

## 3GHz RF-Synthesizer HM8135



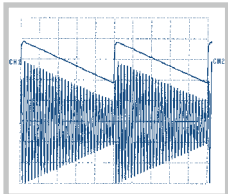
HM8135



HO880 IEEE-488 (GPIB)  
Interface (Option)



Internal Modulation Source



- ✓ 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,  $\Phi$ , 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:  $\pm 0.5 \times 10^{-6}$ )  
Optional: OCXO (Temperature Stability:  $\pm 1 \times 10^{-8}$ )
- ✓ Galvanically isolated USB/RS-232 Dual-Interface, optional IEEE-488 (GPIB)

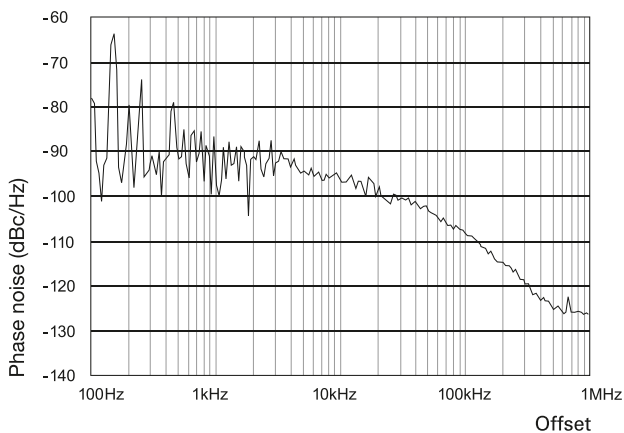
## 3 GHz RF-Synthesizer HM8135

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

Frequency	
Range:	1 Hz...3 GHz
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 <sup>-8</sup>
Aging	≤±1 x 10 <sup>-9</sup> /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:	≤-30 dBc (typ. <-35 dBc)
Non-harmonics:	≤-50 dBc (>15 kHz from carrier)
Sub-harmonics: <2,1 GHz	≤-50 dBc
Sub-harmonics: >2,1 GHz	≤-43 dBc (typ. -47 dBc)
Phase noise:	(at 20 kHz from carrier)
f <16 MHz	≤-120 dBc/Hz
16 MHz ≤f <250 MHz	≤-95 dBc/Hz
250 MHz ≤f <500 MHz	≤-105 dBc/Hz
500 MHz ≤f <1,000 MHz	≤-100 dBc/Hz
1 GHz ≤f <2 GHz	≤-95 dBc/Hz
2 GHz ≤f <3 GHz	≤-90 dBc/Hz
Residual FM:	typ. <4 Hz; ≤6.5 Hz (in 0.3...3 kHz bandwidth)
Residual AM:	typ. <0.06 % (in 0.03...20 kHz bandwidth)



(Typical phase noise at 1 GHz)

Output level	
Range:	-135...+13 dBm
Resolution:	0.1 dB
Display-Offset for ext. Attn.:	0.0...30.0 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
Resolution	10 Hz
External:	Input on front panel
Impedance	10 kΩ    50 pF
Input level	2V <sub>pp</sub> for full scale
Coupling	AC or DC
Output:	Front panel

Level	2V <sub>pp</sub>
Impedance	1 kΩ

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 -1 dB):	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:	±200 Hz...400 kHz (depending on frequency band)
Resolution:	100 Hz
Accuracy:	±3 % + residual FM (f <sub>mod</sub> ≤5 kHz) ±7 % + residual FM (5 kHz <f <sub>mod</sub> <100 kHz)
Ext. frequency response (to -1 dB):	
DC coupling	0...100 kHz
AC coupling	100 Hz...100 kHz
Distortion:	<1 % for deviation ≥50 kHz at 1 kHz <3 % for deviation ≥10 kHz

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	100 Hz...100 kHz
Distortion:	<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):	<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:	f <2 GHz: >80 dB f >2 GHz: >55 dB
Rise/fall times:	<50 ns (typ. <10 ns)
Delay:	<100 ns
Max. frequency:	2.5 MHz (typ. 5 MHz)
Input level:	TTL

Sweep mode	
Range:	1...3,000 MHz
Depth:	500 Hz...2,999 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 1W for a 50 Ω source and against any DC source up to ±7V. The protection disconnects the output until manually reset by operator.	

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

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

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

**Recommended accessories:**

H085	OCXO, temperature stability $\pm 1 \times 10^{-8}$ (Installation only ex factory)
H0880	Interface IEEE-488 (GPIB), galvanically isolated
HZ13	Interface cable (USB) 1.8m
HZ14	Interface cable (serial) 1:1
HZ20	Adapter, BNC to 4 mm banana
HZ21	Adapter, N male to BNC female
HZ24	Attenuators 50 $\Omega$ (3/6/10/20 dB)
HZ33	Test cable 50 $\Omega$ , BNC/BNC, 0.5m
HZ34	Test cable 50 $\Omega$ , BNC/BNC, 1.0m
HZ42	19" Rackmount kit 2RU
HZ72	GPIB-Cable 2m