



Functions Generator HM 8131-2

The **HM 8131-2** Synthesizer Function Generator features simple and intuitive operation requiring no learning period at a hitherto unequalled low price. The most important functions frequency, amplitude, offset voltage, sweep mode are controlled either by a front panel knob or using the keyboard. All other functions

are accessible through menus shown on a back-lighted LCD display.

The **RS-232 interface** allows fetching all data from as well as control of the instrument thus enabling the incorporation of the instrument in automated test sites.

- Standard signals: sine, square wave, triangle, ramps
- 12 digit frequency display on back-lighted LCD
- Arbitrary functions up to 10 MHz as defined by the user
- 12 bit resolution amplitude, 40 MSa/s sample rate at output
- 4 K non-volatile plus 16 K volatile memories
- Interface for SRAM cards (up to 1 MB) storing arbitrary functions
- RS-232 interface for pc control. IEEE-488 interface optional.
- White noise with 10 MHz bandwidth
- Pink noise with 100 kHz bandwidth
- External triggering resp. gating allow burst mode
- Linear or logarithmic sweep triggered or gated
- Direct Digital Synthesis signal generation
- Frequency range 100 μ Hz to 15 MHz with 100 μ Hz
- 30 μ Hz accuracy, temperature stability 2 ppm (0.5 ppm optional)
- FSK and PSK modulation within the full frequency range
- Phase control in 0.1 degree steps referenced to the control signal
- Output voltage 20 V_{pp} no load, 10 V_{pp} 50 ohms. DC offset selection up to \pm 5 V
- Master-slave operation of up to 3 function generators

Specifications HM 8131-2

(Specifications apply at a reference temperature of 23 ±2 degrees C.)

Frequency specifications

Range:	100 µHz to 15 MHz
Resolution:	100 µHz 100 mHz (sweep mode)
Display:	12 digit LCD display
Accuracy:	
Standard oscillator:	± (10 ppm x frequency + 30 µHz)
TXCO (option HO86):	± (0.5 ppm x frequency + 30 µHz)
Temperature coefficient:	
Standard oscillator:	2 ppm/degree C
TXCO (option HO86):	0.5 ppm/degree C (10 to 40 degrees C)
Aging:	
Standard oscillator:	10 ppm/year
TXCO:	2 ppm/year

Available signals

Sine

Frequency range:	100 µHz to 15 MHz
Amplitude:	0 .. 20 V _{pp} no load
Harmonics:	<0.1% (10 Hz .. 20 kHz) <1% (20 kHz .. 3 MHz) <3% (3 .. 15 MHz)

Nonharmonic distortions: < - 65 dBc frequ. (< 1 MHz)
< - (65 dBc + 6 dB/octave) frequ. (> 1 MHz)

Phase noise: < - 90 dBc/sqrt Hz (0 dBm, 1 kHz off carrier)

Square wave

Frequency range:	100 µHz to 15 MHz
Amplitude:	0 .. 20 V _{pp} no load
Rise/fall times:	<10 ns
Overshoot:	<5 % (output voltage >200 mV _{pp})
Symmetry:	50% ± (5% + 10 ns)

Saw tooth

Frequency range:	100 µHz to 100 kHz
Amplitude:	0 .. 20 V _{pp} no load
Linearity error:	<1% below 100 kHz
Slope:	+ or -
Rise/fall times:	45 ns

Triangle

Frequency range:	100 µHz to 1 MHz
Amplitude:	0 .. 20 V _{pp} no load
Linearity error:	<1% below 100 kHz

Noise

White noise: 10 MHz bandwidth

Pink noise: 100 kHz bandwidth

Arbitrary signals

Frequency range:	100 µHz to 10 MHz
Amplitude:	0 .. 20 V _{pp} no load
Output rate:	40 MSa/s
Resolution:	12 bits amplitude
Filter:	7 th order Bessel, b = 10 MHz
Memory:	1 x 4 K words non-volatile 1 x 16 K words volatile
Jitter:	<25 ns

Inputs

GATE/TRIGGER

Impedance: 5 kΩ 100 pF, protected up to 30 V

AM – Modulation

Impedance: 1 kΩ, max. input ±10 V

External reference

frequency input: 10 MHz ±2 ppm

Input voltage

Impedance: 500 Ω, protected up to ±30 V

Outputs

Signal output: BNC, short-circuit proof

Impedance: 50 Ω

Output voltage: 20 .. 200 mV_{pp} (no load) in range 1
0.21 .. 2.0 V_{pp} (no load) in range 2
2.1 .. 20 V_{pp} (no load) in range 3

Resolution: 3 ½ digits (1/10/100 mV)
peak-to-peak or rms voltage indicated (except arbitrary)

Voltage accuracy

Sine 1 kHz: ± (1 % x amplitude + 5 digits)

Square wave 1 kHz: ± (3 % x amplitude + 5 digits)

Amplitude accuracy: ±0.2 dB (<100 kHz)
±0.3 dB (100 kHz to 2 MHz)
+0.5 dB (2 MHz to 15 MHz)

Temperature coefficient: ± 0.1 %/degree

Maximum output voltage as measured against

the case: 42 V

Trigger output: BNC, short-circuit proof,
5 V TTL level

Sawtooth output:

Output voltage: synchronous to sweep 0 .. 5 V

Impedance: 1 kΩ

DC Offset

Output voltage: - 50 mV ... + 50 mV no load in range 1
- 0.5 V ... + 0.5 V no load in range 2
- 5 ... + 5 V no load in range 3

Resolution: 3 digits

Accuracy: $\pm (1 \% \times \text{offset voltage} + 5 \text{ digits})$
Temperature coefficient: $\pm 0.1 \%/\text{degree}$

Phase

Range: 0 ... 359.9 degrees
Resolution: 0.1 degree
Reference: falling slope of sync signal
Jitter: <25 ns
Accuracy: except square wave:
 $\pm (0.1 + \text{frequ./Hz} \times 10 \text{ exp} - 6)$ degrees
Square wave: $\pm (5 + \text{frequ./Hz} \times 30 \times 10 \text{ exp} - 6)$ degrees

Sweep (internal)

Internal sweep: for all signal types linear or logarithmic
Ranges: 100 mHz up to max. signal frequency limit
 Start and stop frequencies are selectable.
Sweep time: 10 ms to 40 s continuously variable or triggered (by external signal, keyboard, interface)

Modulation

FSK/PSK: all signal types, noise excluded
Frequency range: 100 μ Hz up to max. frequency
Trigger: by external signal
Minimum duration: 25 μ s
Delay: typ. 10 μ s PSK, typ. 15 μ s FSK

Amplitude modulation

Source: internal or external
Modulation depth: 0 .. 100 %
Bandwidth: DC - 20 kHz (-3 dB)
Carrier frequency: 100 μ Hz to max. signal frequency
Accuracy: $\pm (5 \% \text{ of display} + 2 \%)$
Internal modulation: 1 kHz sine
External modulation: 20 Hz .. 20 kHz
Gate: (asynchronous)
Delay: <150 ns
Input signal: TTL level
Trigger: (synchronous)
Frequency range: <500 kHz
 Burst mode via ext. trigger or interface.

Miscellaneous

LCD: 2 x 20 characters, back-lighted
Memory card: PCMCIA II format up to 1 MB.
 Allows storage of up to 31 arbitrary functions 16k or up to 114 arbitrary functions 4k.
 Arbitrary signal editor incorporated.

Memories: 10 for control settings
 1 for arbitrary signals via memory card or interface.

Control: Manually or via interface.

RS-232: included

IEEE-488: Option HO88-2

Dimensions (W x H x D): 85 x 75 x 365 mm

Weight: appr. 5 kg

Operating temperature: 0 .. + 40 degrees C

Humidity: 10 .. 90 % relative, no condensation

Supply voltage: 115/230 V $\pm 15\%$

Mains frequency: 50/60Hz

Power consumption: appr. 30VA

Safety class: Class I IEC 61010-1/ VDE 0411

Accessories included

Power cord, Manual, Warranty document

Available additional accessories

HO831 Memoery Card 1 MB
 HO86: TXCO 5 x 10⁻⁷, 0.5 ppm/degree (10 to +40 degrees C)
 HO88-2: IEEE-488 interface
 HZ24: 1 set of attenuators 50 ohms with 3- /6-/10- and 20 dB
 HZ33, HZ34: BNC to BNC cables
 HZ42: 19" rack mount kit 2 units (75 mm)
 HZ72-S/L: double-shielded IEEE-488 cable, 1 or 1.5 m

Software FG8131 (optional)

This software enables simple control of the instrument as well as the back up and restore of the unit settings on a file. It has a signal creator to edit arbitrary data.

An additional function is the ability to transfer the signal data from a HAMEG oscilloscope via DDE from the software SP107 (requires version 2.12 or higher). This software could be downloaded at www.hameg.de.

(Specifications without tolerance limits are values typical of an average production instrument)