adjustable (knob)</td>
</tr>
<tr>
<td>Recovery time (10…90 % load variation)</td>
<td>80μs within ±1mV of nominal value</td>
</tr>
<tr>
<td>Max. transient deviation</td>
<td>typ. 75mV</td>
</tr>
<tr>
<td>Recovery time (50 % basic load, 10 % load variation)</td>
<td>30μs within ±1mV of nominal value</td>
</tr>
<tr>
<td>Max. transient deviation</td>
<td>typ. 17mV</td>
</tr>
</tbody>
</table>

**Channel 2 (5.5V)**

<table>
<thead>
<tr>
<th>Range</th>
<th>0...5.5V, continuously adjustable (knobs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ripple</td>
<td>≤100μVpp [3Hz–300kHz]</td>
</tr>
<tr>
<td>Current</td>
<td>max. 5A</td>
</tr>
<tr>
<td>Current limit/electronic fuse</td>
<td>0...5A, continuously adjustable (knob)</td>
</tr>
<tr>
<td>Recovery time (10…90 % load variation)</td>
<td>80μs within ±1mV of nominal value</td>
</tr>
<tr>
<td>Max. transient deviation</td>
<td>typ. 170mV</td>
</tr>
<tr>
<td>Recovery time (50 % basic load, 10 % load variation)</td>
<td>30μs within ±1mV of nominal value</td>
</tr>
<tr>
<td>Max. transient deviation</td>
<td>typ. 60mV</td>
</tr>
</tbody>
</table>

**Maximum ratings**

- Max. voltage applicable to output terminals:
  - CH 1 = CH 3: 32V
  - CH 2: 6V
- Reverse voltage: max. 0.4V
- Reverse current: max. 5A
- Voltage to earth: max. 150V

**Miscellaneous**

- Safety class: Safety class I (EN61010-1)
- Mains supply: 115/230V ±10%; 50/60Hz, CAT II
- Mains Fuse: 115V: 2 x 5A slow blow 5 x 20 mm
  - 2 x 5A slow blow 5 x 20 mm
- Power consumption: max. 330VA/250W
- Operating temperature: +5…+50°C
- Storage temperature: -20…+70°C
- Rel. humidity: 5…80% (non condensing)
- Dimensions [W x H x D]: 285 x 75 x 365mm
- Weight: approx. 7.4kg

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

### Arbitrary Power Supply HM8143

**Product description, page 25**

**Outputs**

- 2 x 0...30V/2A
- 1 x 5V/2A
- On/off pushbutton control, Floating outputs (allowing parallel and series operation), current limit, electronic fuse, tracking mode

**Channels 1+3 (0…30V)**

<table>
<thead>
<tr>
<th>Output voltage</th>
<th>2 x 0…30V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting resolution</td>
<td>10 mV</td>
</tr>
<tr>
<td>Setting accuracy</td>
<td>±3 digits (typ. ±2 digit)</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>±3 digits (typ. ±2 digit)</td>
</tr>
<tr>
<td>Residual ripple</td>
<td>&lt;5μVpp [3Hz–300kHz]</td>
</tr>
<tr>
<td>Recovery time (10…90 % load variation)</td>
<td>45μs within ±1 mV of nominal value</td>
</tr>
<tr>
<td>Max. transient deviation</td>
<td>typ. 300 mV</td>
</tr>
<tr>
<td>Recovery time (50 % basic load, 10 % load variation)</td>
<td>30μs within ±1 mV of nominal value</td>
</tr>
<tr>
<td>Max. transient deviation</td>
<td>typ. 120 mV</td>
</tr>
</tbody>
</table>

**Channel 2 (5V)**

| Output current | max. 2A |
| Rippled | ≤100μVpp [3Hz–300kHz] |
| Recovery time (10…90 % load variation) | 30μs within ±1 mV of nominal value |
| Max. transient deviation | typ. 60 mV |
| Recovery time (50 % basic load, 10 % load variation) | 0μs within ±100 mV of nominal value |
| Max. transient deviation | typ. 20mV |

**Arbitrary Function (Channel 1 only)**

- Number of points: max. 4096
- Resolution: 12Bit
- Parameters of points: Dwell time and Voltage
- Dwell time: 100μs…60s
- Repetition rate: 1…255 and continuous

**Inputs**

- Modulation input
  - BNC socket: 0…10V
  - Accuracy: 1% of full scale
  - Modulation bandwidth: 150Hz
- Slew rate [V/dt]: >50 kHz
- Trigger input [BNC socket]: Triggering the arbitrary function
- Level: TTL

**Miscellaneous**

- Max. voltage applicable to output terminals
  - CH 1 + CH 3: 30V
  - CH 2: 5V
- Voltage to earth: max. 150V

Accessories supplied: Operating manual, line cord, CD
Recommended accessories:

- HZ10S 5 x silicone test lead (measurement connection in black)
- HZ10R 5 x silicone test lead (measurement connection in red)
- HZ10B 5 x silicone test lead (measurement connection in blue)
- HZ42 19” Rackmount Kit 2RU

Accessories supplied:

- Operating manual, line cord, CD
- Recommended accessories:
  - HZ10S 5 x silicone test lead (measurement connection in black)
  - HZ10R 5 x silicone test lead (measurement connection in red)
  - HZ10B 5 x silicone test lead (measurement connection in blue)
  - HZ42 19” Rackmount Kit 2RU
All data valid at 23 °C after 30 minutes warm-up.

**Specifications**

- **Display**: 4 x 4-digit 7-segment LEDs
- **Interface**: USB/RS-232 (H0820), IEEE-488 (GPIB) (optional)
- **Protection class**: I acc. to EN 61010 (IEC 61010) with protective earth
- **Power supply**: 115/230 V ± 10 %, 50…60 Hz, CAT II
- **Mains fuse**: 5 x 20 mm slow blow
- **Weight**: approx. 9 kg
- **Dimensions**: 285 x 75 x 365 mm

**Recommended accessories**:
- H0880 IEEE-488 (GPIB) Interface (galvanically isolated)
- HZ10S 5 x silicone test lead (measurement connection in black)
- HZ10R 5 x silicone test lead (measurement connection in red)
- HZ13 Interface cable (USB) 1.8 m
- HZ14 Interface cable (serial) 1:1
- HZ42 19" Rackmount Kit 2RU
- HZ72 GPIB-Cable 2 m

**Accessories supplied**:
- Operating manual, line cord, CD, Software

**Programmable 2 Channel High Performance Power Supply HMP2020**

**Programmable 3 Channel High Performance Power Supply HMP2030**

Product description, page 23

**Outputs**

Advanced parallel and series operation: simultaneous switching on/off of active channels via "Output" button, common voltage- and current control using tracking mode (individual channel linking), individual mapping of channels which shall be affected by FuseLink overcurrent protection (switch-off), all channels galvanically isolated from each other and the protective earth.

**HMP2020**

- 1 x 0…32 V/0…10 A
- 1 x 32 V/0…5 A
- Output terminals: 4 mm safety sockets frontside, Screw-type terminal rear side (4 units per channel)
- Output power: 188 W max.
- Compensation of lead resistances [SENSE]: 1 V
- Overvoltage/overcurrent protection (OVP/OPCP): Adjustable for each channel
- Electronic fuse: Adjustable for each channel, may be combined using FuseLink
- Response time: <10 ms

**32 V channels**

**Output values**

- HMP2020
  - 1 x 0…32 V/0…10 A, (5 A at 32 V, 160 W max.)
  - 1 x 0…32 V/0…5 A, (2.5 A at 32 V, 80 W max.)
- HMP2030
  - 3 x 0…32 V/0…5 A, (2.5 A at 32 V, 80 W max.)

**Resolution**

- Voltage: 1 mV
- Current HMP2030: <1 A: 0.1 mA, ≥1 A: 1 mA
- Current HMP2020: <1 A: 0.2 mA, ≥1 A: 1 mA, (10 A Channel, CH 1)
- Current HMP2020: <1 A: 0.2 mA, ≥1 A: 1 mA, (5 A Channel, CH 2)

**Setting accuracy**

- Voltage: <0.05 % + 5 mV (typ. ±2 mV)
- Current HMP2030: <0.1 % + 5 mA (typ. ±0.5 mA at I < 500 mA)
- Current HMP2020: <0.1 % + 5 mA (typ. ±0.5 mA at I < 500 mA), (10 A Channel, CH 1)
- Current HMP2020: <0.1 % + 5 mA (typ. ±0.5 mA at I < 500 mA), (5 A Channel, CH 2)

**Measurement accuracy**

- Voltage: <0.05 % + 2 mV

**Current HMP2030**

- <500 mA: <0.05 % + 0.5 mA, typ. ±0.2 mA
- ≥500 mA: <0.05 % + 2 mA, typ. ±1 mA

**Current HMP2020**

- <500 mA: <0.05 % + 0.5 mA, typ. ±0.2 mA, (10 A Channel, CH 1)
- ≥500 mA: <0.05 % + 2 mA, typ. ±2 mA, (5 A Channel, CH 2)

**Residual ripple**

- Voltage: 3 Hz...100 kHz: 1.5 mV typ.
- Current: <1 mA, <250 μA

**Recovery time after a load step from 10…90 % for return within a ±10 V window:** <100 μs

**Arbitrary Function EasyArb**

- Parameters of points: Voltage, current, time
- Number of points: 128
- Dwell time: 10 ms...60 s
- Repetition rate: Continuous or burst mode with 1...255 repetitions
- Trigger: Manually via keyboard or via Interface

**Maximum ratings**

- Reverse voltage: 33 V max.
- Reverse polarized voltage: 0.4 V max.
- Max. permitted current in case of reverse voltage: 5 A max.
- Voltage to earth: 1500 V max.

**Miscellaneous**

- Temperature coefficient / °C:
  - Voltage: 0.01 % + 2 mA
  - Current: 0.02 % + 3 mA
- Display: 240 x 64 Pixel LCD (full graphical)
- Memory: Non volatile memory for 3 Arbitrary functions and 10 device settings
- Interface: Dual-Interface USB/RS-232 (H0720)
- Processing time: <50 ms
- Protection class: Safety class I (EN61010-1)
- Power supply: 115/230 V ± 10 %, 50…60 Hz, CAT II
- Mains fuses: 5 x 20 mm slow blow, 115 V: 2 x 6 A, 230 V: 2 x 15 A
- Power consumption: 350 VA max.
- Operating temperature: -5…+40 °C
- Storage temperature: -20…+70 °C
- Rel. humidity: 5…80 % (non condensing)
- Dimensions (W x H x D): 285 x 75 x 365 mm
- Weight: 8.5 kg

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

**Accessories supplied**:
- Line cord, Operating manual, CD, Software

**Recommended accessories**:
- H0730 Dual-Interface Ethernet/USB
- H0740 Interface IEEE-488 (GPIB), galvanically isolated
- HZ10S 5 x silicone test lead (measurement connection in black)
- HZ10R 5 x silicone test lead (measurement connection in red)
- HZ10B 5 x silicone test lead (measurement connection in blue)
- HZ13 Interface cable (USB) 1.8 m
- HZ14 Interface cable (serial) 1:1
- HZ42 2RU 19" Rackmount Kit
- HZ72 GPIB-Cable 2 m
Specifications

Programmable 3 Channel High Performance Power Supply HMP4030
(Programmable 4 Channel High Performance Power Supply HMP4040)
Product description, page 22

Outputs
Advanced parallel and series operation: simultaneous switching on/off of active channels via “Output” button, common voltage- and current control using tracking mode (individual channel linking), individual mapping of channels which shall be affected by FuseLink overcurrent protection (switch-off), all channels galvanically isolated from each other and the protective earth.

HMP4030 3 x 0…32 V/0…10A
HMP4040 4 x 0…32 V/0…10A
Output terminals: 4 mm safety sockets frontside, Screw-type terminal rear side (4 units per channel)
Output power: 386 W max.
Compensation of lead resistances (SENSE): 1 V
Overvoltage/overcurrent protection (OVP/OPC): Adjustable for each channel
Electronic fuse: Adjustable for each channel, may be combined using FuseLink
Response time: <10 ms

32 V channels
Output values:
HMP4030 3 x 0…32 V/0…10 A (5 A at 32 V, 160 W max.)
HMP4040 4 x 0…32 V/0…10 A (5 A at 32 V, 160 W max.)
Resolution:
Voltage 1 mV
Current <1 A: 0.2 mA; ≥1 A: 1 mA
Setting accuracy:
Voltage <0.05 % + 5 mV (typ. ±2 mV)
Current <0.1 % + 5 mA (typ. ±1 mA at 1 <500 mA)
Measurement accuracy:
Voltage <0.05 % + 2 mV
Current <500 mA: <0.05 % + 1 mA, typ. ±0.5 mA
Current ≥500 mA: <0.05 % + 2 mA, typ. ±2 mA
Residual ripple
3 Hz…100 kHz 3 Hz…20 MHz
Voltage <150 μVmax, 1.5 μVmax, typ.
Current <1 mA
Residual deviation after a load change (10…90 %):
Voltage <0.01 % + 2 mV
Current <0.01 % + 250 μA
Residual deviation after a line voltage change (±10 %):
Voltage <0.01 % + 2 mV
Current <0.01 % + 250 μA
Recovery time after a load step from 10…90 % for return within a ±10 mV window: <100 μs

Arbitrary Function EasyArb
Parameters of points:
Voltage, current, time
Number of points: 128
Dwell time: 10 ms…60 s
Repetition rate: Continuous or burst mode with 1…255 repetitions
Trigger: Manually via keyboard or via interface

Maximum ratings
Reverse voltage: 33 V max.
Reverse polarized voltage: 0.4 V max.
Max. permitted current in case of reverse voltage: 5 A max.
Voltage to earth: 150 V max.

Miscellaneous
Temperature coefficient/°C:
Voltage 0.01 % + 2 mV
Current 0.02 % + 3 mA
Display: 240 x 128 Pixel LCD [full graphical]
Memory: Non volatile memory for 3 Arbitrary functions and 10 device settings
Interface: Dual-Interface USB/RS-232 [HO720]
Processing time: <50 ms

Protection class: Safety class I (EN61010-1)
Power supply: 115/230 V±10 %; 50…60 Hz, CAT II
Mains fuses: 5 x 20 mm slow blow
115 V: 2 x 10 A
230 V: 2 x 5 A
Power consumption: 550 VA max.
Operating temperature: +5…+40 °C
Storage temperature: -20…+70 °C
Rel. humidity: 5…80 % (non condensing)
Dimensions (W x H x D): 285 x 125 x 365 mm
Weight: approx. 10 kg

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

Accessories supplied:
Line cord, Operating manual, CD, Software
Recommended accessories:
HZ703 Dual-Interface Ethernet/USB
HZ740 Interface IEEE-488 (GPIB), galvanically isolated
H210 S 5 x silicone test lead (measurement connection in black)
H210R 5 x silicone test lead (measurement connection in red)
H213 Interface cable (USB) 1.8 m
H214 Interface cable (serial) 1:1
H243 19” Rackmount Kit 3RU
H272 GPIB-Cable 2 m
H291 19” Rackmount Kit 4RU

6½-Digit Precision Multimeter HM8112-3
Product description, page 29

DC specifications
Ranges:
0.1 V; 1 V; 10 V; 100 V; 600 V
Input impedance:
0.1 V, 1.0 V: >1 GΩ
10 V, 100 V, 600 V: 10 MΩ
Accuracy:
Values given are in ±% of reading (rdg.) + % of full scale (f.s.)

<table>
<thead>
<tr>
<th>Range</th>
<th>1 year</th>
<th>23 °C ±2 °C</th>
<th>Temp. coefficient 10…21 °C+25…40 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 V</td>
<td>0.005</td>
<td>0.0006</td>
<td>0.0008</td>
</tr>
<tr>
<td>1.0 V</td>
<td>0.003</td>
<td>0.0006</td>
<td>0.0008</td>
</tr>
<tr>
<td>10.0 V</td>
<td>0.003</td>
<td>0.0006</td>
<td>0.0008</td>
</tr>
<tr>
<td>100.0 V</td>
<td>0.003</td>
<td>0.0006</td>
<td>0.0008</td>
</tr>
<tr>
<td>600.0 V</td>
<td>0.004</td>
<td>0.0006</td>
<td>0.0008</td>
</tr>
</tbody>
</table>

Integration time: 0.1 s…1…60 s
Display range: 120.000 digit 1,200.000 digit
600 V range: 60.000 digit 600.000 digit
Resolution: 1 μV 100 nV
Zero point
Temperature drift: better than 0.3 μV/°C
Long-term stability: better than 3 μV for 90 days

AC specifications
Measurement ranges:
0.1 V; 1 V; 10 V; 100 V; 600 V
Measurement method:
true rms, DC or AC coupled (not in 0.1 V range)
Input impedance:
0.1 V, 1V: 1 GΩ II ±60 pF
10…600 V: 10 MΩ II ±60 pF
Response time:
1.5 sec to within 0.1 % of reading
Accuracy:
For sine wave signals >5 % of full scale
Values given are in ±% of reading + ±% of full scale, 23 °C ±2 °C for 1 year

<table>
<thead>
<tr>
<th>Range</th>
<th>20 HZ…1 kHz</th>
<th>1…10 kHz</th>
<th>10…50 kHz</th>
<th>50…100 kHz</th>
<th>100…300 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 V</td>
<td>0.1±0.08</td>
<td>5±0.5 (5 kHz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0 V</td>
<td>0.08±0.06</td>
<td>0.15±0.08</td>
<td>0.3±0.1</td>
<td>0.8±0.15</td>
<td>7±0.15</td>
</tr>
<tr>
<td>10.0 V</td>
<td>0.08±0.08</td>
<td>0.1±0.08</td>
<td>0.3±0.1</td>
<td>0.8±0.15</td>
<td>4±0.15</td>
</tr>
<tr>
<td>100.0 V</td>
<td>0.08±0.08</td>
<td>0.1±0.08</td>
<td>0.3±0.1</td>
<td>0.8±0.15</td>
<td></td>
</tr>
<tr>
<td>600.0 V</td>
<td>0.08±0.08</td>
<td>0.1±0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Specifications

**Temperature**
- **coef.:** 10...21 °C and 25...40 °C (%rdg. + %f.s.)
  - at 20 Hz...10kHz: 0.01 + 0.008
  - at 10...100kHz: 0.08 + 0.01
- **crest factor:** 7:1 (max. 5x range)
- **integration time:** 0.1s to 1...60s
- **max. measurement voltage:** approx. 3 V
- **measurement range:** all
- **max. input voltage LOW against chassis/safety earth:** 250V

**Measurement current**
- **ranges:**
  - AC: 1000 Ω, 1kΩ, 10kΩ, 100kΩ, 1MΩ, 10MΩ
  - DC: 100Ω, 1kΩ, 10kΩ, 100kΩ, 1MΩ, 10MΩ
- **accuracy:** ±(% of reading + % of full scale)

**Resistance**
- **ranges:**
  - AC: 1000 Ω, 1kΩ, 10kΩ, 100kΩ, 1MΩ, 10MΩ
  - DC: 100Ω, 1kΩ, 10kΩ, 100kΩ, 1MΩ, 10MΩ
- **accuracy:** ±(0.3 % rdg. + 0.05 K)

**Overload protection**
- (V0-HI to V0-LO) and to chassis:
- **Crest factor:** 7:1 (max. 5x range)

**Input protection**
- fuse, FF 1 A 250 V
- **overload protection:** 250 V md.

**Display ranges**
- **ac:** 120.000 digit 1,200.000 digit
- **dc:** 100.000 digit 1,000.000 digit

**Integration time**
- **ranges:**
  - AC: 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ
  - DC: 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ
- **resolution:** 1 μA 1 mA 10 mA 100 mA 1 A
- **accuracy:** ±(% of reading + % of full scale)

**Power consumption**
- approx. 8 W

**Storage temperature**
- 20...70 °C

**Weight**
- approx. 3 kg

**Dimensions**
- L: 19" (483 mm)
- W: 440 mm
- H: 133 mm

**Memory**
- 30,000 readings / 128 kB

**Safety class**
- I (EN 61010)

**Accessories supplied**
- line cord, Operating manual, PVC test lead [HZ15], interface cable (HZ14), CD

### 8 kW Power Meter HM8115-2

**Product description, page 30**

**Voltage**
- **true RMS voltage measurement (AC+DC)**
  - Ranges:
    - 50V
    - 150V
    - 500V
  - **resolution:** 0.1V
  - **accuracy:** ±(0.6 % + 5 digit)

**Current**
- **true RMS current measurement (AC+DC)**
  - Ranges:
    - 160mA
    - 1 A
    - 16 A
  - **resolution:** 1mA
  - **accuracy:** ±(0.4 % + 5 digit)

**Active power measurement**
- The measurement range is the product of the selected voltage respective current ranges.

**Reactive power measurement**
- The measurement range is the product of the selected voltage respective current ranges.
Specifications

Accuracy: 20...400 Hz: ±[2.5% + 10 digit + 0.02 × P]
P = active power
Display: 4-digit, 7-segment LED

Apparent power measurement

Ranges: 8 VA 24 VA 80 VA 240/800 VA 2400/8000 VA
Resolution: 1 mVA 10 mVA 100 mVA 1 VA
Accuracy: 20 Hz...1 kHz: ±[0.8% + 5 digit]
Display: 4-digit, 7-segment LED

Power factor measurement

Display: 0.00...1.00
Accuracy: 50...60 Hz: ±[2% + 3 digit] sine wave
voltage and current >1/10 of full scale

Monitor output (analogue)

Connection: BNC connector [galvanic isolation to test circuit and RS-232 interface]
Reference potential: protective earth
Level: 1 V, at full scale (2400/8000 digit)
Accuracy: typ. 5%
Output impedance: approx. 10 kΩ
Bandwidth: DC...1 kHz
Protected up to: ±30 V

Functions and displays

Measurement functions: voltage, current, power, power factor
Range selection: automatic/manual
Overrange alarm: visual and acoustic
Display resolution:
Voltage: 3-digit, 7-segment LED
Current: 4-digit, 7-segment LED
Power: 4-digit, 7-segment LED
Power factor: 3-digit, 7-segment LED

Interface

Interface: USB/RS-232 (H020), IEEE-488 (GPIB) (optional)
Connection RS-232: D-sub connector [galvanic isolation to test circuit and monitor output]
Protocol: Xon/Xoff
Data rate: 9600 Baud
Functions: control/data fetch

Miscellaneous

Safety Class: Safety Class I (EN 61010)
Power supply: 110/230V ±10%, 50...60Hz, CAT II
Power consumption: approx. 1.5 W at 50 Hz
Operating temperature: +5...+40°C
Storage temperature: -20...+70°C
Rel. humidity: 5...80% (non condensing)
Dimensions (W x H x D): 285 x 75 x 365 mm
Weight: approx. 4 kg

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

200 kHz LCR-Bridge HM8118
Product description, page 31

Conditions

Test signal voltage: 1 V
Open and short corrections performed
Measurement time: SLOW

Display

Equivalent circuits: Auto, Series or Parallel
Parameters displayed: Value, Deviation or % Deviation
Averaging: 2...99 measurements

Accuracy

Primary Parameters: Basic accuracy
(Test voltage: 1.0 V, measurement SLOW/MEDIUM, autoranging mode, constant voltage OFF, bias off). For FAST mode double the basic accuracy values

0.2% + |Z|/1.5 GΩ
Impedance: 100 MΩ
2 MΩ
1 MΩ
4 MΩ
25 kΩ
100 kΩ
2.5 Ω
0.01 Ω
20 Hz 1 kHz 10 kHz 100 kHz 0.1% + 1 mΩ/|Z|
0.3% + 1 mΩ/|Z|
0.5% + 5 mΩ/|Z|
0.05% + |Z|/2 GΩ
0.1% + |Z|/1,5 GΩ
0.5% + |Z|/100 MΩ
0.2% + |Z|/100 MΩ
0.5% + 2 mΩ/|Z|
0.3% + 1 mΩ/|Z|
0.5% + 2 mΩ/|Z|

Secondary Parameters: Basic accuracy D, Q
Phase angle: ±0.0005° @ f = 1 kHz

Ranges

|Z|, R, X: 0.01 mΩ...100 MΩ
|Y|, G, B: 10 nS...1000 S
C: 0.01 pF...100 µF
L: 10 nH...100 mH
D: 0.0001...9.9999
Q: 0.1...9999.9
θ: -180...+180°
Δ: -999.99...999.99%
M: 1 µH...100 H
N: 0.95...500

Measurement conditions and functions

Test frequency: 20 Hz...200 kHz (69 steps)
Frequency accuracy: ±0.005% ppm
AC test signal level: 50 mV rms...1.5 V rms
Resolution: 10 mV
Drive level accuracy: ±(5% + 5 mV)
Internal Bias Voltage: 0...±10 V
Resolution: 0.5 V
External Bias Voltage: 0...±40 V, (fused 0.5 A)
Internal Bias Current: 0...±200 mA
Resolution: 1 mA
Range Selection: Auto and Hold

Accessories supplied: Line cord, Operating manual, CD, Software
Recommended accessories:
H0880: IEEE-488 (GPIB) Interface [galvanically isolated]
HZ10S: 5 x silicon test lead black
HZ10R: 5 x silicon test lead red
HZ10B: 5 x silicon test lead blue
HZ13 Interface cable (USB) 1.8 m
HZ14 Interface cable (serial) 1.1 m
HZ33 Test cable 50Ω, BNC/BNC, 0.5 m
HZ34 Test cable 50Ω, BNC/BNC, 1 m
HZ42: 19" Rackmount kit 2RU
HZ72: GPIB-Cable 2 m
HZ815: Socket adapter
### Specifications

#### Input characteristics (Input C)

<table>
<thead>
<tr>
<th>Connection</th>
<th>External Reset</th>
<th>Reference</th>
<th>Gate/Arming</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>500 Ω</td>
<td>5 Ω</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input impedance</th>
<th>Max. input voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>±30 V</td>
<td>5 V (DC + AC&lt;sub&gt;ref&lt;/sub&gt;)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input sensitivity</th>
<th>Input impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>±20 V</td>
</tr>
<tr>
<td></td>
<td>±20 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input level</th>
<th>Min. input duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;2V</td>
<td>&gt;50 ns</td>
</tr>
<tr>
<td>&lt;0.5 V</td>
<td>&lt;50 ns</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Min. pulse duration</th>
<th>Max. input voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 ns</td>
<td>5 V (DC + AC&lt;sub&gt;ref&lt;/sub&gt;)</td>
</tr>
<tr>
<td>50 ns</td>
<td>5 V (DC + AC&lt;sub&gt;ref&lt;/sub&gt;)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Min. eff. gate time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20 µs</td>
<td></td>
</tr>
</tbody>
</table>

#### Measurement functions

- **Frequency measurement (Inputs A, B, C)**
  - **Range**: 0...200 MHz (3 GHz)
  - **LSD**: (1.25 x 10⁻⁵ x frequency)/measurement time
  - **Resolution**: 1 LSD
  - **Accuracy**: ≈resolution/frequency
  - **Ext. gate error**: (resolution ±ext. gate time error)/measurement time

- **Period duration measurement**
  - **Range**: 5 ns...10,000 s
  - **LSD**: (1.25 x 10⁻⁵ x period)/measurement time
  - **Resolution**: 1 LSD
  - **Accuracy**: ≈resolution/period

- **Totalization A**
  - **(manual control)**
  - **(external control)**
  - **Range**: 0...200 MHz
  - **LSD**: 10 ns
  - **Resolution**: 1 LSD
  - **Accuracy**: ≈resolution + trigger error²
  - **Number of averages**: N = 1...25

- **RPM measurement**
  - **NPR₁ presetting**: 1...65,535 pulses per revolution
  - **Gate time**: 330 ms fixed
  - **LSD**: 7.5 x 10⁻⁵ x revolution speed
  - **Resolution**: 1 LSD
  - **Accuracy**: ≈trigger error²/0.33

- **Offset**
  - **Range**: Covers the entire measurement range

---

#### Input characteristics (Input A and B)

- **Connection**: BNC socket
- **Frequency range**: 0...200 MHz (DC-coupled), 10 Hz...200 MHz (1 MD, AC-coupled), 500 kHz...200 MHz (50 Ω, AC-coupled)
- **Input impedance**: 1 MΩ II 30 pF or 50 Ω (switchable)
- **Input attenuation**: 1:1, 1:10, 1:100 (selectable)
- **Input sensitivity**: 250 Ω (sinewave, 80 Ω, pulse)
- **Input trigger level**: 0...±20 V
- **Max. input voltage**: 250 V (DC + AC<sub>ref</sub>)
- **Minimum pulse duration**: <5 ns
- **Input noise**: 100 μV

---

#### Other Instrument Functions

- **Test signal source**: 20 Hz...80 MHz 50 mVrms (sine wave, auto trigger)
- **Frequency range**: 500 kHz...200 MHz (50 Ω, AC-coupled)
- **Input characteristics**: 100 MHz…3 GHz

---

#### Accessories supplied:

- Line cord, Operating manual, HZ184 4 Terminal Kelvin Test Cable and HZ188 4 Terminal SMD Component Test Fixture, CD
- HZ116 4 Terminal Interface
- HO118 Binning Interface
- HZ33 Test cable 50 Ω, BNC/BNC, 1 m
- HZ42 19” Rackmount kit 2RU
- HZ34 Test cable 50 Ω, BNC/BNC, 0.5 m
- HZ72 GPIB-Cable 2 m
- HZ181 4 Terminal Test Fixture including Shorting Plate
- HZ186 4 Terminal Transformer Test Cable

---

#### Notes on Measurements:

- All data valid at 23 °C after 30 minutes warm-up.
- Minimum pulse duration: <5 ns for single pulse
- Input noise: (typ.) 100 μV
- Accuracy: ±(resolution/frequency + ext. gate error²)/measurement time
Specifications

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

**Weight:** approx. 4 kg

**Dimensions:** 5…80 % (non condensing)

**Rel. humidity:**

- **Storage temperature:** -20…+70 °C
- **Operating temperature:** +5…+40 °C

**Temperature stability (0…50 °C):**
- TCXO (standard): ±0.5 ppm
- OCXO: ±1 ppm/year

**Aging:**
- TCXO (standard): ±1 x 10^-8/year
- OCXO: ±1 x 10^-9/day

**External Reference:**
- OCXO: ±1 x 10^-8/day
- TCXO (standard): ±0.5 x 10^-6
- TCXO: ±1 x 10^-9/day

**Aging:**
- (0…50 °C): ±0.5 ppm/year
- (0…50 °C): ±1 ppm/year

**Input level:**
- 2 Vpp for full scale

**Output level:**
- AC or DC

**Coupling:**
- Internal or external

**Resolution:**
- Same resolution as in normal measurement. If the gate time is changed in the offset mode, the offset resolution is the reference value resolution or the current reading resolution (whichever is less precise).

**Gate time**
- Range: 1 ms...
- Resolution: 1 ms
- External gate time: min. 20 μs

**Time base**
- Frequency: 400 MHz clock rate, 10 MHz crystal
- Temperature stability:
  - TCXO (standard): ±0.5 x 10^-8
  - OCXO: ±1 x 10^-8
- Aging
  - TCXO: ±0.27 ppm per month, 0.05 ppm per day
  - OCXO: ±1 x 10^-9/day

**External Reference:**
- TCXO (standard): ±1 x 10^-8/day
- TCXO: ±1 x 10^-9/day

**Miscellaneous**
- **Interface:**
  - USB/RS-232 (H0820), IEEE-488 (GPIB) (optional)
- **Safety class:**
  - Safety Class I (EN61010-1)
- **Power supply:**
  - 115…230 V ±10 %, 45…60 Hz, CAT II
- **Display:**
  - LCD display (83 x 21 mm)
- **Safety Class:**
  - Safety Class I (EN61010-1)
- **External Reference:**
  - TCXO (standard): ±1 x 10^-8/day
  - TCXO: ±1 x 10^-9/day

**Accessories supplied:**
- Line cord, Operating manual, CD

**Recommended accessories:**
- H085 OCXO (installation only ex factory)
- H0880 IEEE-488 (GPIB) Interface (galvanically isolated)
- HZ13 Interface cable (USB) (1:1)
- HZ20 Adapter plug
- HZ24 Attenuators 50 Ω
- HZ33 Test cable 50 Ω (BNC-BNC) 0.5 m
- HZ34 Test cable 50 Ω (BNC-BNC) 1.0 m
- HZ42 19” Rackmount kit 2RU
- HZ72 GPIB-Cable 2 m

**1.2GHz RF-Synthesizer HM8134-3**

**Product description, page 33**

**Frequency Reference 10 MHz**

- **Standard:** TCXO
- **Temperature stability (0…50 °C):** ±0.5 ppm
- **Aging:** ±1 ppm/year
- **Option:** OCXO (H085)
- **Temperature stability (0…50 °C):** ±1 x 10^-8
- **Aging:** ±1 x 10^-9/day

**Internal reference output:**
- Level: TTL

**External reference input:**
- Level: >0 dBm

**Frequency:** 10 MHz ±20 ppm

**Spectral purity (without modulation)**

| Harmonics: | ≤-35 dBc |
| Non-harmonics: | ≤-59 dBc (15kHz from carrier) |
| Phase noise: | (at 20kHz from carrier) |
| f ≤16 MHz: | ≤-120 dBc/Hz |
| 16 MHz ≤f <250 MHz: | ≤-94 dBc/Hz |
| 250 MHz ≤f <500 MHz: | ≤-105 dBc/Hz |
| 500 MHz ≤f <1000 MHz: | ≤-100 dBc/Hz |
| 1000 MHz ≤f <1200 MHz: | ≤-95 dBc/Hz |
| Residual FM: | ≤5 Hz (at 1 GHz in 0.3…3kHz bandwidth) |
| Residual AM: | typ. <0.06 % [in 0.03…20 kHz bandwidth] |

**Miscellaneous**

- **Interface:**
  - USB/RS-232 (H0820), IEEE-488 (GPIB) (optional)
- **Safety class:**
  - Safety Class I (EN61010-1)
- **Power supply:**
  - 115…230 V ±10 %, 45…60 Hz, CAT II
- **Display:**
  - LCD display (83 x 21 mm)
- **Safety Class:**
  - Safety Class I (EN61010-1)
- **External Reference:**
  - TCXO (standard): ±1 x 10^-8/day
  - TCXO: ±1 x 10^-9/day

**Accessories supplied:**
- Line cord, Operating manual, CD

**Recommended accessories:**
- H085 OCXO (installation only ex factory)
- H0880 IEEE-488 (GPIB) Interface (galvanically isolated)
- HZ13 Interface cable (USB) (1:1)
- HZ20 Adapter plug
- HZ24 Attenuators 50 Ω
- HZ33 Test cable 50 Ω (BNC-BNC) 0.5 m
- HZ34 Test cable 50 Ω (BNC-BNC) 1.0 m
- HZ42 19” Rackmount kit 2RU
- HZ72 GPIB-Cable 2 m

**1.2GHz RF-Synthesizer HM8134-3**

**Product description, page 33**

**Frequency**

- **Range:** 1 Hz…1200 MHz
- **Resolution:** 1 Hz
- **Settling time:** <10 ms

**Frequency Reference 10 MHz**

- **Standard:** TCXO
- **Temperature stability (0…50 °C):** ±0.5 ppm
- **Aging:** ±1 ppm/year
- **Option:** OCXO (H085)
- **Temperature stability (0…50 °C):** ±1 x 10^-8
- **Aging:** ±1 x 10^-9/day

**Internal reference output:**
- Level: TTL

**External reference input:**
- Level: >0 dBm

**Frequency:** 10 MHz ±20 ppm

**Spectral purity (without modulation)**

| Harmonics: | ≤-35 dBc |
| Non-harmonics: | ≤-59 dBc (15kHz from carrier) |
| Phase noise: | (at 20kHz from carrier) |
| f ≤16 MHz: | ≤-120 dBc/Hz |
| 16 MHz ≤f <250 MHz: | ≤-94 dBc/Hz |
| 250 MHz ≤f <500 MHz: | ≤-105 dBc/Hz |
| 500 MHz ≤f <1000 MHz: | ≤-100 dBc/Hz |
| 1000 MHz ≤f <1200 MHz: | ≤-95 dBc/Hz |
| Residual FM: | ≤5 Hz (at 1 GHz in 0.3…3kHz bandwidth) |
| Residual AM: | typ. <0.06 % [in 0.03…20 kHz bandwidth] |

**Miscellaneous**

- **Internal Reference:**
  - 10 MHz…150 kHz sine wave
  - 10 Hz…20 kHz square wave, triangle, sawtooth
- **Resolution:** 10 Hz

**Output level**

- **Range:** -127…+13 dBm
- **Resolution:** 0.1 dB
- **Display-Offset for Ext. Attn.:** 0.0…30.0 dB in 0.1 dB steps
- **Precision:**
  - for level >-57 dBm: ±0.5 dB
  - for level <-57 dBm: ±0.5 dB + (0.2 x (-57 dBm - level)/10)
- **Impedance:** 50 Ω
- **V.S.W.R.:** ≤2

**Modulation sources**

- **Internal:**
  - 10 Hz…150 kHz sine wave,
  - 10 Hz…20 kHz square wave, triangle, sawtooth
- **Resolution:** 10 Hz

- **External:**
  - (input on front panel)
- **Impedance:** 10 kΩ II 50 Ω
- **Input level:** 2 Vp for full scale
- **Coupling:** AC or DC
- **Output:** (on front panel)
- **Level:** 2 Vp
- **Impedance:** 1 kΩ

**Amplitude modulation (Level ≤+7 dBm)**

- **Source:** internal or external
- **Modulation depth:** 0…100 %
- **Resolution:** 0.1 %
- **Accuracy:** ±4 % of reading
  - ±0.5 % [AM-depth ≤80 %, f<sub>max</sub> ≤40 kHz]
- **Ext. frequency resp. (to -1 dB):**
  - 10 Hz…50 kHz for AC
  - 20 kHz for AC
- **Distortion:** <2 % [AM-depth ≤60 %, f<sub>max</sub> ≤1 kHz]
- <6 % [AM-depth ≤80 %, f<sub>max</sub> ≤20 kHz]

**Frequency modulation**

- **Source:** internal or external
- **Deviation:**
  - ±200 Hz…400 kHz
  - (depending on frequency band)
- **Resolution:** 100 Hz
- **Accuracy:** ±3 % + res. FM (f<sub>max</sub> ≤5 kHz)
  - ±7 % + res. FM (5 kHz ≤ f<sub>max</sub> ≤100 kHz)
- **Ext. frequency response (to -1 dB):**
  - DC coupling: 0…100 kHz
  - AC coupling: 10 Hz…100 kHz
- **Distortion:** <1 % for deviation ≥50 kHz at 1 kHz
  - <3 % for deviation ≥10 kHz at 1 kHz
### Specifications

**Phase modulation**

- **Source:** internal or external
- **Deviation:**
  - <16 MHz: 0…3.14 rad
  - >16 MHz: 0…10 rad
- **Resolution:** <0.01 rad
- **Accuracy:** ±5% up to 1 kHz + residual PM
- **Ext. frequency response to -1 dB:**
- **DC coupling:** 0…100 kHz
- **AC coupling:** 10 kHz…100 kHz
- **Distortion:** <3% for f<sub>mod</sub> = 1 kHz and deviation = 10 rad

**FSK modulation**

- **Range (F0...F1):** 16…1200 MHz
- **Mode:** 2 FSK levels
- **Data source:** external
- **Max. rate:** 10 kbit/s
- **Shift (F1...F0):**
  - <16 MHz: 0…±3.14 rad
  - >16 MHz: 0…±10 rad
- **Resolution:** 0.01 rad
- **Accuracy:** ±3% + residual FM (f<sub>mod</sub> ±5 kHz) ±7% + residual FM (5 kHz < f<sub>mod</sub> < 100 kHz)

**PSK modulation**

- **Mode:** 2 PSK levels
- **Data source:** external
- **Max. rate:** 10 kbit/s
- **Shift (Ph1...Ph0):**
  - <16 MHz: 0…±3.14 rad
  - >16 MHz: 0…±10 rad
- **Resolution:** 0.01 rad
- **Accuracy:** ±5% up to 1 kHz + residual PM

**Pulse modulation**

- **Source:** external (rear panel)
- **Dynamic range:** >80 dB
- **Rise/fall times:** <50 ns
- **Delay:** <100 ns
- **Max. frequency:** 2.5 MHz
- **Input level:** TTL

**Sweep mode**

- **Range:** 1…1200 MHz
- **Depth:** 500 Hz…1199 MHz
- **Sweep time:** 20 ms…5 s
- **Trigger:** internal

**Protective functions**

The synthesizer is protected against reverse power applied to the RF output up to 1 W for a 50 Ω source and against any DC source up to ±7 V. The protection disconnects the output until manually reset by operator.

**Miscellaneous**

- **Interface:** USB/RS-232 (HO820, IEEE-488 (GPIB) (optional)
- **Configuration memories:** 10
- **Safety class:** Safety Class I (EN61010-1)
- **Power supply:** 115/230 V ±10%, 50…60 Hz, CAT II
- **Power consumption:** approx. 40 VA
- **Operating temperature:** 5…+40 °C
- **Storage temperature:** -20…+70 °C
- **Rel. humidity:** 5…80% (non-condensing)
- **Dimensions (W x H x D):** 285 x 75 x 365 mm
- **Weight:** approx. 5 kg

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

### Accessories supplied

- Line cord, Operating manual, CD
- **Recommended accessories:**
  - HO85 OCXO temperature stability ±1x 10⁻⁸
  - HO880 IEEE-488 (GPIB) Interface (galvanically isolated
  - HZ13 Interface cable (USB) 1.8 m
  - HZ14 Interface cable (serial) 1:1
  - HZ20 Adapter, BNC to 4 mm banana
  - HZ21 Adapter plug
  - HZ24 Attenuator Set 50 Ω (3/6/10/20 dB)
  - HZ33 Test Cable 50 Ω (BNC-BNC) 0.5 m
  - HZ34 Test Cable 50 Ω (BNC-BNC) 1.0 m
  - HZ42 19” Rackmount kit 2RU
  - HZ72 GPIB-Cable 2 m

### 3 GHz RF-Synthesizer HM8135

**Product description, page 34**

#### Frequency

- **Range:** 1 Hz…3 GHz
- **Resolution:** 1 Hz
- **Setting time:** <10 ms

#### Frequency Reference 10 MHz

- **Standard:** TCXO
  - Temperature stability (0…50 °C): ±0.5 ppm/year
  - Aging: ±1 ppm/year
- **Option:** OCXO (HO85)
  - Temperature stability (0…50 °C): ±1x 10⁻⁸
  - Aging: ±1x 10⁻⁸/day
- **Internal reference output:** (rear panel)
- **Level:** TTL
- **External reference input:** (rear panel)
- **Level:** >0 dBm
- **Frequency:** 10 MHz ±20 ppm

#### Spectral purity (without modulation)

- **Harmonics:** ≤-35 dBc
- **Non-harmonics (at 20 kHz from carrier):** ≤-50 dBc
- **Sub-harmonics (at 20 kHz from carrier):** ≤-50 dBc
- **Phase noise:** (at 20 kHz from carrier)
  - 1 GHz: ≤-70 dBc/Hz
  - 3 GHz: ≤-100 dBc/Hz
- **Sub-harmonics:** ≤-10 dBc/Hz
- **Residual FM:** typ. ±(0.06 % in 0.03…20 kHz bandwidth)
- **Residual AM:** typ. ±(0.06 % in 0.03…20 kHz bandwidth)

#### Output level

- **Range:** -1.35…+15 dBm
- **Resolution:** 0.1 dB
- **Display-Offset for ext. Attn.:** 0…±30 dB in 0.1 dB steps

#### Precision f <1.5 GHz; level >-120 dBm

- for level >-57 dBm:
  - ≤0.5 dB
- for level ≤-57 dBm:
  - ≤(0.5 dB + (0.2 x (-57 dBm - level))/10)

#### Precision f >1.5 GHz; level >-120 dBm

- for level >-57 dBm:
  - ≤0.7 dB
- for level ≤-57 dBm:
  - ≤(0.7 dB + (0.5 x (-57 dBm - level))/10)

#### Impedance

- 50 Ω

V.S.W.R.:

- f ≤1 GHz: ≤1.5
- f >1 GHz: ≤2.5

#### Modulation sources

- **Internal:** 10 Hz…200 kHz sine wave
  - 10 Hz…20 kHz square wave, triangle, sawtooth
- **External:** Input on front panel

[Typical phase noise at 1 GHz]
### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impedance:</strong></td>
<td>10 kΩ II 50ΩF</td>
</tr>
<tr>
<td><strong>Input level:</strong></td>
<td>2 Vpp for full scale</td>
</tr>
<tr>
<td><strong>Coupling:</strong></td>
<td>AC or DC</td>
</tr>
<tr>
<td><strong>Output:</strong></td>
<td>Front panel</td>
</tr>
<tr>
<td><strong>Level:</strong></td>
<td>2 Vpp</td>
</tr>
<tr>
<td><strong>Impedance:</strong></td>
<td>1 kΩ</td>
</tr>
</tbody>
</table>

#### Amplitude modulation (Level ±7 dBm)
- **Source:** Internal or external
- **AM-depth:** 0…100 %
- **Resolution:** 0.1 %
- **Accuracy:** ±4 % displayed rate, ±0.5 % (AM-depth ≤80 %, f<sub>mod</sub> ≤50 kHz)
- **Ext. frequency resp. (to -1dB):**
  - 10 Hz…100 kHz for AC
- **Distortion:**
  - <2 % (AM-depth ≤60 %, f<sub>mod</sub> ≤1 kHz)
  - <6 % (AM-depth ≤80 %, f<sub>mod</sub> <20 kHz)

#### Frequency modulation
- **Source:** Internal or external
- **Deviation:** ±(0.5 kHz/500 kHz + 0.3 %) (depending on frequency band)
- **Resolution:** 100 Hz
- **Accuracy:** ±3 % + residual FM (f<sub>mod</sub> ≤5 kHz)
- **Ext. frequency response (to -1dB):**
  - DC coupling: 0…100 kHz
  - AC coupling: 100 kHz…100 kHz
- **Distortion:**<br>
  - <1 % for deviation ≥50 kHz at 1 kHz

#### Phase modulation
- **Source:** Internal or external
- **Deviation:**<br>
  - 16 MHz: 0…3.14 rad
  - ≥16 MHz: 0…10 rad
- **Resolution:** 0.01 rad
- **Accuracy:** ±5 % up to 1 kHz + residual PM
- **Ext. frequency response (to -1dB):**
  - DC coupling: 0…100 kHz
  - AC coupling: 100 kHz…100 kHz
- **Distortion:**<br>
  - <3 % for f<sub>mod</sub> = 1 kHz and deviation = 10 rad

#### FSK modulation
- **Range (F0…F1):** 16 MHz…3 GHz
- **Mode:** 2 FSK levels
- **Data source:** External
- **Max. rate:** 10 kbit/s
- **Shift (F1…F0):** 0…10 MHz
- **Resolution:** 100 Hz
- **Accuracy:** ±3 % + residual FM (f<sub>mod</sub> ≤5 kHz)
- ±7 % + residual FM (5 kHz <f<sub>mod</sub> <100 kHz)

#### PSK modulation
- **Mode:** 2 PSK levels
- **Data source:** External
- **Max. rate:** 10 kbit/s
- **Shift (Ph1…Ph0):**<br>
  - 16 MHz: 0…±3.14 rad
  - ≥16 MHz: 0…±10 rad
- **Resolution:** 0.01 rad
- **Accuracy:** ±5 % up to 1 kHz + residual PM

#### Pulse modulation
- **Source:** External (rear panel)
- **Dynamic range:**<br>
  - f ≥20 MHz: >80 dB
  - f ≥500 MHz: >50 dB
- **Rise/fall times:**<br>
  - 50 ns (typ. <10 ns)
- **Delay:** ≤100 ns
- **Max. frequency:** 2.5 MHz (typ. 5 MHz)
- **Input level:** TTL

### Sweep mode
- **Range:** 1…3000 MHz
- **Depth:** 500 Hz…2999 MHz
- **Sweep time:** 20 ms…5 s

### Trigger
- **Source:** Internal

### Protective functions
- The synthesizer is protected against reverse power applied to the RF output up to 1 W for a 50 Ω source and against any DC source up to ±7 V. The protection disconnects the output until manually reset by operator.

### Miscellaneous

#### Interfaces
- **USB/RS-232 (HO820),**
- **IEEE-488 (GPIB) (optional)**

#### Configuration memories
- **10**

#### Safety class
- **Safety Class I (EN61010-1)**

#### Power supply
- **115/230 V ±10 %, 50…60 Hz, CAT II**

#### Power consumption
- **approx. 40 VA**

#### Operating temperature
- **-20…+70 °C**

#### Storage temperature
- **5…80 % (non condensing)**

#### Rel. humidity
- **±5 % up to 1 kHz + residual PM**

#### Dimensions (W x H x D):
- **285 x 75 x 365 mm**

#### Weight
- **approx. 5 kg**

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

### Accessories supplied
- Line cord, Operating manual, CD

### Recommended accessories
- HO86 DC00 temperature stability ±1 x 10⁻⁷
- HO880 IEEE-488 (GPIB) interface (galvanically isolated)
- HZ13 Interface cable (USB) 1.8 m
- HZ14 Interface cable (serial) 1:1
- HZ20 Adapter, BNC to 4 mm banana
- HZ21 Adapter plug
- HZ24 Attenuator Set 50 Ω (3/6/10/20 dB)
- HZ33 Test Cable 50 Ω (BNC-BNC) 0.5 m
- HZ34 Test Cable 50 Ω (BNC-BNC) 1.0 m
- HZ42 19” Rackmount kit 2RU
- HZ72 GPIB-Cable 2 m

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### 12.5 MHz Arbitrary Function Generator HMB150

**Product description, page 35**

#### Frequency

- **Range:** 10 MHz…12.5 MHz
- **Resolution:** 5 digit, max. 10 MHz
- **Accuracy:** ±(1 digit + 5 MHz)
- **Temperature coefficient:** 0.5 ppm/°C
- **Aging:** 2 ppm/year

#### Waveforms

**Sine wave**

- **Frequency range:** 10 MHz…12.5 MHz
- **Amplitude:** 20 Vpp @ 20 Vpp (open circuit)

**Harmonic Distortion @ 1 Vpp:**
- f <1 kHz: -65 dB
- 1 kHz ≤ f ≤ 5 MHz: -50 dB
- 5 MHz ≤ f ≤ 12.5 MHz: -40 dB

**Total Harmonic Distortion @ 1 Vpp:**
- f <1 kHz: typ. 0.05 %

**Spurious [Non-Harmonic] @ 1 Vpp:**
- f <1 kHz: -85 dB
- 1 kHz ≤ f ≤ 12.5 MHz: -65 dB + 6 dB/octave

**Square wave**

- **Frequency range:** 10 MHz…12.5 MHz
- **Amplitude:** 20 Vpp @ 20 Vpp (open circuit)

**Rise/fall time:** <10 ns

**Overshoot:** <5 % (Vout ≤200 mV)

**Symmetry:** 50 % ±5 % ±10 ns%

**Pulse**

- **Frequency range:** 10 MHz…5 MHz
- **Amplitude:** 10 Vpp…-10 Vpp or -10 Vpp…-10 Vpp

**Rise/fall time:** <10 ns

**Pulse width:** 100 ns…80 s

**Duty cycle:** max. 90 %
## Specifications

### 25 MHz Arbitrary Function Generator HMF2525
### 50 MHz Arbitrary Function Generator HMF2550

**Product description, page 28**

### Display:
- 16 characters, LCD with backlight

### Memory:
- for the last device settings and for 1 arbitrary signal

### Safety Class:
- Safety Class I [EN61010-1]

### Power supply:
- 115…230 V ±10 %, 50…60Hz, CAT II

### Power consumption:
- approx. 20W

### Operating temperature:
- +5…+40 °C

### Storage temperature:
- -20…+70 °C

### Rel. humidity:
- 5…80 % (non condensing)

### Dimensions (W x H x D):
- 285 x 75 x 365 mm

### Weight:
- approx. 5kg

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

### Accessories supplied:
- Line cord, Operating manual, CD, Software

### Recommended accessories:
- H0880 IEEE-488 (GPIB) Interface (galvanically isolated)
- HZ13 Interface cable (USB) 1.8m
- HZ14 Interface cable (serial) 1:1
- HZ20 Adapter, BNC to 4 mm banana
- HZ24 Attenuator Set 50Ω (3/6/10/20 dB)
- HZ33 Test Cable 50Ω (BNC-BNC) 0.5 m
- HZ34 Test Cable 50Ω (BNC-BNC) 1.0 m
- HZ42 19" Rackmount kit 2RU
- HZ72 GPIB-Cable 2 m

### Sawtooth

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>10mHz…25MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td>±2.1…+20Vpp (open circuit)</td>
</tr>
<tr>
<td>Linearity</td>
<td>better than 1 %</td>
</tr>
</tbody>
</table>

### Triangle

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>10mHz…250kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td>±2.1…+20Vpp (open circuit)</td>
</tr>
<tr>
<td>Linearity</td>
<td>better than 1 %</td>
</tr>
</tbody>
</table>

### Arbitrary generator

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>10mHz…250kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td>±2.1…+20Vpp (open circuit)</td>
</tr>
<tr>
<td>Output voltage</td>
<td>Range 1: -75…+75 mV (open circuit)</td>
</tr>
<tr>
<td>Resolution</td>
<td>X: 1024 (10 bit), Y: 1024 (10 bit) or X: 4096 (12 bit), Y: 4096 (12 bit)</td>
</tr>
<tr>
<td>Setting accuracy (1 kHz):</td>
<td>Range 1: ±2 %</td>
</tr>
<tr>
<td>Frequency response:</td>
<td>&lt;100kHz ±0.2 dB</td>
</tr>
<tr>
<td>Offset error:</td>
<td>Range 3: ±50 mV</td>
</tr>
<tr>
<td>Display:</td>
<td>2½ digits (LCD)</td>
</tr>
</tbody>
</table>

### Inputs

- Gate/Trigger: BNC connector
- Impedance: 5kΩ II 100 pF
- Max. input voltage: ±30 V
- Modulation Input: BNC connector
- Impedance: 1kΩ
- Max. input voltage: ±30 V

### Outputs

- Signal output: BNC connector, short circuit proof, ext. voltage up to ±15V
- Impedance: 50Ω
- Output voltage: Range 1: 2.1…20Vpp (open circuit)
  Range 2: 0.21…20Vpp (open circuit)
  Range 3: 20…200mVpp (open circuit)
- Resolution: Range 1: 100 mV
  Range 2: 10 mV
  Range 3: 1 mV
- Setting accuracy (1 kHz): Range 1: ±2 %
  Range 2: ±3 %
  Range 3: ±4 %
- Frequency response: <100kHz ±0.2 dB
- Offset error: Range 3: ±50 mV
- Display: 2½ digits (LCD)
- Trigger output: BNC connector
- Level: 5V/10V
- Impedance: 50Ω
- Sawtooth output: BNC connector
- Output voltage: 0…5 V, synchronous to sweep
- Impedance: 1kΩ

### DC offset

- Output voltage: Range 1: -7.5…+7.5 V (open circuit)
  Range 2: -0.75…+0.75 V (open circuit)
  Range 3: ±0.5% of signal level
- V_{dc,range} = 2 x V_{offset,range} ±V_{range,ref}

### Sweep (internal)

- Setting of start and stop frequencies
- Internal sweep: all waveforms
- Sweep time: linear, 20 ms…100 s: continuous or triggered (ext. signal, interface)

### Amplitude Modulation

- Modulation via external signal
- Modulations depth: 0…100 %
- Bandwidth: DC…20 kHz (-3 dB)

### Gate (asynchronous)

- Modulation on/off via external TTL signal
- Delay time: <150 ns
- Input signal: TTL

### Trigger Function (synchronous)

- Burst mode via ext. trigger input or interface
- Frequency range: <500kHz

### Miscellaneous

- Interface: USB/RS-232 (H0820), IEEE-488 (GPIB) (optional)

### 25 MHz Arbitrary Function Generator HMF2525

#### Frequency
- 10μHz…25 MHz

#### Temperature stability:
- ±1 ppm (18…28 °C)

#### Aging (after 1 year):
- ±1 ppm (25 °C)

### Amplitude

- Output voltage: 5Vpp…10Vpp (into 50Ω)
  10Vpp…20Vpp (open circuit)
- Resolution: 1mV (into 50Ω)
- Setting accuracy: ±1 % of control + 1 mVpp at 1 kHz
- Frequency response (Sine): f <100 kHz: ±0.15 dB
  100 kHz ≤ f <1 MHz: ±0.1 dB
  1 MHz ≤ f <10 MHz: ±0.1 dB
- DC offset:
  - Voltage range (AC + DC): ±5 mV…5 V (into 50Ω)
  - ±10 mV…10 V (open circuit)
- Accuracy:
  - ±2 % of offset
  - ±0.5 % of signal level
  - ±2 mV
  - ±1 mV/MHz

### Units:
- Vpp, dBm

### Waveform Sine Wave

- Total harmonic distortion (1 Vpp):
  - f <100 kHz: < -70 dBc
  - 100 kHz ≤ f <1 MHz: < -55 dBc
  - 1 MHz ≤ f <25 MHz: < -40 dBc
  - f ≥ 25 MHz: < -37 dBc
- Spurious Non-harmonics 1 Vpp:
  - f <1 MHz: < -70 dBc
  - 1 MHz ≤ f <50 MHz: < -70 dBc + 6dB/Octave
- Total harmonic distortion (1 Vpp):
  - f 1 kHz: 0.04 % typ.
- Phase noise:
  - [10 MHz, 10 kHz Offset, 1 Vpp]: < -115 dBc/Hz typ.

### Waveform Square

- Rise/fall time: < 8 ns
- Overshoot: < 3 % typ.
- Symmetry (50 % duty cycle): 1 % ± 5 ns
- Jitter (RMS): < 1 ns typ.
Specifications

1 μs…500 s
Internal Trigger period:
Manual, internal or external via Trigger
Trigger source:
Start/stop phase:
0…360° (sine only)
Internal/external triggered, 1…50,000 cycles,
Type:
All
Signals:
All (except pulse)
1 ms…500 s
Sweep time:
up/down
Direction:
Type:
linear/logarithmic
Frequency range:
10 μHz…12.5 MHz
HMF2525
100 μHz…25 MHz
HMF2550
Amplitude:
5mV…+5V respectively
-5mV…-5V [into 50Ω]
Rise/fall time:
<8 ns, variable up to 500 ns
Pulse width:
15ns…999s
Resolution:
5 ns
Jitter (RMS):
<500ps typ.
Overshoot:
<3 % typ.

Waveform Ramp, Triangle
Frequency range:
HMF2525
10 μHz…5 MHz
HMF2550
10 μHz…10 MHz
Symmetry:
1…99 %
Linearity:
f <250kHz ≤0.1 % typ.
f ≥250kHz ≤2 % typ.
Non-volatile memory:
Up to 256kPts
Signal length:
Up to 256kPts
Predefined waveforms:
50 %.
noise (white/pink), cardinal sine, exponential (rise/fall)
Ext. modulation bandwidth:
1-3 dB
Amplitude modulation:
0…100%
Frequency modulation:
Max. 10 MHz
Phase modulation:
Phase deviation:
-180°…+180°
Pulse width modulation:
Deviation:
0…49.99 % of the pulse width

Waveform Arbitrary
Frequency range:
HMF2525
10 μHz…12.5 MHz
HMF2550
10 μHz…25 MHz
Sample rate:
250 MSa/s
Amplitude resolution:
14 Bit
Bandwidth [-3dB]:
>50 MHz
Signal length:
Up to 256kPts
Non-volatile memory:
up to 4MB (internal file system)
Predefined waveforms:
50 %.
sine, square (50 %),
ramp (positive/negative), triangle (50 %),
noise (white/pink), cardinal sine, exponential (rise/fall)

Inputs and Outputs

<table>
<thead>
<tr>
<th>Signal output</th>
<th>BNC socket (frontside), short-circuit-proof, ext. voltage ±15V max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Gate/Trigger</td>
<td>BNC socket (frontside)</td>
</tr>
<tr>
<td>Impedance</td>
<td>5kΩ</td>
</tr>
<tr>
<td>Level</td>
<td>TTL (protected up to ±30V)</td>
</tr>
<tr>
<td>Edge</td>
<td>Positive/negative (selectable)</td>
</tr>
<tr>
<td>Pulse width</td>
<td>Min. 100 ns</td>
</tr>
<tr>
<td>Trigger output</td>
<td>BNC socket (frontside)</td>
</tr>
<tr>
<td>Impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Level</td>
<td>Positive TTL level impulse</td>
</tr>
<tr>
<td>Frequency</td>
<td>10 MHz max.</td>
</tr>
<tr>
<td>Modulation input</td>
<td>BNC socket (rear side)</td>
</tr>
<tr>
<td>Impedance</td>
<td>10kΩ</td>
</tr>
<tr>
<td>Max. input voltage</td>
<td>±5V for full scale</td>
</tr>
<tr>
<td>Bandwidth [-3dB]:</td>
<td>DC…50 kHz (sampled at 250kSa/s)</td>
</tr>
<tr>
<td>Reference input</td>
<td>BNC socket (rear side)</td>
</tr>
<tr>
<td>Impedance</td>
<td>1kΩ</td>
</tr>
<tr>
<td>Frequency</td>
<td>10 MHz ±100 kHz</td>
</tr>
<tr>
<td>Input voltage</td>
<td>TTL</td>
</tr>
<tr>
<td>Reference output</td>
<td>BNC socket (rear side)</td>
</tr>
<tr>
<td>Impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Frequency</td>
<td>10 MHz</td>
</tr>
<tr>
<td>Output voltage</td>
<td>1.65 Vp (into 50Ω)</td>
</tr>
<tr>
<td>Ramp output</td>
<td>BNC socket (rear side)</td>
</tr>
<tr>
<td>Impedance</td>
<td>200Ω</td>
</tr>
<tr>
<td>Output voltage</td>
<td>0…5V, synchronous with sweep</td>
</tr>
</tbody>
</table>

Sweep
Signals:
All (except pulse)
Type:
linear/logarithmic
Direction:
up/down
Sweep time:
1ms…500s

Burst
Signals:
All
Type:
Internal/external triggered, 1…50,000 cycles, Immediate or Gate controlled
Start/stop phase:
0…360° (sine only)
Trigger source:
Manual, internal or external via Trigger source or interface
Internal Trigger period:
1μs…500s

Modulation
Type of modulation:
AM, FM, PM, PWM, FSK
Waveform carrier:
All (except pulse)
Internal modulation:
Sine, square (50 %),
ramp (positive/negative), triangle (50 %),
noise (white/pink), cardinal sine, exponential (rise/fall),
Arbitrary with up to 4096 Pts.
Internal modulation frequency:
10 μHz…50 KHz
Ext. modulation bandwidth:
1-3 dB
DC…50 KHz (sampled at 250kSa/s)
Amplitude modulation:
0…100%
Frequency modulation:
Max. 10 MHz
Phase modulation:
Phase deviation:
-180°…+180°
Pulse width modulation:
Deviation:
0…49.99 % of the pulse width

Miscellaneous
Display:
8.9 cm (3.5”) color TFT QVGA 65k colors
Interface:
Dual-Interface USB/RS-232 [H0720]
Save/Recall memory:
4 MB internal file system/ext. USB
Protection class:
Safety class I (EN61010-1)
Power supply:
105…253 V, 50…60 Hz, CAT II
Power consumption:
approx. 30W
Operating temperature:
+5…+40 °C
Storage temperature:
-20…+70 °C
Rel. humidity:
5…80 % (non condensing)
Dimensions (W x H x D):
285 x 75 x 365mm
Weight:
3.4 kg

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

Accessories supplied:
Line cord, Operating manual, CD, Software
Recommended accessories:
H0730 Dual-Interface Ethernet/USB
H0740 Interface IEEE-488 (GPIB), galvanically isolated
H213 Interface cable (USB) 1.8m
H214 Interface cable (serial) 1:1
H220 Adapter plug BNC plug - 4 mm safety sockets
H224 Attenuators 3/6/10 and 20 dB
H233 Test cable BNC plug - BNC plug 0.5m
H234 Test cable BNC plug - BNC plug 1.0m
H242 19" Rackmount kit 2RU
H272 IEEE-488 (GPIB) Cable 2m

Mainframe HM8001-2
Product description, page 38

General information
Mainframe with power supply accommodates 2 modules

Power supply module

Details of available supply voltages and load capability:
refer to manual HM8001 (www.hameg.com)
2 x 8Vmax max. 0.4A each
2 x 5Vmax max. 1A each
4 x 20Vmax max. 0.5A each
Voltages between 5V and 20V are programmable from each module
(Polarity selectable)
Available output power:
each module max. 25W
All DC voltages are electronically stabilized, floating and short-circuit proof. Current output of 2 HM8040-3 with HM8001-2:
sum of all channels <2A

Miscellaneous
Power switch [ON/OFF] located between the two modules on the front panel.
Safety class:
Safety Class I (EN61010-1)
Specifications

**Accuracy**

- 0.5…50 V: ±0.02 dB above 9 mV
- CMRR: ≥60 dB (50…60 Hz ± 0.5%)
- Crest factor: 7 max.

**AC current**

- Measurement ranges: 500μA, 5 mA, 50 mA, 500 mA, 10 A
- Resolution: 10 nA, 100 nA, 1 μA, 10 μA, 1 mA
- Accuracy: 0.5…500 mA: ±(0.7 % of reading + 0.07 % of f.s.)
- 40 Hz…5 kHz: ±(0.7 % of reading + 0.07 % of full scale)

**AC + DC measurements**

As shown for AC + 25 digits

**Resistance**

- Measurement ranges: 500Ω, 5 kΩ, 50 kΩ, 500 kΩ, 5 MΩ, 50 MΩ
- Resolution: 10 μΩ, 100 μΩ, 1 Ω, 10 Ω, 1 kΩ
- Accuracy: 500…50 kΩ: ±(0.05 % of reading + 0.004 % of full scale)

**Temperature**

- Temperature coefficient: 0.5% per degree C

**Miscellaneous**

- Power supply (from mainframe):
  - +5 V: 300 mA
  - ±5 V: 140 mA
- Operating temperature: -20…+50 °C
- Rel. humidity: 5…80 % (non condensing)

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

**Accessories supplied**:
- Operating manual, Interface cable (HZ14), PVC test leads (HZ15), CD, Software
- HZ10S 5 x silicone test lead [measurement connection in blue]
- HZ10R 5 x silicone test lead [measurement connection in red]
- HZ812 PT100 Temperature probe
- HZ801 4 BNC connectors
- HZ809 Test Adapter

**4¾-Digit Programmable Multimeter HM8012**

Product description, page 39

**DC voltage**

- Measurement ranges: 500 mV, 5 V, 50 V, 500 V, 600 V
- Resolution: 10 μV, 100 μV, 1 mV, 10 mV, 100 mV
- Accuracy: 500 mV, 50 V: ±(0.05 % of reading + 0.004 % of full scale)
- 500 mV: ±(0.05 % of reading + 0.004 % of full scale)

**DC current**

- Measurement ranges: 500 μA, 5 mA, 50 mA, 500 mA, 10 A
- Resolution: 10 nA, 100 nA, 1 μA, 10 μA, 1 mA
- Accuracy: 0.5…500 mA: ±(0.2 % of reading + 0.004 % of full scale)
- 500 mV range: 1 mA
- 5…50 MΩ range: 10 nA
- 50 kΩ range: 100 μA
- 500 kΩ range: 1 μA
- 5 MΩ range: 10 μA
- 50 MΩ range: 100 μA

**AC voltage**

- Measurement ranges: 500 mV, 5 V, 50 V, 500 V, 600 V
- Resolution: 10 μV, 100 μV, 1 mV, 10 mV, 100 mV
- Accuracy: 500 mV, 50 V: ±(0.05 % of reading + 0.004 % of full scale)
- 500 mV: ±(0.05 % of reading + 0.004 % of full scale)

**Miscellaneous**

- Power supply: 115/230V~ [50…60Hz], CAT II
- Max. permissible line fluctuation: ±10 %
- Power consumption: max. 110 W (with overload protection)
- Operating temperature: +5…+60 °C
- Storage humidity: 50 % (non condensing)
- Dimensions (W x H x D): 285 x 75 x 365 mm
- Weight: approx. 4 kg

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

**Accessories supplied**:
- Line cord, Operating manual

**Recommended accessories**:
- HO801 4 BNC connectors
- HZ812 PT100 Temperature probe
- HZ10B 5 x silicone test lead (measurement connection in blue)
- HZ10R 5 x silicone test lead (measurement connection in red)
- HZ812 PT100 Temperature probe
- HZ10S 5 x silicone test lead [measurement connection in black]
- HZ809 Test Adapter
- HZ801 4 BNC connectors
- HZ10B 5 x silicone test lead [measurement connection in blue]
- HZ809 Test Adapter
- HZ812 PT100 Temperature probe

**Power supply (from mainframe)**:
- +5 V: 300 mA
- ±5 V: 140 mA
- Operating temperature: -20…+50 °C
- Rel. humidity: 5…80 % (non condensing)
- Dimensions (W x H x D): 135 x 68 x 228 mm
- Weight: approx. 0.5 kg

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

**Accessories supplied**:
- Operating manual, Interface cable (HZ14), PVC test leads (HZ15), CD, Software

**Recommended accessories**:
- HZ10S 5 x silicone test lead [measurement connection in black]
- HZ10R 5 x silicone test lead [measurement connection in red]
- HZ812 PT100 Temperature probe
- HZ809 Test Adapter
- HZ10B 5 x silicone test lead [measurement connection in blue]
- HZ812 PT100 Temperature probe
25 kHz-LCR-Meter HM8018
Product description, page 39

Measurement functions
Measuring modes: R, L, C, \( \varepsilon \), Q/D, \( \Omega \)
Equivalent circuits: serial, parallel
Measuring method: 2-wire, 4-wire
Measuring ranges:
- R: 0.001 Ohm...99.9 MΩ
- C: 0.001 pF...99.9 nF
- L: 0.01 μH...9999 μH
- Q: 0.0001...99.9
- \( \varepsilon \): [180.0°]-[180.0°] (±180.0°)
Basic accuracy: 0.2%
Measuring frequencies:
- 100 Hz, 120 Hz, 1 kHz, 10 kHz, 25 kHz
Freq. Accuracy: ±100 ppm (except 120 Hz: 120.2 Hz ±100 ppm)
Measuring voltage: 0.5 Vrms ±10% (unloaded)
Measuring rate: 2 measurements/second
Range changing: automatic, manual
DC Bias voltage: 1 V ±10%
Zero setting: Open/short circuit compensation
Compensation limits:
- Short: R < 100
- Z < 150
- Open: Z > 10 kΩ

Measurement accuracy
with \( D < 0.1 \) or \( Q > 10 \):
- C: \( A_e = A_l + C/C_{max} + C_{min}/C \)
- L: \( A_e = A_l + L/L_{max} + L_{min}/L \)
- Z: \( A_e = A_l + Z/Z_{max} + Z_{min}/Z \)
- R: \( A_e = A_l + R/R_{max} + R_{min}/R \)

with \( D \geq 0.1 \):
- \( A_e = \sqrt{1 + D} \)

with the parameters:
- \( C_e = \) Measurement value
- \( A_l = 0.2 \% \) at f = 100 Hz, 120 Hz, 1 kHz
- \( A_l = 0.3 \% \) at f = 10 kHz
- \( A_l = 0.5 \% \) at f = 25 kHz

Parameter
Auto Range
- \( C_{max} = 160 \mu F/f \) (f in kHz)
- \( L_{max} = 53 pF/f \) (f in kHz)
- \( Z_{max} = 480 H/f \) (f in kHz)
- \( R_{max} = 3 MΩ \)
- \( Z_{min}, R_{min} = 0.5 Ω \)

Dissipation factor accuracy: \( D_e = \frac{A_e}{100} \)
Quality factor accuracy: \( Q_e = \frac{Q_{10} - D_{e}}{1 + D_{e}} \)
Phase angle accuracy: \( \Theta_e = \frac{180}{\pi} \frac{\Theta}{100} \)

Display
5-digits 7-Segment LEDs with sign
Display Parameters:
- Value
- % Value
- Deviation
- % Offset
Calculation from measurement value and reference value stored

Miscellaneous
- The inputs are short-circuit-proof and overvoltage protected up to 100 V<br>, with a maximum energy consumption of 1 J.
- One configuration can be saved.
- Power supply (from mainframe):
  - +5 V/300 mA
  - +5.2 V/50 mA
  - -5.2 V/50 mA
  - (I = 2 W)
- Operating temperature: +5°C...+60°C
- Storage temperature: -20°C...+70°C
- Rel. humidity: 5...80% (non condensing)
- Dimensions (W x H x D): 135 x 68 x 228 mm
- Weight: approx. 0.5 kg

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

1.6 GHz Universal Counter HM8021-4
Product description, page 40

Measurement functions
Frequency A/C, Period A;
Totalize A;
Pulse width: \( \frac{1}{f} \) (averaged);
Totalling A during ext. gate

Input characteristics (Input A)
Frequency range:
- 0...150 MHz: DC-coupled
- 10 Hz...150 MHz: AC-coupled
Sensitivity:
- (normal triggering)
  - DC...80 MHz: 20 mV rms (sine wave)
  - 20 mV (pulse)
  - 80 mV rms (sine wave)
  - 20 Hz...80 MHz (auto trig.) 50 mV rms (sine wave)
Minimum pulse width: 5 ns
Input noise: 100 μV (typ.)
Coupling: AC or DC (selectable)
Input impedance: x1, x20 (selectable)
Max. input voltage:
- 0...440 Hz: 400 V (DC + AC peak)
- 1 MHz: decreasing to 8 V rms
Input characteristics (Input C)
Frequency range: 100 MHz...1.6 GHz
Sensitivity:
- to 1.3 GHz: 30 mV (typ. 20 mV)
- to 1.6 GHz: 100 mV (typ. 80 mV)
Input impedance: 50 Ω nominal
Coupling: AC
Max. input voltage: 5 V (DC + AC peak)

Input characteristics (external gate)
Input impedance: 4.7 kΩ
Max. input voltage: ±30 V
High/low level: >2V/ <0.5 V
Min. pulse duration: 50 ns
Min. effective gate time: 150 μs

Frequency measurement (Input A)
LSD: \( 2.5 \times 10^{-7} \times \text{freq.} \) / measurement time
Resolution: 1 LSD

Period duration measurement
Range: 0.6 ns...10,000 s
LSD: \( 0.6 \times 10^{-7} \times \text{period} / \text{measurement time} \)
Resolution: 1 LSD

Totalling (manually/externally gated)
Range: DC...20 MHz
Min. pulse duration: 20 ns
LSD: 1 count
Resolution: LSD
Ext. gate error: in manual mode only 100 ns
Time interval (averaged)
LSD: 10 ps...100 ns
Resolution: 1 LSD
**Specifications**

- **Offset**
  - Range: covers the entire measurement range

- **Gate time**
  - Range: 100 ms...10 s in 3 steps
  - External gate time: min. 150 μs

- **Timebase**
  - Frequency: 10 MHz clock, 10 MHz crystal
  - Accuracy (between 10 °C and 40 °C): ±5 x 10⁻⁷
  - Aging: ±3 ppm/15 years

- **Miscellaneous**
  - Display: 8-digit 7-segment LED display with 7.65 mm digit height, sign and exponent
  - Power consumption: approx. 7 W
  - Operating temperature: +5...+40 °C
  - Storage temperature: -20...+70 °C
  - Rel. humidity: 5...80 % (non condensing)

- **Dimensions** (W x H x D): 135 x 68 x 228 mm
  - Weight: approx. 0.6 kg

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

**Accessories supplied:** Operating manual, CD

**Recommended accessories:**
- HZ20 Adapter, BNC to 4mm banana
- HZ24 Attenuators 50Ω (3/6/10/20 dB)
- HZ33 Test Cable 50Ω (BNC-BNC) 0.5 m
- HZ34 Test Cable 50Ω (BNC-BNC) 1.0 m

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**10 MHz Function Generator HM8030-6**

*Product description, page 40*

**Operating modes**
- Sine, square, triangle, pulse; free running, internal sweep or external frequency modulation, with or without DC offset

**Frequency ranges**
- 0.05 Hz...10 MHz in 8 ranges, variable: x0.09 to x 1.1 (12:1)
- Frequency drift: <0.5%/hr or 0.8%/24 hrs. at constant ambient temperature

**Waveform characteristics**
- Sine wave distortion:
  - 0.05 Hz...1 MHz max. 0.5 %
  - 1...10 MHz max. 5 %
- Square wave rise time: typ. 15 ns
- Overshoot: <5 % (for termination into 50Ω)
- Triangle non-linearity: <1 % (to 100 kHz)

**Displays**
- Frequency: 5-digit, 7-segment LED, each 8 x 5 mm
- Accuracy:
  - up to 5 Hz: ±(3 % + 3 digits)
  - 5 Hz...10 MHz: ±(5 x 10⁻⁵ + 1 digit)
- LED indicators for mHz, Hz, kHz and s

**Output**
- Signal output: short-circuit proof
- Impedance: 50Ω
- Output voltage: 10 V₉₀ into 50Ω load; 20 V₉₀ (open circuit)
- 2 attenuators: each 20 dB ±0.2 dB
- Variable: 0...20 dB
- Amplitude error:
  - sine wave/triangle: 0.05 Hz...0.5 MHz: max. ±0.2 dB
  - 5 Hz...10 MHz: max. ±2.0 dB

**Trigger output:** square wave synchronous to approx. 5V/TTL

**FM input**
- [VCF, BNC connector on rear panel of HM8001-2 and option HO801]
  - Frequency deviation: approx. 1:100
  - Input impedance: 6kΩ II 25 pF
  - Input voltage: max. ±30V

**Internal sweep**
- Sweep speed: 20 ms...15 s
- Sweep range: approx. 1:100

**Power supply**
- (+5V/200 mA)
- (+16V300 mA)
- (-16V/250 mA)

**Outputs**
- 2 x 0...20 V/0.5 A and 5 V/1 A
  - Single pushbutton control of all outputs, linear regulators with overheating protection. Floating outputs for parallel/serial operation, current limit and electronic fuse

**20V Output**
- Setting range: 2 x 0...20V, continuously variable
- Residual ripple: ≤1 mVₚₚₚₚ
- Output current: max. 0.5 A
- Current limit/electronic fuse: 0...0.5 A continuously variable
- Dynamic behaviour:
  - Load change: 10...90 % of full load
  - Recovery time: 200 μs
  - Dyn. transient deviation: typ. 2 mV
  - Dyn. output impedance: 3.75 mΩ
- Load change at 50 % basic load and ±10 % of full load
  - Recovery time: 150 μs
  - Dyn. transient deviation: 400 μV
  - Dyn. output impedance: 4 mΩ

**5V Output**
- Range: 5V ±0.5V screwdriver adjustment
- Ripple and noise: ≤1 mVₚₚₚₚ
- Output current: max. 1 A continuous, short-circuit-proof

**Combined displays of 20V outputs**
- 7-segment LED: 2 x 3-digit displays, each can be switched to display either voltage [V] or current [mA]
- Resolution: 0.1V/1mA
- Display accuracy: ±1 digit voltage/±4 digit current
- LED: current limit indication
Maximum limits

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse voltage:</td>
<td>25 V, each output</td>
</tr>
<tr>
<td>Reverse current:</td>
<td>500 mA, each output</td>
</tr>
<tr>
<td>Voltage to ground:</td>
<td>100 V, each terminal</td>
</tr>
<tr>
<td>Temperature control:</td>
<td>If the internal temperature exceeds 75...80 °C, the HM8040-3 will be switched off automatically.</td>
</tr>
</tbody>
</table>

Miscellaneous

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety class:</td>
<td>Safety class I (EN61010-1)</td>
</tr>
<tr>
<td>Power supply (from mainframe):</td>
<td></td>
</tr>
<tr>
<td>1 x 8 V/1 A</td>
<td></td>
</tr>
<tr>
<td>2 x 24 V/530 mA</td>
<td></td>
</tr>
<tr>
<td>1 x 5 V/400 mA</td>
<td></td>
</tr>
<tr>
<td>2 x 18 V_/100 mA</td>
<td></td>
</tr>
<tr>
<td>(∑ = 40 W)</td>
<td></td>
</tr>
<tr>
<td>Current output of 2 HM8040-3 with HM8001-2:</td>
<td>sum of all channels ≤2 A</td>
</tr>
<tr>
<td>Operating temperature:</td>
<td>+5...+40 °C</td>
</tr>
<tr>
<td>Storage temperature:</td>
<td>-20...+70 °C</td>
</tr>
<tr>
<td>Rel. humidity:</td>
<td>5...80% (non condensing)</td>
</tr>
<tr>
<td>Dimensions (W x H x D):</td>
<td>135 x 68 x 228 mm</td>
</tr>
<tr>
<td>Weight:</td>
<td>approx. 1.07 kg</td>
</tr>
</tbody>
</table>

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

Accessories supplied: Operating manual, CD
Recommended accessories:
- HZ10S 5 x silicone test lead [measurement connection in black]
- HZ10R 5 x silicone test lead [measurement connection in red]
- HZ10B 5 x silicone test lead [measurement connection in blue]
### H0010/H0011 Serial Bus Option description, page 10

#### CAN/LIN Trigger and Decode in Progress

<table>
<thead>
<tr>
<th>Bus Configuration</th>
<th>I2C Bus</th>
<th>SPI Bus</th>
<th>UART/RS-232 Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit/Baud rate</td>
<td>up to 10 Mbit/s (HM0352x/2524), up to 5 Mbit/s (HM072x...202x)</td>
<td>up to 25 Mbit/s (HM0352x/2524), up to 12.5 Mbit/s (HM072x...202x)</td>
<td>300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud, up to 62.5 Mbit/s (HM0352x/2524), up to 31 Mbit/s (HM072x...202x)</td>
</tr>
<tr>
<td>Number of Bit's</td>
<td>7 or 10 Bit for Address ID, 8 Bit for Data</td>
<td>32 Bit for Data</td>
<td>8 Bit for Data</td>
</tr>
<tr>
<td></td>
<td>1, 1.5, 2 Bit for Stop Bit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polarity</td>
<td>n/a</td>
<td>Chip select, positive or negative, or without Chipselect (2-wire SPI)</td>
<td>High or Low active</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clock rising or falling edge</td>
<td>Data High or Low active</td>
</tr>
<tr>
<td>Parity</td>
<td>n/a</td>
<td>none, odd or even</td>
<td></td>
</tr>
</tbody>
</table>

#### Trigger Source

<table>
<thead>
<tr>
<th>Source</th>
<th>H0010: digital Channel LCH0...15 (Opt. HO3508) analog Channel LCH 1...2 [CH1...4]</th>
<th>H0011: analog Channel LCH1...2 (CH1...4)</th>
<th>H0010: digital Channel LCH0...15 (Opt. HO3508) analog Channel LCH 1...2, external Trigger Entry for Chip Select, [CH1...4]</th>
<th>H0011: analog Channel LCH1...2 [CH1...4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event</td>
<td>7 or 10 Bit Address ID</td>
<td>Data packets up to 32 Bit</td>
<td>Data packets up to 8 Bit</td>
<td>Data packets up to 8 Bit</td>
</tr>
<tr>
<td></td>
<td>with positive or negative Chip Select or without Chip Select, (2-wire SPI)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Input format

<table>
<thead>
<tr>
<th>Hardware accelerated Decode Source</th>
<th>H0010: digital Channel LCH0...15 (Opt. HO3508) analog Channel LCH 1...2 [CH1...4]</th>
<th>H0011: analog Channel LCH1...2 (CH1...4)</th>
<th>H0010: digital Channel LCH0...15 (Opt. HO3508) analog Channel LCH 1...2, external Trigger Entry for Chip Select, [CH1...4]</th>
<th>H0011: analog Channel LCH1...2 [CH1...4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Bus display, color coded for</td>
<td>Bus display, color coded for</td>
<td>Bus display, color coded for</td>
<td>Bus display, color coded for</td>
</tr>
<tr>
<td>Read Address ID</td>
<td>Yellow</td>
<td>Date</td>
<td>Date: cyan</td>
<td>Date: cyan</td>
</tr>
<tr>
<td>Write Address ID</td>
<td>Magenta</td>
<td>Start: White</td>
<td>Start: White</td>
<td>Start: White</td>
</tr>
<tr>
<td>Date:</td>
<td>Cyan</td>
<td>Stop: White</td>
<td>Stop: White</td>
<td>Stop: White</td>
</tr>
<tr>
<td>Start:</td>
<td>White</td>
<td>ACK/NACK:</td>
<td>Error: Red</td>
<td>Error: Red</td>
</tr>
<tr>
<td>Trigger Condition:</td>
<td>Green/Red</td>
<td></td>
<td>Trigger Condition: Green</td>
<td>Trigger Condition: Green</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>up to four lines for decoded values, synchronous display of the Bit lines</td>
<td>up to four lines for decoded values, synchronous display of the Bit lines</td>
</tr>
<tr>
<td>Format</td>
<td>Address ID: hexadecimal</td>
<td>Data ASCII, binary, decimal, hexadecimal</td>
<td>n/a</td>
<td>Data ASCII, binary, decimal, hexadecimal</td>
</tr>
</tbody>
</table>

### Differences H0010/H0011

<table>
<thead>
<tr>
<th>Feature</th>
<th>H0010</th>
<th>H0011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic channel (LC 0...LC 15) as source for serial bus trigger and decode</td>
<td>x</td>
<td>-</td>
</tr>
<tr>
<td>Analog channel (CH 1...CH 4) as source for serial bus trigger and decode</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Time synchronous decode of two serial busses</td>
<td>x</td>
<td>-</td>
</tr>
</tbody>
</table>
Specifications

H O O 1 2  C A N / L I N

for all Oscilloscopes of the HMO Series

- CAN, LIN 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 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 Comfortably
- Powerful Trigger to isolate specific Messages
- Option for all Oscilloscopes of the HMO Series, retrofittable

See page 91 for technical specifications or www.hameg.com/H0012
<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H0012 CAN/LIN Serial Bus Option</strong></td>
</tr>
</tbody>
</table>

### Bus Configuration

<table>
<thead>
<tr>
<th>CAN Bus</th>
<th>LIN Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bit rates</strong></td>
<td>Pre-Defined or User-Select, 100 Bit/s...4 Mb/s (HMO352x/2524), 100 Bit/s...2 Mb/s (HMO72x...202x)</td>
</tr>
<tr>
<td><strong>Signal Type</strong></td>
<td>CAN-L or CAN-H, Single Ended or Differential Probe [Analog Channel only]</td>
</tr>
<tr>
<td><strong>Sample Point Range</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Threshold</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Polarity</strong></td>
<td>High or Low Aktive</td>
</tr>
<tr>
<td><strong>Protocol Version</strong></td>
<td>1.x, 2.x, J2602, 1.x or 2.x</td>
</tr>
</tbody>
</table>

### Trigger

<table>
<thead>
<tr>
<th>CAN Bus</th>
<th>LIN Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source</strong></td>
<td>digital Channel LCH 0...15 [Opt. HO3508], analog Channel LCH 1...2 [CH 1...4]</td>
</tr>
<tr>
<td><strong>Event</strong></td>
<td>Start of Frame (SOF), End of Frame (EOF)</td>
</tr>
<tr>
<td><strong>Error Frame</strong></td>
<td>Error condition: Stuff Bit Error, CRC Error, Not Acknowledge, Form Error</td>
</tr>
<tr>
<td><strong>Overload Frame</strong></td>
<td>Data Frame [11 or 29Bit ID]</td>
</tr>
<tr>
<td><strong>Remote Frame</strong> [11 or 29Bit ID]</td>
<td>Identifier: 0, 1, X [Don't Care] Pattern, trigger when =, ≠, &lt;, &gt;</td>
</tr>
<tr>
<td><strong>Identifier and Data</strong></td>
<td>ID and 64 Bit data pattern [0, 1, X], trigger when =, ≠, &lt;, &gt;</td>
</tr>
<tr>
<td><strong>Input format</strong></td>
<td>Hexadecimal or Binary</td>
</tr>
</tbody>
</table>

### Hardware accelerated Decode

<table>
<thead>
<tr>
<th>CAN Bus</th>
<th>LIN Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source</strong></td>
<td>digital Channel LCH 0...15 [Opt. HO3508], analog Channel LCH 1...2 [CH 1...4]</td>
</tr>
<tr>
<td><strong>Display Bus</strong></td>
<td>color coded for Start and End of Frame: White brackets, Data ID: Magenta, Remote ID: Yellow, DLC: White, Data: Cyan, CRC: White, ACK: Green, Overload: White, Error: Red, up to four lines for decoded values, synchronous display of the Bit lines</td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td>Display of Bus 0 or 1</td>
</tr>
<tr>
<td><strong>Format</strong></td>
<td>Identifier &amp; other: hexadecimal, Data: ASCII, binary, decimal, hexadecimal</td>
</tr>
</tbody>
</table>
We provide a worldwide dealer network, in order to offer best local support. For questions about our products, please visit www.hameg.com/dealer to find your local contact information.

| HM400 | HM800 | HM6050-2 | HM7042-5 | HM8001-2 | HM8012 | HM8018 | HM8021-4 | HM8030-6 | HM8040-3 | HM8112-3 | HM8115-2 | HM8118 | HM8123 | HM8134-3 | HM8135 | HM8143 | HM8150 | HMF2525 | HMF2550 | HMP2020 | HMP2030 | HMP4030 | HMP4040 | HMO722 | HMO724 | HMO1022 | HMO1024 | HMO1522 | HMO1524 | HMO2022 | HMO2024 | HMO2524 | HMO3022 | HMO3024 | HMO3524 | HMS1000 | HMS1000E | HMS1010 | HMS3000 | HMS3010 | H118 | H0730 | H0740 | H0801 | H0880 | H03011 | H03508/H03516 | H0010 | H0011 | H0012 | HZ10 | HZ15 | HZ16 | HZ17 | HZ18 | HZ19 | HZ20 | HZ21 | HZ22 | HZ24 | HZ26 | HZ31 | HZ32 | HZ33/HZ34 | HZ33S/HZ34S | HZ42 | HZ43 | HZ45 | HZ46 | HZ51 | HZ52 | HZ72 | HZ99 | HZ100 | HZ109 | HZ115 | HZ154 | HZ181 | HZ184 | HZ186 | HZ188 | HZ200 | HZ2350 | HZ2355 | HZ2520 | HZ2525 | HZ2530 | HZ2540 | HZ2547 | HZ2550 | HZ2560 | HZ2575 | HZ2809 | HZ2812 | HZ2815 | HZ2887 | HZ2010 | HZ2020 | HZ2030 | HZ2040 | HZ2041 | HZ2050 | HZ2051 | HZ2090 | HZ2091 | HZ2092 | HZ350 | HZ355 | HZ520 | HZ525 | HZ5250 | HZ5255 | HZ5300 | HZ5305 | HZ5350 | HZ5400 | HZ5405 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 | HZ5455 | HZ5460 | HZ5465 | HZ5470 | HZ5475 | HZ5480 | HZ5485 | HZ5490 | HZ5495 | HZ5410 | HZ5415 | HZ5420 | HZ5425 | HZ5430 | HZ5435 | HZ5440 | HZ5445 | HZ5450 |
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