



# MXG Analog Signal Generator Express Configurations

N5181AEP MXG RF Analog (100 kHz to 1, 3 or 6 GHz)

N5183AEP MXG MW Analog (100 kHz to 20 GHz)

Technical Overview

*When you just can't wait, get the same great  
Agilent MXG analog signal generators—**faster***



**Agilent Technologies**

## When You Just Can't Wait ...

### Sometimes the best answer is a great tool at the right time

Six express models are available: CXA and EXA signal analyzers, RF and microwave MXG analog signal generators, and two ENA Series network analyzers.

- Preloaded with popular features
- Ready for off-the-shelf delivery from authorized distributors
- Included features are value priced

It's an unbeatable combination: Save time and money while keeping your project or production line moving.



A great tool at the right time is often the best solution. That's why Agilent offers preconfigured RF and microwave instruments that are ready for off-the-shelf delivery from our authorized distributors.

Six express models are available: CXA and EXA signal analyzers, RF and microwave MXG analog signal generators, and two ENA Series network analyzers. Preloaded with popular features, the express configurations deliver the same specifications and functionality as Agilent's build-to-order instruments. They also provide the same level of upgradeability, ensuring that they—and you—can evolve as your test needs change.

Best of all, the included features are value priced. It's an unbeatable combination: Save time and money while keeping your project or production line moving.

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EXPRESS

# Make an Impact with Optimized Signal Generation

Accuracy, repeatability and reliability are essential to the testing of communication systems, receivers and components. That's why Agilent MXG signal generators have been optimized to meet the needs of product designers in R&D and test engineers in manufacturing.

There are two express MXG analog signal generators, one RF and one microwave. The express MXG RF analog signal generator is ideal for component design and production verification up to 6 GHz with included expanded license key upgradeability and AM/FM/phase modulation, plus optional pulse modulation. The express MXG microwave analog has a maximum frequency of 20 GHz and is optimized for manufacturing with included step attenuator and AM/FM/phase modulation, plus optional narrow pulse modulation. High output power is optional on both the RF and microwave models.

Key specifications	Express MXG RF analog	Express MXG microwave analog
Frequency range	100 kHz to 1, 3 or 6 GHz	100 kHz to 20 GHz
Output power	+23 dBm (optional)	+18 dBm (optional)
Frequency switching speed	5 ms (typical)	5 ms
Phase noise (20 kHz offset at 1 GHz)	-121 dBc (typical)	-121 dBc (typical)
Non-harmonics	-56 dBc (typical)	-50 dBc (> 2 to 20 GHz)

## Create precise RF reference signals with MXG RF analog

The MXG RF analog signal generator is optimized to provide the accurate and repeatable reference signals needed on an R&D bench or the production line. With scalable RF performance, the MXG is easily configured to meet your needs in a wide range of applications: local oscillator (LO) and clock substitution; continuous wave (CW) interferers; power calibration; antenna testing; and analog communication systems that use AM, FM or phase modulation.



## Enhance testing at microwave frequencies with with express MXG microwave analog

The MXG microwave analog signal generator covers 100 kHz to 20 GHz and delivers the performance needed for the testing of broadband components, radar and military communications systems. Excellent power and level accuracy provide a reliable stimulus that can drive high-power devices. Typical applications include LO substitution, blocker/interferer signals and antenna testing (as transmitting source).



# Address Your Immediate Needs with Built-In Capabilities

Both express MXG models are pre-configured with the key features most commonly included in a build-to-order instrument. This ensures that you're getting a great tool that provides the functionality you need today—and is easily upgradable if you want to add features tomorrow. The table summarizes the capabilities included in the RF and microwave versions of the express MXG.

Express model	Included capability
<b>Express MXG RF analog and Express MXG microwave analog</b>	<b>AM/FM/phase modulation:</b> Generates internally or externally driven AM, FM and PM signals. Especially useful when testing analog communication systems.
<b>Express MXG RF analog</b>	<b>Expanded license key upgradeability:</b> Contains the hardware required to enable fast, easy performance upgrades with the purchase of the appropriate license key (equivalent to N5181A-099; not required for N5183AEP).
<b>Express MXG microwave analog</b>	<b>Step attenuator:</b> Provides calibrated output levels down to $-130$ dBm while maintaining level accuracy that is superior to higher-priced instruments. Useful when testing the selectivity and sensitivity of receivers expected to acquire extremely low-power signals.

**EXPRESS**

Pre-configured with the most **common features** in a build-to-order instrument



*Express MXG analog signal generators cover a wide range of applications including local oscillator (LO) and clock substitution; continuous wave (CW) interferers; power calibration; antenna testing; and analog communication systems that use AM, FM or phase modulation.*

# Enhance Your Signal Generator with Optional Features

In addition to the pre-configured features, you can tailor your express MXGs with two optional capabilities. One of the options enhances instrument performance with high output power. The other options add instrument functionality for pulse modulation or narrow pulse modulation.

**Performance**  
**P**  
**High output power**  
**(Option 1EA)**

Available on both N5181AEP and N5183AEP.

- Increases the output power level to +23 dBm up to 3 GHz for N5181AEP and to +18 dBm from 3.2 to 20 GHz for N5183AEP.
- Additional output power can be used to compensate for path losses from system components or effectively characterize transceivers.
- Common test applications include:
  - Verification of amplifier linearity
  - Generation of blocking and interference signals
  - Characterization of transceiver maximum input level

**Functionality**  
**F**  
**Pulse modulation**  
**(Option UNU)**

Available on N5181AEP.

- Adds pulse modulation with variable pulse width, fast rise/fall times, variable repetition rate up to 2 MHz and 80 dB on/off ratio.
- Recommended for the testing of RF radar, communication and control systems that use pulse modulation or experience pulse-modulated interference when deployed.
- Typical applications include:
  - Testing of components and power amplifiers with CW pulses
  - Testing of antennas and radar receivers with modulated pulses
  - Generation of interference signals

**Functionality**  
**F**  
**Narrow pulse modulation**  
**(Option UNW)**

Available on N5183AEP.

- Adds narrow pulse modulation variable pulse widths, fast rise/fall times, variable repetition rate up to 10 MHz and > 80 dB on/off ratio.
- Recommended for the testing of microwave radar, communication and control systems that use pulse modulation or experience pulse-modulated interference when deployed.
- Typical applications include:
  - Testing of components and power amplifiers with CW pulses
  - Testing of antennas and radar receivers with modulated pulses
  - Generation of interference signals



*The express MXGs are optimized to provide the accurate and repeatable reference signals needed on an R&D bench or the production line. All of this capability fits into just two rack units (2RU), saving valuable rack space.*

# Configure Your MXG Analog Signal Generator

It takes just two steps to tailor an express MXG to meet your requirements. The first step is to select the frequency range. The second step is to add optional capabilities, if needed.

## Express MXG RF analog

Step 1. Select maximum frequency (choose one; includes expanded license key upgradeability)			
Model number	Frequency range	Included capabilities	Equivalent build-to-order model:
N5181AEP-001	100 kHz to 1 GHz	AM/FM/phase modulation	N5181A-501 with Options UNT and 099
N5181AEP-002	100 kHz to 3 GHz	AM/FM/phase modulation	N5181A-503 with Options UNT and 099
N5181AEP-003	100 kHz to 6 GHz	AM/FM/phase modulation	N5181A-506 with Options UNT and 099

Step 2. Add optional features (choose up to two)		
Option number	Description	Notes
N5181AEP-1EA	High output power	Provides +23 dBm of output power, often eliminating the need for an external power amplifier; excellent level accuracy enables precise characterization of devices
N5181AEP-UNU	Pulse modulation	Adds the capability to generate pulse-modulated signals; pulse parameters such as pulse width and repetition rate can be set internally or controlled by an external source

## Express MXG microwave analog

Step 1. Select maximum frequency (choose one; includes expanded license key upgradeability)			
Model number	Frequency range	Included capabilities	Equivalent build-to-order model:
N5183AEP	100 kHz to 20 GHz	AM/FM/pulse modulation step attenuator	N5183A-520 with Options UNT and 1E1

Step 2. Add optional features		
Option number	Description	Notes
N5183AEP-1EA	High output power	Provides +18 dBm of output power, often eliminating the need for an external power amplifier; excellent level accuracy enables precise characterization of devices
N5183AEP-UNW	Narrow pulse modulation	Adds the capability to generate pulse-modulated signals with pulse width as narrow as 20 ns; pulse parameters such as pulse width and repetition rate can be set from the front panel

# Specifications

## Express N5181AEP MXG RF and N5183AEP MXG microwave analog configurations

For detailed specifications, refer to the *N5181A MXG RF Analog Signal Generator Data Sheet*, literature number 5989-5311EN. For detailed specifications, refer to the *N5183A MXG Microwave Analog Signal Generator Data Sheet*, literature number 5989-7572EN.

	N5181AEP MXG RF analog signal generator express configuration	N5183AEP MXG analog signal generator express configuration
Frequency range	100 kHz to 1, 3 or 6 GHz	100 kHz to 20 GHz; performance below 250 kHz is unspecified, except as indicated
Frequency switching speed	Time from receipt of SCPI command or trigger signal to within 0.1 ppm of final frequency or within 100 Hz, whichever is greater, and amplitude settled to within 0.2 dB; additional time may be required for the amplitude to settle within 0.2 dB when switching to or from frequencies < 500 kHz	
Type (standard)		
SCPI mode	≤ 5 ms (typ)	
List/step sweep mode	≤ 5 ms (typ)	
Internal time base reference oscillator aging rate	Aging rate is determined by design as a function of the TCXO and is not specified < ± 1 ppm/yr (nom)	
External reference input frequency	Standard (fixed): 10 MHz ±10 Hz	
Output power	Quoted specifications between 20 and 30 °C. Maximum output power typically decreases by 0.04 dB/°C for temperatures outside this range. Minimum output power: 110 dBm	Quoted specifications between 15 and 35 °C. Maximum output power typically decreases by 0.2 dB/°C for temperatures outside this range. Minimum output power: -90 dBm (settable to -130 dBm)

# Specifications, Continued

## Express N5181AEP MXG RF and N5183AEP MXG microwave analog configurations

N5181AEP		N5183AEP		
<b>Maximum output power</b>	Performance below 250 kHz is unspecified except as indicated.			
Range	Standard	Option 1EA (high output power)	Standard	Option 1EA (high output power)
100 to 250 kHz	+13 dBm	+15 dBm	+11 dBm	+14 dBm
> 100 kHz to 50 MHz	+13 dBm	+15 dBm	—	—
> 250 kHz to 3.2 GHz	—	—	+11 dBm	+15 dBm
> 50 MHz to 3.0 GHz	+13 dBm	+23 dBm	—	—
> 3.0 to 5.0 GHz	+13 dBm	+17 dBm	—	—
> 5.0 GHz	+11 dBm	+16 dBm	—	—
> 3.2 MHz to 20 GHz	—	—	+11 dBm	+18 dBm
<b>Amplitude switching speed</b>	Time from receipt of SCPI command or trigger signal to amplitude settled within 0.2 dB; switching speed specifications apply when status register updates are off; quoted specifications between 20 and 30 °C; for temperatures outside this range, absolute level accuracy degrades by 0.005 dB/°C for frequencies ≤ 4.5 GHz and 0.01 dB/°C for frequencies > 4.5 GHz		Time from receipt of SCPI command or trigger signal to amplitude settled within 0.2 dB; specification does not apply when switching from and to amplitudes where ALC levels are < 0 dB	
Type	Standard		Standard	
SCPI mode	≤ 5 ms (typ)		≤ 2 ms (typ)	
List/step sweep mode	≤ 5 ms (typ)		≤ 2 ms (typ)	



# Specifications, Continued

## Express N5181AEP MXG RF and N5183AEP MXG microwave analog configurations

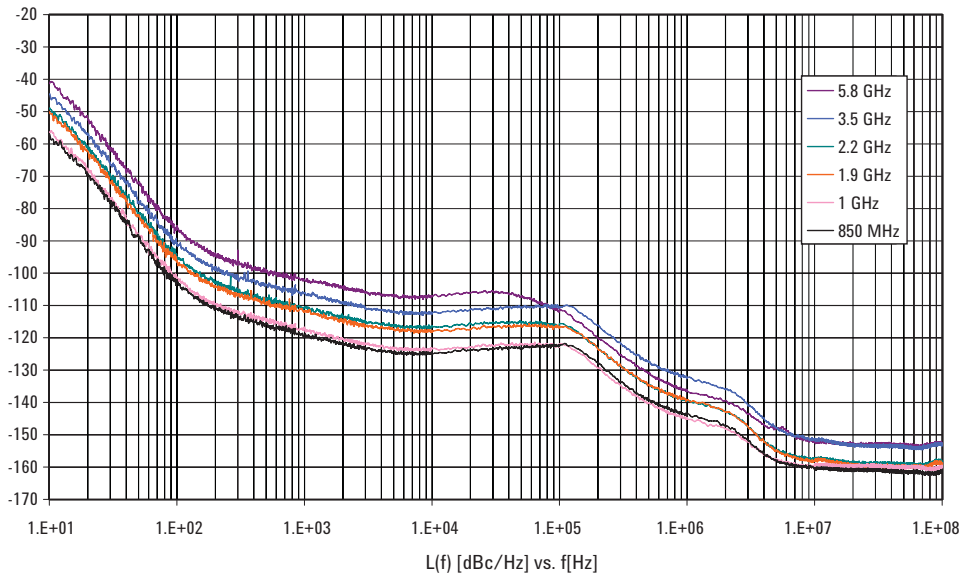
	N5181AEP		N5183AEP		
<b>Absolute level accuracy (ALC on)</b>	Or maximum specified output power, whichever is lower. Quoted specifications between 20 °C and 30 °C. For temperatures outside this range, absolute level accuracy degrades by 0.005 dB/°C for frequencies ≤ 4.5 GHz and 0.01 dB/°C for frequencies > 4.5 GHz. Output power may drift up to .003 dB per g/Kg change in specific humidity (nom)		Level accuracy applies from –20 dBm to maximum output power between 15 °C and 35 °C; for temperatures outside this range, absolute level accuracy degraded by 0.01 dB/°C for frequencies ≤ 4.5 GHz and 0.02 dB/°C for frequencies > 4.5 GHz; specifications do not apply above the maximum specified power		
Frequency range	+23 to –60 dBm	< –60 to –110 dBm	> + 10 to –10 dBm	–10 to –75 dBm	–75 to –90 dBm
100 kHz to 250 kHz	±0.6 dB	±1.0 dB	—	—	—
> 250 kHz to 1 MHz	±0.6 dB	±0.7 dB	—	—	—
250 kHz to 2 GHz	—	—	±0.6 dB	±1.4 dB	—
> 1 MHz to 1 GHz	±0.6 dB	±0.7 dB	—	—	—
> 1 to 3 GHz	±0.6 dB	±0.8 dB	—	—	—
> 2 to 20 GHz	—	—	±0.9 dB	±1.0 dB	±1.6 dB
> 3 to 4 GHz	±0.7 dB	±0.8 dB	—	—	—
> 4 to 6 GHz	±0.8 dB	±1.1 dB	—	—	—
<b>Spectral purity</b>	Single sideband phase noise (at 20 kHz offset)				
500 MHz	≤ –126 dBc/Hz (typ)		≤ –122 dBc/Hz (typ)		
1 GHz	≤ –121 dBc/Hz (typ)		≤ –116 dBc/Hz (typ)		
2 GHz	≤ –115 dBc/Hz (typ)		≤ –110 dBc/Hz (typ)		
3 GHz	≤ –110 dBc/Hz (typ)		≤ –110 dBc/Hz (typ)		
4 GHz	≤ –109 dBc/Hz (typ)		≤ –104 dBc/Hz (typ)		
5 GHz	—		≤ –104 dBc/Hz (typ)		
6 GHz	≤ –104 dBc/Hz (typ)		—		
10 GHz	—		≤ –98 dBc/Hz (typ)		
20 GHz	—		≤ –92 dBc/Hz (typ)		

## N5183AEP MXG microwave analog signal generator only

N5183AEP only				
Absolute level accuracy with step attenuator (dB)	Equivalent to N5183A-1E1			
Frequency range	> + 10 dBm	+10 to –10 dBm	< –10 to –75 dBm	< –75 to –90 dBm
250 kHz to 2 GHz	±0.6 dB	±0.6 dB	±0.7 dB	±1.4 dB
> 2 to 20 GHz	±0.9 dB	±0.9 dB	±1.0 dB	±1.6 dB
> 20 to 40 GHz	±1.0 dB	±0.9 dB	±1.1 dB	±2.0 dB

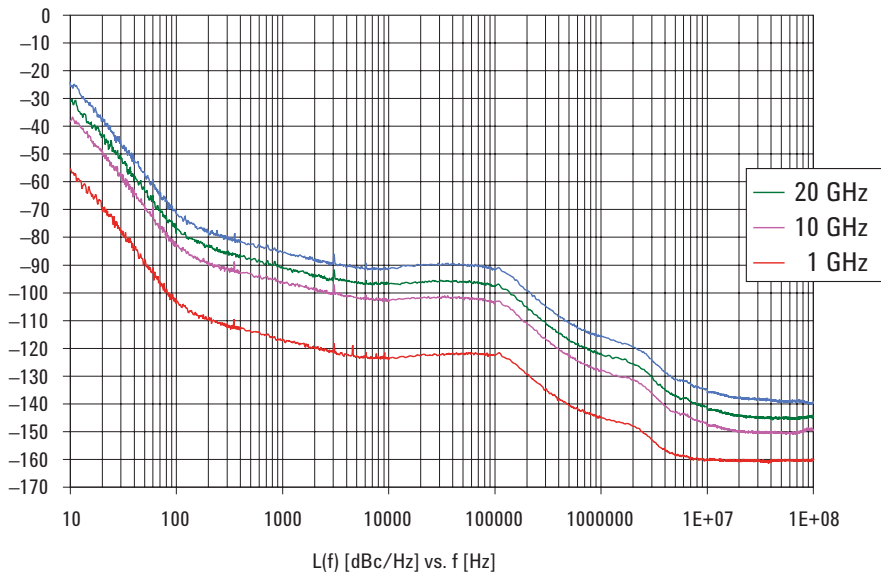
# Specifications, Continued

## N5181AEP single sideband phase noise optimized signal-to-noise floor mode



1. Signal-to-noise optimized mode will improve broadband noise floor. In this mode, other specifications may not apply.

## N5183AEP single sideband phase noise



## Specifications, Continued

N5181AEP			N5183AEP	
Analog modulation				
Frequency bands	N is a factor used to define certain specifications in the document		N is a factor used to define certain FM and $\Phi$ M specifications in the instrument	
Band	Frequency range	N	Frequency range	N
1	100 kHz to < 250 MHz	1	100 kHz to < 250 MHz	1
2	250 to < 375 MHz	0.25	250 to < 375 MHz	0.25
3	375 to < 750 MHz	0.5	375 to < 750 MHz	0.5
4	750 to < 1500 MHz	1	750 to < 1500 MHz	1
5	1500 to < 3000.001 MHz	2	1.5 to < 3.0 GHz	2
6	3000.001 to 6000 MHz	4	3.0 to < 6.0 GHz	4
7	—	—	6.0 to < 12.0 GHz	8
8	—	—	12.0 to < 20.0 GHz	16

N5181AEP			N5183AEP	
Frequency modulation	Equivalent to N5181A-UNT		Equivalent to N5183A-UNT	
Max deviation	N x 10 MHz (nom)		N x 10 MHz (nom)	
Modulation frequency response (at 100 kHz deviation)	1 dB bandwidth	3 dB bandwidth	1 dB bandwidth	3 dB bandwidth
DC coupled	DC to 3 MHz (nom)	DC to 7 MHz (nom)	DC to 3 MHz (nom)	DC to 7 MHz (nom)
AC coupled	5 Hz to 3 MHz (nom)	5 Hz to 7 MHz (nom)	5 Hz to 3 MHz (nom)	5 Hz to 7 MHz (nom)
Phase modulation	Equivalent to N5181A-UNT		Equivalent to N5183A-UNT	
Modulation deviation and frequency response	Max deviation	3 dB bandwidth	Max deviation	3 dB bandwidth
Normal BW	N x 5 radians (nom)	DC to 1 MHz (nom)	N x 5 radians (nom)	DC to 1 MHz (nom)
High BW mode	N x 0.5 radians (nom)	DC to 4 MHz (nom)	N x 0.5 radians (nom)	DC to 4 MHz (nom)
Amplitude modulation	AM is specified at carrier frequencies from 1 MHz to 3 GHz, power levels $\leq$ +4 dBm, and with ALC on and envelope peaks within ALC operating range (–20 dBm to maximum specified power, excluding step-attenuator setting); equivalent to N5181A-UNT		AM is specified at carrier frequencies > 2 MHz, ALC on, and when AM envelope does not exceed max power or go below –15 dBm for Option 520; equivalent to N5183A-UNT	
Maximum depth	100%		90%	
Modulation rate (3 dB BW)	<ul style="list-style-type: none"> <li>DC coupled: 0 to 10 kHz (typ)</li> <li>AC coupled: 5 Hz to 10 kHz (typ)</li> </ul>		<ul style="list-style-type: none"> <li>DC coupled: 0 to 10 kHz (typ)</li> <li>AC coupled: 5 Hz to 10 kHz (typ)</li> </ul>	

## Specifications, Continued

N5181AEP		N5183AEP	
Pulse modulation (Option UNU)		Narrow pulse modulation (Option UNW)	
Pulse specifications apply to frequencies > 500 MHz; operable down to 10 MHz			
On/off ratio	> 80 dB (typ)	> 80 dB (typ)	
Rise/fall time	< 50 ns (typ)	< 10 ns; 7 ns (typ)	
Minimum width	≥ 500 ns ALC OFF	≥ 20 ns ALC OFF	
Pulse repetition frequency	DC to 2 MHz ALC OFF	DC to 5 MHz for > 3.2 GHz	
Internal pulse generator (included with Option UNU)		Internal pulse generator (included with Option UNW)	
Modes	Free-run, square, triggered, adjustable doublet, trigger doublet, gated, and external pulse		
Square wave rate	0.1 Hz to 10 MHz, 0.1 Hz resolution (nom)		
Pulse period	30 ns (500 ns with UNU) to 42 seconds (nom)	30 ns to 42 seconds (nom)	
Pulse width	20 ns (500 ns with UNU) to pulse period – 10 ns (nom)	20 ns to pulse period – 10 ns (nom)	
Resolution	10 ns (nom)	10 ns (nom)	
<b>Recommended calibration cycle</b>	36 months. Agilent is committed to providing you with the lowest total cost to own and operate equipment. In support of this commitment, Agilent has verified that the stability of this product's architecture justifies a longer calibration interval of 3 years		
Remote programming			
Interfaces	GPIB IEEE-488.2, 1987 with listen and talk		
LAN	100BaseT LAN interface, LXI Class B compliant		
USB	Version 2.0		
Control languages	SCPI Version 1997.0		
Compatibility languages supporting 100% of commonly used commands	Agilent Technologies E4438C, E4428C, E442xB, E443xB, E8241A, E8244A, E8251A, E8254A, E8247C, E8257C/D, E8267C/D, 8648 Series, 8656B, E8663B, 8657A/B		
Instrument characteristics			
Weight	≤ 12.5 kg (27.5 lb.) net, ≤ 27.2 kg (60 lb.) shipping	≤ 13.8 kg (30 lb.) net, ≤ 28.4 kg (62 lb.) shipping	
Dimensions	88 mm H x 426 mm W x 432 mm L (3.5 in H x 16.8 in W x 17 in L)		

# More Information

## MXG RF and Microwave Analog Signal Generators

The MXG delivers the performance you require for a wide variety of broad-band measurements in a compact, 2U-high package, making it a particularly useful tool for RF and microwave component and system manufacturing test applications, including LO and clock substitution, continuous wave (CW) interferers, power calibration, antenna testing, and analog communication systems that use AM, FM or phase modulation.

## Power to overcome system losses

Every microwave engineer knows that as frequencies go up, so do power losses through cables, switches, filters, and other components in your test system. The MXG helps to overcome those losses and provide adequate power to your device.

## Increase throughput

Demanding schedules require that modern test systems deliver high measurement throughput. The MXGs delivers a fast, reliable stimulus.

## Lower cost of ownership

Every element of the MXG is designed to maximize uptime and reduce your cost of ownership, from a simplified design that delivers high reliability to cost- and time-effective tools for easy self-maintenance. The MXG has 100% internal diagnostic capability and is composed of a few easily replaceable, pre-calibrated assemblies that minimize any potential downtime to less than 1 working day.

## Extensive code compatibility

The MXG enables you to extend the life of your automated test systems without losing your significant investment in software. With compatibility languages for the signal generators on the previous pages, the MXG makes it easy to refresh your existing test systems.

### Definitions and conditions

**Specification (spec):** Represents warranted performance of a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature range of 0 to 55 °C, unless otherwise stated, and after a 45 minute warm-up period. The specifications include measurement uncertainty. Data represented in this document are specifications unless otherwise noted.

**Typical (typ):** Represents characteristic performance, which 80% of the instruments manufactured will meet. This data is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 25 °C).

**Nominal (nom):** The expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is not warranted and is measured at room temperature (approximately 25 °C).

**Measured (meas):** An attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is not warranted and is measured at room temperature (approximately 25 °C).

*Note: All graphs contain measured data from several units at room temperature unless otherwise noted.*



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