



## MSG Series

Microwave Signal Generator



QuickSyn®  
Engine

Noise XT and Phase Matrix collaboration enabled the generation of a high performance, affordable Microwave Signal Generator. The MSG series exhibits outstanding phase noise in a compact instrument. The QuickSyn® engine employs a patented, revolutionary phase-refining technology that provides a unique combination of fast-switching speed and low phase-noise characteristics.

Models MSG-10-1/2 and MSG-20-1/2 cover the frequency ranges of 0.5 to 10 GHz and 0.5 to 20 GHz respectively (extendable down to 0.1 GHz and 0.2 GHz). MSG synthesizers utilize a fundamental VCO to achieve the desired output frequency.

In contrast to frequency multiplication schemes, this approach eliminates possible spectrum contamination from sub-harmonic products. The use of the advanced direct digital synthesis approach, enables a very fine frequency resolution of 0.001 Hz.

The VCO noise is suppressed by utilizing an ultra low noise reference oscillator in conjunction with a low-noise locking mechanism. Microphonic effects are also greatly reduced due to the use of a low-mass VCO and very wide PLL filter bandwidth.

### Models :

- MSG-10-1 (Single 10 GHz Output)
- MSG-10-2 (Dual 10 GHz Output)
- MSG-20-1 (Single 20 GHz Output)
- MSG-20-2 (Dual 20 GHz Output)

### Features:

- 0.1 to 10 GHz and 0.2 to 20 GHz Coverage
- Single or Dual Configuration
- 0.001 Hz Resolution
- Power Calibration and Control
- 100  $\mu$ s Frequency Switching
- High Spectral Purity



# MSG Series Microwave Signal Generator

## Specifications\*

FREQUENCY	
DESCRIPTION	SPECIFICATIONS (MSG-10 / MSG-20)
Frequency Range ❶	0.5 to 10 GHz / 0.5 to 20 GHz
Frequency Resolution	0.001 Hz
Frequency Stability	Same as reference
Frequency Switching Time	full band Step, to $\pm 50$ kHz of final frequency
Standard Unit	1 ms ( <i>in all modes</i> )
With Option 03	100 $\mu$ s ( <i>triggered list mode</i> )
List Mode	32,000 points, separate control of freq., power, RF output mute, and pulse modulation

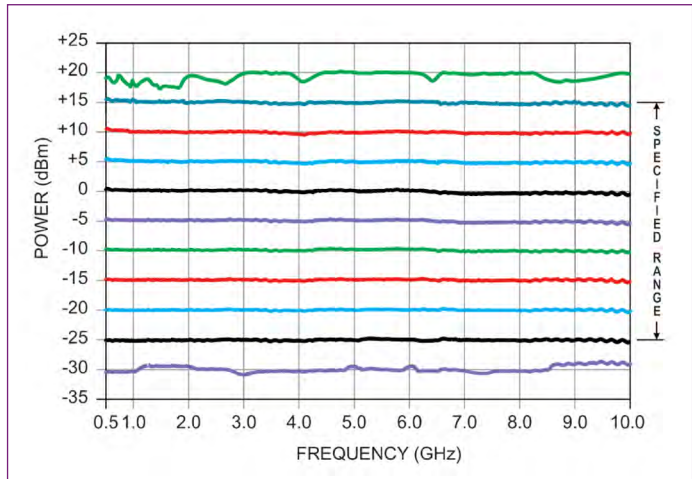
SPECTRAL PURITY ❸	
Harmonics	-45 dBc typ. / -35 dBc typ.
Non-Harmonic Spurious	-75 dBc typ. / -70 dBc typ. -65 dBc max. / -60 dBc max.

Frequency	0.5 GHz typ. (max.)	1 GHz typ. (max.)	5 GHz typ. (max.)	10 GHz typ. (max.)	20 GHz typ. (max.)
100 HZ	-109 (-103)	-103 (-97)	-89 (-83)	-83 (-77)	-77 (-71)
1 kHz	-135 (-132)	-132 (-126)	-118 (-112)	-112 (-106)	-106 (-100)
10 kHz	-144 (-139)	-138 (-133)	-128 (-123)	-122 (-117)	-116 (-111)
100 kHz	-144 (-139)	-138 (-133)	-128 (-123)	-122 (-117)	-116 (-111)
1 MHz	-146 (-141)	-140 (-135)	-132 (-127)	-126 (-121)	-120 (-115)
Floor	-151 (-147)	-150 (-147)	-150 (-147)	-150 (-147)	-150 (-147)

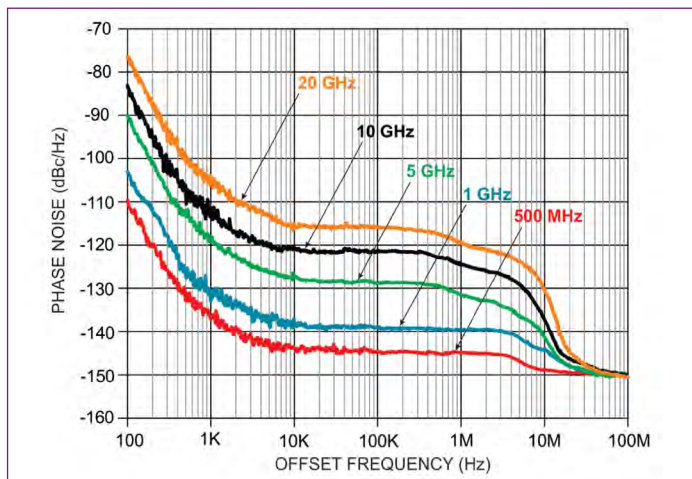
MODULATION	Pulse Modulation ❸
On/Off Ratio	80 dB min.
Repetition Freq. Range	DC to 10 MHz
Min. Pulse Width	50 ns nom.
Width Compression	< 15 ns nom.
Delay Time	< 35 ns nom.
Rise/Fall Time (10 to 90%)	10 ns max.
Pulse Overshoot	10 % max.
Input Level	CMOS (+5 V = RF on, 0 V = RF off)
Absolute Max. Input Level	+6 V
Input Impedance	100 K $\Omega$ ( <i>pulled up to +5 V</i> )

MODULATION	Frequency Modulation (FM)
NB 1 Mode Rate Range	100 Hz to 10 kHz
NB 2 Mode Rate Range	10 kHz to 100 kHz
WB Mode Rate Range	50 kHz to 1 MHz
Phase Mode Rate Range	DC to 100 kHz
Sensitivity ❸	user settable
Deviation	see note ❸
Absolute Max. Input Level	$\pm 2$ V (4 V p-p)
Input Impedance	50 $\Omega$ nom.

OUTPUT POWER	
DESCRIPTION	SPECIFICATIONS (MSG-10 / MSG-20)
Power	+15 dBm / +13 dBm
Power Accuracy	$\pm 2.0$ dB typ.
With Option 02 :	
Power Control Range ❷	-25 to +15 dBm / -10 to +13 dBm
Power Resolution ❷	0.10 dB nom.
Power Mute	-65 dBm max.
Output Return Loss	-10 dB nom.
Mechanical Step Att.	0 -70 dB / 10 dB Step.



Output Power of an MSG-10



Phase Noise

MODULATION	AM Modulation ❷
Rate Range	DC to 100 kHz
Modulation Depth ❸	40 dB min. / 20 dB min.
Sensitivity ❸	user settable
Absolute Max. Input Level	$\pm 2$ V (4 V p-p)
Input Impedance	50 $\Omega$ nom.

(\* ) Specification and ordering information subject to change without notice.

# MSG Series Microwave Signal Generator

## Specifications\* (Continued)

REFERENCE	INTERNAL REFERENCE
DESCRIPTION	SPECIFICATIONS (MSG-10 / MSG-20)
Output Frequency	10 MHz nom.
Output Power	+5 ±2 dBm
Refence Mute	-60 dBm max.
Frequency Temp. Stability	±0.2 ppm (over 0° to 50° C)
Aging (after 30 days of operation)	±1.25 ppm for 10 years
Locking Range	±2.0 ppm
Output impedance	50 Ω nom.

REFERENCE	EXTERNAL REFERENCE
DESCRIPTION	SPECIFICATIONS (MSG-10 / MSG-20)
Input Frequency ⑦	10 MHz
Input Power	+5 ±5 dBm
Absolute Max. Input Level	+15 dBm
Input Impedance	50 Ω nom.

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"Typ." means approximately 2/3 of all units meet these characteristics at room temperature. Characteristics identified by typ. and nom. are by design and are not normally verified on every unit during production.

### Notes:

- ❶ Frequency extension down to 0.1 GHz (MSG-10) and 0.2 GHz (MSG-20) are available as option 1. Output power between 0.1 and 0.5 GHz is limited at +10 dBm. Harmonics may increase below 0.5 GHz.
- ❷ Available with option 2 only. Power accuracy may change at low power levels.
- ❸ Measured at maximum specified power.
- ❹ Measured with power set at mid range. AM is clipped when available power (min. or max.) is reached.
- ❺ AM and FM sensitivity is dependent on synthesizer output frequency and is controllable by software.
- ❻ The amplitude of the FM input signal must be adjusted to obtain the desired deviation according to the output frequency range.
- ❼ External reference frequency input to be within ± 2 ppm max.

### Warranty:

Noise XT and Phase Matrix have a proven commitment to quality and reliability in instrumentation. This commitment is demonstrated in the MSG series of synthesizers with a full one-year standard warranty. Parts and labor are all included at no cost to you.

GENERAL	ENVIRONMENTAL SPECIFICATIONS
DESCRIPTION	SPECIFICATIONS
Temperature Range	Operate : 0° to +55° C
Temperature Range	Non-Operate : -40° to +70° C
Warm-up Time	15 minutes

ELECTRICAL	
DESCRIPTION	SPECIFICATIONS
Supply Voltage	110 / 220 V AC
Power Consumption	80 W

ORDERING	
Models	MSG-10-1, MSG-10-2 MSG-20-1, MSG-20-2
Option 01	0.1 GHz output frequency extension (MSG-10) ❶ 0.2 GHz output frequency extension (MSG-20) ❶
Option 02	Power control, -25 to +15 dBm (MSG-10) Power control, -10 to +13 dBm (MSG-20)
Option 03	Fast-switching (any frequency to any frequency) 100 μs max. (to ± 50 kHz in ext. triggered list mode)
Option 04	High Stability 10 MHz Reference
Option 05	Pulse Modulation
Option 06	Amplitude modulation ❷
Option 07	Frequency and phase modulation
Option 08	Mechanical Step Attenuator, incl. Opt.02
Option 09	Built-in Modulation Sources

# NOISE XT

DISTRIBUTOR / PARTNER



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