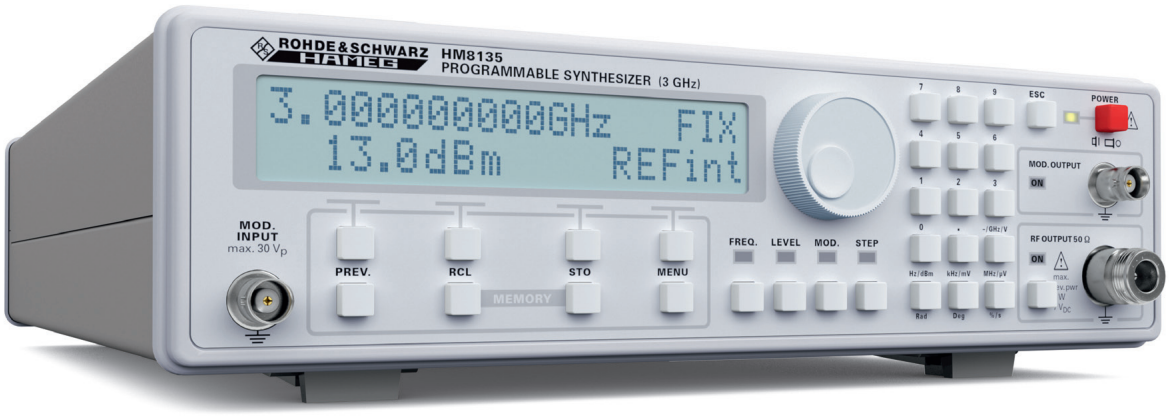
3 GHz
HF-Synthesizer
HM8135

HAMEG® Instruments
A Rohde&Schwarz Company



USB | RS-232 | optional IEEE-488 | Lab-VIEW

Key facts

- Frequency range: 1 Hz to 3 GHz
- High dynamic output power: -135 dBm to +13 dBm
- Frequency resolution: 1 Hz
- High spectral purity, excellent SWEEP mode
- Modulation modes: AM, FM, pulse, phase, FSK, PSK
- Internal modulation (10 Hz to 200 kHz): sine, square, triangle, ramp
- External Ref.-Input/Output (10 MHz) via BNC-connector
- HM8135: TCXO (temperature stability: $\pm 0.5 \times 10^{-6}$)
  HM8135-X: OCXO (temperature stability: $\pm 1.0 \times 10^{-8}$)
- R RS-232/USB dual interface, IEEE-488 (GPIB) optional

Test & Measurement

Technical Data

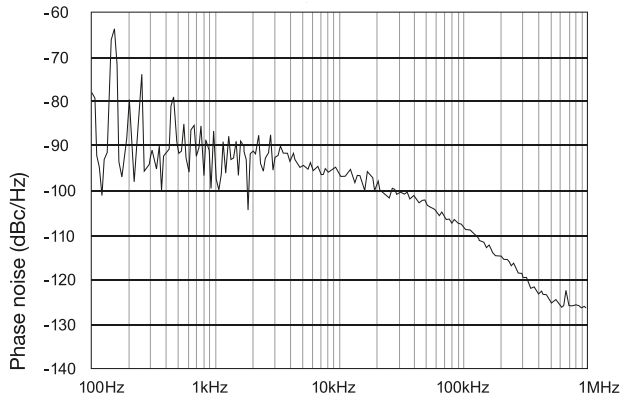
ROHDE&SCHWARZ

Technical Data

3 GHz HF-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		
Temperature stability	Standard TCXO;	Option OCXO (HO85)
0…50°C Aging	≤±0,5 ppm; ≤±1 ppm/year;	≤±1 x 10^{-8} ≤±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	≤-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	(bei 20 kHz 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 <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 for level <-57 dBm	 ≤±0,7 dB ≤±(0,7 dB + (0,5 x (-57 dBm - level))/10)	
Precision f >1.5 GHz; level >-120 dBm for level >-57 dBm for level <-57 dBm	 ≤±0,5 dB ≤±(0,5 dB + (0,2 x (-57 dBm - level))/10)	
Impedance	50 Ω	
V.S.W.R. f ≤1 GHz f >1 GHz	≤1.5; ≤2.5	
Modulation sources		
Internal 110 Hz…200 kHz 10 Hz…20 kHz	sine wave, square wave, triangle, sawtooth	
Resolution	10 Hz	
External		
Impedance	10 kΩ II 50 pF	
Input level	2 V_{pp} for full scale	
Coupling	AC or DC	
Output (Front panel)		
Level	2 V_{pp}	
Impedance	1 kΩ	
Amplitude modulation (Level -30...+7dBm))		
Source	internal or external	
AM depth	0…100%	
Resolution	0,1%	
Accuracy	±5% @ f_{mod} 1 kHz, f>16 MHz	
Ext. frequency resp. (to -1 dB)	10 Hz…100 kHz for AC	
Distortion	<2% (AM-depth ≤60%, f_{mod} ≤1 kHz) <6% (AM-depth ≤80%, f_{mod} <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_{mod} ≤5 kHz) ±7% + res. FM (5 kHz <f_{mod} <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 >16 MHz	0…3,14 rad 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 fmod = 1 kHz and deviation = 10 rad	
FSK modulation		
Range (F0…F1)	16…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_{mod} ≤5 kHz) ±7% + residual FM (5 kHz <f_{mod} <100 kHz)	
PSK modulation		
Mode	2 PSK levels	
Data source	external	
Max. rate	10 kbit/s	
Shift (Ph1…Ph0) <16 MHz >16 MHz	0…±3,14 rad 0…±10 rad	

Resolution	0,01 rad
Accuracy	±5% up to 1 kHz + residual PM
Pulse modulation	
Source	external
Dynamic range f <2 GHz f >2 GHz	>80 dB >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…3.200 MHz
Depth	500 Hz…2.999 MHz
Sweep time	20 ms…5 s
Trigger	intern
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	Dual-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	ca. 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

Accessories supplied Line cord, Operating manual, CD

Recommended accessories

HO85 OCXO, temperature stability ±1 x 10^{-8} (Installation only ex factory)
HO880 Interface IEEE-488 (GPIB), galvanically isolated
HZ13 Interface cable (USB) 1.8 m
HZ14 Interface cable (serial) 1 1
HZ20 Adapter, BNC to 4 mm banana
HZ21 Adapter, N male to BNC female
HZ24 Attenuators 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