

Keysight N9310A

RF Signal Generator

9 kHz to 3.0 GHz

Data Sheet



Definitions and Conditions

“**Specifications**” describe the performance of parameters covered by the product warranty and apply to the full temperature range of 5 to 45 °C, unless otherwise noted.

“**Typical**” values describe additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80 percent of the units exhibit with a 95 percent confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.

“**Nominal**” values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

The signal generator will meet its specifications when:

- It is within its calibration cycle
- It has been turned on at least 45 minutes
- It has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on; if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range

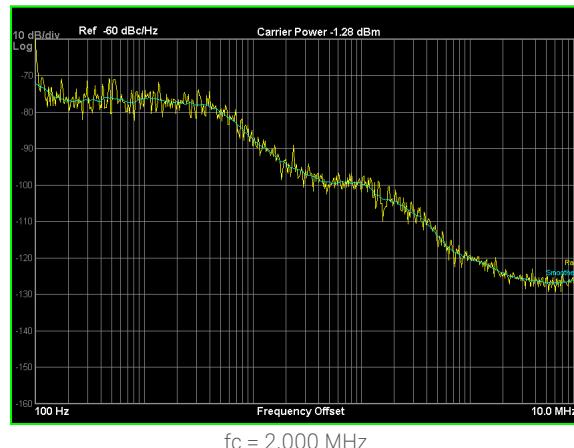
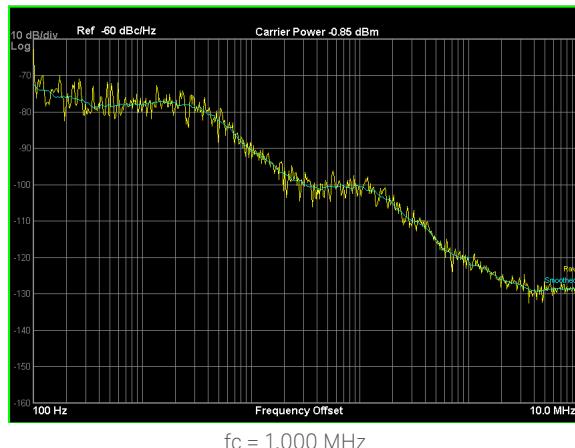
Specifications

Supplemental information		
Frequency		
Range	9 kHz to 3.0 GHz	
Resolution	0.1 Hz	
Switching speed	< 10 ms	Typical; Within 0.1 ppm of final frequency
Frequency reference		
	Option PFR	Standard
Aging rate	$\pm 1 \times 10^{-7}$ /year $\pm 1.5 \times 10^{-7}$ /2 years	$\pm 1 \times 10^{-6}$ / year
Temperature stability	$\pm 1.5 \times 10^{-8}$ (20 to 30 °C) $\pm 5 \times 10^{-8}$ (5 to 50 °C)	$\pm 1 \times 10^{-6}$ (5 to 45 °C)
Timebase reference output		
Frequency	10 MHz	
Amplitude	> 0.35 Vrms level into 50 Ω	
Connector	BNC female	
External reference input		
Range	2 MHz, 5 MHz, 10 MHz	
Amplitude	0.5 to 2 Vrms	
Connector and impedance	50 Ω; BNC female	
Output		
Power	-127 to +13 dBm	+20 dBm settable
Resolution	0.1 dB	
Accuracy	< ± 1 dB	$F_c \geq 100$ kHz, -120 ≤ Level ≤ +13 dBm, 20 to 30 °C
Switching speed	< 10 ms	Typical; < 0.3 dB deviation
VSWR (typical)	< 1.6	1.5 MHz ≤ F_c ≤ 2.5 GHz
	< 1.8	2.5 GHz ≤ F_c ≤ 3 GHz
Output connector and impedance	N-type; 50 Ω nominal	
Reversal power protection		
DC voltage	30 V	
RF power	+36 dBm	1 minute; the warning for reversed power protection is nominally at +25 dBm
Spectral purity		
SSB phase noise	< -95 dBc/Hz	Typical, $F_c = 1$ GHz at 20 kHz offset
Residual FM	< 30 Hz rms; < 90 Hz peak	CW mode, $F_c = 1$ GHz; BW = 0.3 to 3 kHz
	< 20 Hz rms	Res FM optimized mode
Harmonics	< -30 dBc	Level ≤ 0 dBm, $F_c \geq 1$ MHz
Non-harmonics	< -50 dBc	Level ≤ 0 dBm, ≥ 10 kHz from carrier

Specifications (continued)

Supplemental information

Characteristic SSB phase noise



Sweep modes RF and LF

LF sweep range	20 Hz to 80 kHz
RF sweep range	9 kHz to 3 GHz
Sweep points	2 to 1,001
Dwell time	10 ms to 1 s

Amplitude

Sweep range	-127 to +13 dBm
Sweep points	2 to 1,001
Dwell time	10 ms to 1 s

Simultaneous modulation¹

		AM		I/Q	FM		ØM	Pulse	
		Internal	External		Internal	External		Internal	External
AM	Internal	-	•	-	•	•	•	-	-
	External	•	-	-	•	•	•	-	-
I/Q		-	-	-	•	•	•	•	•
FM	Internal	•	•	•	-	•	-	•	•
	External	•	•	•	-	-	-	•	•
ØM		•	•	•	-	-	-	•	•
Pulse	Internal	-	-	•	•	•	•	-	-
	External	-	-	•	•	•	•	-	-

1. The N9310A has one external modulation input connector. The simultaneous external modulations are applied to the same input signal.

Specifications (continued)

Supplemental information		
Amplitude modulation	(Fc ≥ 100 kHz)	
Operating modes	Internal, external AC	
Range	0 to 100%	Envelope peak < maximum specified power
Resolution	0.1%	
Rates	20 Hz to 20 kHz	
Accuracy	< ± (5% of setting +0.2%)	1 kHz, 0 dBm and 80% modulation, 0.3 to 3 kHz bandwidth
Distortion	< 2%	1 kHz, 0 dBm and 80% modulation, 0.5 to 15 kHz bandwidth
External input	MOD IN connector	
Sensitivity	0.5 Vpeak	Input voltage for 100% modulation depth
Input impedance	BNC; > 100 kΩ	Nominal
Frequency modulation	(Fc ≥ 100 kHz)	
Operating modes	Internal, external AC	
Frequency deviation	20 Hz to 100 kHz	
Resolution	< 1%	Minimum 1 Hz
Rates	20 Hz to 80 kHz	
Distortion	1%	1 kHz rate, 0.3 to 3 kHz bandwidth, deviation = 50 kHz
Deviation accuracy	< ± (5% of FM deviation +300 Hz)	1 kHz, 0 dBm and 50 kHz deviation, 0.3 to 3 kHz bandwidth
Carrier frequency deviation	< 200 Hz	Relative to carrier; external mode
External input	MOD IN connector	
Sensitivity	0.5 Vpeak	Input voltage for 100 kHz modulation deviation
Input impedance	BNC; > 100 kΩ	Nominal
Phase modulation	(Fc ≥ 100 kHz)	
Operating modes	Internal	
Phase deviation	0 to 10 rad	Rate ≤ 10 kHz
	0 to 5 rad	10 kHz < rate ≤ 20 kHz
Resolution	< 1%	
Rates	300 Hz to 20 kHz	
Deviation accuracy	< ± (5% of FM deviation +0.2 rad)	1 kHz rate, 0.3 to 3 kHz bandwidth
Distortion	< 1.5%	1 kHz rate, 0.3 to 3 kHz bandwidth, deviation = 5 rad
Input impedance	BNC; > 100 kΩ	Nominal
Pulse modulation		
Operating modes	Internal, external	
On/Off ratio	≥ 40 dB	
Rise/Fall time	< 3 μs	
Pulse width	100 μs to 1 s	Internal, external
Pulse period	200 μs to 2 s	Internal
Time resolution	1 μs	
Input connector and voltage level	BNC female; TTL	

Specifications (continued)

Supplemental information		
Internal modulation source	Provides a modulation signal for AM, FM, phase modulation, and LF out	
Waveform	Sine	
Frequency range	20 Hz to 80 kHz	
Resolution	0.1 Hz	
Accuracy	0.005%	Typical
LF out (Internal modulation source)		
Amplitude	0 to 3 Vpeak	Level to high impedance
Output voltage resolution	< 1%	1 mV minimum resolution
Frequency response	< ± 0.2 dB	20 Hz to 20 kHz
Total harmonic distortion	< 0.1%	Typical; 20 Hz to 20 kHz, 30 kHz low pass filter
Connector and impedance	BNC female; < 1Ω	Front panel
Precision frequency reference (option PFR)		
Output frequency	10 MHz	
Accuracy	± [(time since last adjustment × aging rate) + temperature stability + calibration accuracy ²⁾ ³	
Temperature Stability		
20 to 30 °C	± 1.5 × 10 ⁻⁸	
5 to 50 °C	± 5 × 10 ⁻⁸	
Aging		
1 year	± 1 × 10 ⁻⁷	
2 years	± 1.5 × 10 ⁻⁷	
Achievable Initial Calibration Accuracy	± 4 × 10 ⁻⁸	
Output level	> +4 dBm	
Connector	BNC female, 50 Ω nominal, rear panel	
Calibration connection	Mini USB port, rear panel	
I/Q modulation (Option 001 only)		
Operating mode	External I/Q inputs	
VSWR	< 1.5	
Full scale input	$\sqrt{I_2 + Q_2} = 0.5 \text{ Vrms}$	
Modulation frequency range	DC to 20 MHz	At 3 dB points
Carrier suppression	40 dBc	Typical; modulation frequency = 10 kHz
QPSK EVM	3%	Typical; 1 Msps; 0.22 RRC filter
GMSK phase error	1.2 °rms	Typical; 1 Msps; BT = 0.5
Connector and impedance	BNC female; 50 Ω	Rear panel

2. Calibration accuracy depends on how accurately the frequency standard was adjusted to 10 MHz. If the adjustment procedure is followed, the calibration accuracy is given by the specification of the achievable initial calibration accuracy.

3. The specification applies after the generator has been powered on for four hours.

Specifications (continued)

Supplemental information				
USB connector				
USB host interface	3 x A plug	V 1.1 protocol		
USB device interface	1 x B plug	V 1.1 protocol		
General				
Recommended calibration cycle	2-year	Keysight Technologies, Inc. has verified that the stability of this product's architecture justifies a longer calibration interval of 2 years.		
Power requirement	100 to 240 Vac; 50 to 60 Hz	Auto-ranging		
Power consumption	65 W			
Temperature range	5 to 45 °C -20 to 70 °C	Operating Storage		
Weight	9.2 kg	Nominal		
Dimensions	132.5 x 320 x 400 mm	H x W x D		
Display				
Resolution	640 x 480			
Size	165.1 mm (6.5 in) diagonal (nominal)			
Data storage				
Internal	16 MB nominal			
External	Supports USB 2.0-compatible memory devices			
EMC				
Complies with European EMC Directive 2004/108/EC				
- IEC/EN 61326-1 or IEC/EN 61326-2-1				
- CISPR Pub 11 group 1, class A				
- AS/NZS CISPR 11:2004				
- ICES/NMB-001:2004				
This ISM device complies with Canadian ICES-001				
Cet appareil ISM est conforme à la norme NMB-001 du Canada				
Safety				
Complies with European Low Voltage Directive 2006/95/EC				
- IEC/EN 61010-1 2nd edition				
- Canada: CSA C22.2 No. 61010-1-04				
- USA: UL 61010-1 2nd edition				
Audio noise				
Acoustic noise emission	Geräuschemission			
LpA < 70 dB	LpA < 70 dB			
Operator position	Am Arbeitsplatz			
Normal position	Normaler Betrieb			
Per ISO 7779	Nach DIN 45635 t.19			
Environmental stress				
Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, vibration, altitude, and power line conditions. Test methods are aligned with IEC 60068-2 and levels are similar to MILPRF-28800F Class 3				

myKeysight**myKeysight**www.keysight.com/find/mykeysight

A personalized view into the information most relevant to you.

**Three-Year Warranty**www.keysight.com/find/ThreeYearWarranty

Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.

**Keysight Assurance Plans**www.keysight.com/find/AssurancePlans

Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.

www.keysight.com/go/quality

Keysight Technologies, Inc.

DEKRA Certified ISO 9001:2008

Quality Management System

Keysight Channel Partnerswww.keysight.com/find/channelpartners

Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/n9310a

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
 (BP-09-23-14)