Function Generator HM8131-2

- **Direct Digitally Synthesized Function Generator**
- **Frequency Range: 100µHz to 15 MHz**
- **Resolution: 100µHz**
- **Memory Card for Signal Registration**
- **Arbitrary Waveform Generation**
- **Keyboard Entry or Rotary Control of major parameters**
- **RS232-Interface included as Standard**

The **HM8131-2** is a high performance, yet affordable, **15MHz Synthesized Function Generator**. The instrument uses direct digital synthesis to generate standard waveforms such as sine, square, ramp, triangle and white noise, as well as arbitrary signals with **synthesized frequency accuracy**.

Direct keyboard entry or signal parameter adjustment via rotary control simplifies operation. Major settings like frequency, amplitude, offset voltage and sweep parameters can be directly input. Input of other functions are menu driven. Two lines of 20 characters each are displayed on a **backlit LCD** in order to present a clear indication of the instrument settings. To change a setting, all that's needed is to make a selection from the LCD and push the corresponding buttons.

The **HM8131-2** can be remote controlled via the standard, **built-in RS232 serial interface** or by an optional **IEEE-488-Interface** which in that case replaces the serial interface. Interfaces are easily interchangeable at the field level. A standard **S-RAM memory card** enables the storage and recall of Arbitrary Waveforms up to a total capacity of 1MB.

Frequencies are displayed as a 12 digit presentation with **100µHz resolution**. This remarkable high resolution is important, for example, for the stimulation of mechanical vibration. The standard timebase provides 2 ppm/°C frequency stability, thus making a frequency counter for checking the frequency unnecessary. An optional TCXO timebase provides 0.5 ppm stability. Even greater long term stability can be achieved using an external timebase such as the **HM8125 GPS Frequency Standard**.

Linear and logarithmic frequency sweeps are quickly specified by entering start and stop frequencies and the sweep time. The entire frequency span of the **HM8131-2** can be covered in one sweep. Sweeps can be triggered from the front panel, the internal rate generator, the external trigger input or the interface. Any waveform, incl. arbitrary waveforms, may be triggered. A burst can be generated by means of an external trigger signal.

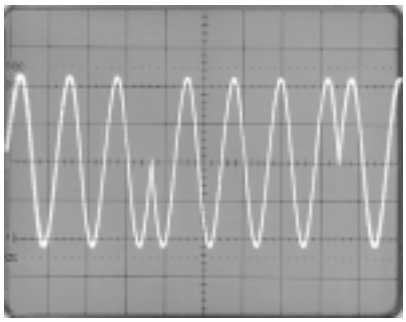
The standard waveforms can be amplitude modulated, either internally or externally. The **HM8131-2** also provides **FSK** and **PSK**-modulation. **Signal phase** can be adjusted down to 0.1 degree resolution. The phase relationship between multiple HM8131-2 sharing the same timebase is fixed with 0.1 degree phase accuracy lock.

The ability to generate arbitrary waveforms is another advantage of the HM8131-2. **Arbitrary waveforms** are generated at sample rates of 40 MS/s with 12 bits (0.025%) vertical resolution. The maximum output frequency is 15MHz. The **HM8131-2** can **store** records as long as **4K or 16 K points**. The waveforms can be point or vector edited from the front panel. Data for waveforms can be downloaded from any PC or transfered via memory card.

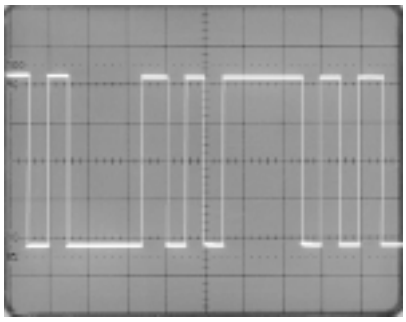
The output of the **HM8131-2** has the low phase noise inherent to **DDS (Direct Digital Synthesis)**. The wideband output amplifier provides low distortion as well as excellent pulse response. It can drive 10Vpp into 50Ω (20Vpp into high impedance loads) with less than 10ns risetime. The output is protected against externally applied voltages and is short-circuit proof. The output voltage can be read with a 3½ digit resolution from the LCD. Offset voltage is adjustable up to ±5V.

The **HM8131-2** contains **non-volatile memory** to store up to 10 complete set-ups of the instrument. This allows commonly used waveshapes, frequencies and modulations to be instantly recalled. In addition one 4k word arbitrary waveform can be stored as well as the power-down condition.

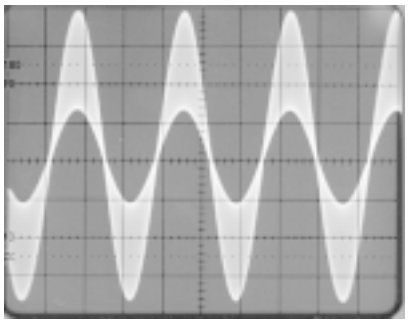
The **HM8131-2** is a **high precision instrument** with easy operation, making it the ideal choice for a wide range of applications like product line testing, research and development, service, education and training. And best of all, the **HM8131-2** is priced well below conventional function generators offering far less performance.



PSK Modulated Sine Wave



FSK Modulated Square Wave



Amplitude Modulation (50%)

Specifications (Ref. temp.: 23°C ± 2°C)

Frequency

Range: 100µHz to 15MHz
Resolution: 100µHz
100mHz for sweep
Display: 12 digit; LCD
Accuracy: ±(10ppm x freq. + 30 µHz); standard oscillator
Opt. TCXO: ±(0.5ppm x freq. + 30 µHz); ± 30 µHz; external with HM 8125
Temp. coef.: 2 ppm/°C; standard oscillator
0.5 ppm 10°C-40°C; TCXO (HO86)
< $5x10^{-10}$; external with HM 8125
Aging: < 10 ppm/ year; standard osc.
< 2 ppm/ year; TCXO
< $1x10^{-12}$; external with HM 8125

Waveforms

Sine

Freq. range: 100µHz to 15MHz
Amplitude: 0 to 20Vpp (Open Circuit)
Harmonic Dist.: <0.1% (10Hz to 20kHz)
<1% (20kHz to 3MHz)
<3% (3MHz to 15MHz)
Non harmonic distortion:
<–65dBc Freq.<1MHz
<–(65dBc Freq. +6dB/ Oct.) Freq.>1MHz)
Phase noise: <–90dBc/√Hz (0dBm, 1kHz off carrier)

Square

Freq. range: 100µHz to 15MHz
Amplitude: 0 to 20Vpp Open Circuit
Rise-/Falltime: <10ns
Aberration: <5% (U_{out} ≥ 200mV)
Symmetry: 50% ±(5% + 10ns)

Ramp

Freq. range: 100µHz to 100kHz
Amplitude: 0 - 20Vpp (Open Circuit)
Slope: positive and negativ
Linearity: better than 1% (<100kHz)
Rise-/Fall time: typ. 45ns

Triangle

Freq. range: 100µHz to 1MHz
Amplitude: 0 - 20Vpp (Open Circuit)
Linearity: better than 1% (<100kHz)

Noise

White (bandwidth 10MHz)

Arbitrary

Freq. range: 100µHz to 10MHz
Amplitude: 0 - 20Vpp (Open Circuit)
Sampl. rate: 40MS/s
Resolution: vertical 12 bit (0.025% fs)
Waveform length: 4K or 16K points
Filter: Bessel, 7th ord. b. 10MHz

Phase

Range: 0-359.9° **Resolution:** 0.1°
Accuracy: ±(0.10 + Freq./µHz x 10^{-6}) degree
Square wave: ±(5+Freq./µHz x 30 x10^{-6}) degree
Reference: falling edge of Sync.-signal
Jitter: <25ns

Output

Signal output: (BNC jack)
Impedance: 50Ω short circuit proof
ext. voltage up to max.±15V(30sec.)
Output voltage: 2.1 to 20Vpp(o.c.)
0.21 to 2.0Vpp(o.c.)
20 to 200mVpp(o.c.)
Resolution: 3 ½ digit; 100/10/1mV
V_{pp} or RMS (excl. ARB)
Accuracy: ±(1% x Amplitude+ 5digit)
for Sine; 1kHz (pulse and square additional 3%)
Flatness: ±0.2dB <100kHz
±0.3dB 100kHz to 1MHz
±0.5dB 1MHz to 15MHz
Display: 3½ digit Vpp or RMS (excl. ARB)
DC Offset: -5V to + 5V (Offset + Signal <10V)
–0.5V to + 0.5V (Offset + Signal <1V)
-50mV to + 50mV (Offset + Signal <0.1V)
Resolution: 3 Digit
Accuray: ±(1% xOffset vltg. + 5digit)
Temp. stab.: 0.1%/°C
Max. volt. to chassis: 42V

Sweep

Sweep (internal): all waveforms lin. or log.
Freq. range: 100mHz to max. frequency
(free setting of start and stop frequency)
Sweep time: 10ms to 40s continuous or trig.

Modulation

FSK/PSK

(all signals exc. ARB)
Frequency: 100µHz to 15 Mhz
Min. duration: 15µs PSK; 25µs FSK
Delay: typ. 10µs PSK; typ. 15µs FSK
Trigger / Modulation: via external signal

AM

Mod. depth: 0 to 100% (resolution 1%)
Bandwidth: DC - 20kHz (-3dB)
Carrier: 100µHz to max. signal freq.
Accuray: ± (5% of value + 2%)
Internal mod.: 1kHz sine
External mod.: 20Hz–20kHz; 1V sine for 100%
Impedance: 1kΩ; protected up to ±30V

Inputs

GATE/TRIGGER (BNC jack)

Impedance: 5kΩ II 100pF; protected up to ±30V
External Reference (BNC jack)
10MHz ±2ppm; 1V RMS; 500Ω

Gate (asynchronous) (BNC jack)

Mod. control: on/off via external TTL signal
Delay time: <150ns
Input signal: TTL; active level selectable
Burst: via ext. trigger input
Impedance: 5kΩ II 100pF; protected up to ±30V
(external signal width > period)

Trigger (synchronous) (BNC jack)

Freq. range: <500kHz
Source: ext.; front panel; interface
Impedance: 5kΩ II 100pF; protected up to ±30V

Trigger Output (BNC jack; rear side)

Level: 5V / TTL short-circuit proof

Ramp Output (BNC jack; rear side)

Level: 0 to 5V (sweep out) / **Imp.:** 1kΩ;

General

Settings: Remote controlled via interface or manual via front panel (keyboard or rotary control)
1 power-down set-up memory
10 set-up memories
1 nonvolatile memory 4K points for Arb. signal
1 volatile memory 16K points for Arb. signal
Interface for S-RAM card built-in
RS232 Interface built-in
IEEE-488 Interface (Option HO88)

Power requ.: 115/230V ±15%; 50-60Hz, 30 VA
Operating conditions: +0°C to +40°C
max. rel. humidity: 10%-90%, no condensation
Dimensions:285mmx75mmx365mm (WxHxD)
Weight: approx. 5 kg
Safety: Class I, According to IEC 348

Subject to change without notice 1/97

Optional accessories:

HZ33, HZ34: 50Ω Coaxial cable BNC-BNC; **HZ24:** Set of BNC attenuators 3/6/10 and 20dB; incl. 1 HZ22
HO88: IEEE-488 Interface; **HZ72:** Double shielded IEEE-bus cable, **Option HO86:** TCXO.