

Chapter 6 Specifications

This chapter lists the technical specifications and general specifications of the RF signal generator. The technical specifications are valid when the instrument is within the calibration period, is stored for at least two hours in 0°C to 50°C temperature and is warmed up for 40 minutes. Unless otherwise noted, the specifications in this manual include the measurement uncertainty.

Typical Value (typ.): the typical performance that 80 percent of the measurement results can meet at room temperature (approximately 25°C). This data is not warranted and does not include the measurement uncertainty.

Nominal Value (nom.): the expected average performance or the designed performance attribute (for example, the 50 Ω connector). This data is not warranted and is measured at room temperature (approximately 25°C).

Measured Value (meas.): the performance attribute measured during the design phase and used to be compared with the expected performance (for example, the variation of the amplitude drift with time). This data is not warranted and is measured at room temperature (approximately 25°C).

Note: Unless otherwise noted, all the values in this chapter are the measurement results of multiple instruments at room temperature.

Technical Specifications

Frequency

Frequency		
	DSG815	DSG830
Frequency range	9 kHz to 1.5 GHz	9 kHz to 3 GHz
Frequency resolution	0.01 Hz	
Setting time ^[1]	<10 ms (typ.)	

Frequency Band		
Band	Frequency range	N ^[2]
1	$f < 227.5 \text{ MHz}$	0.25
2	$227.5 \text{ MHz} \leq f < 455 \text{ MHz}$	0.125
3	$455 \text{ MHz} \leq f < 910 \text{ MHz}$	0.25
4	$910 \text{ MHz} \leq f < 1820 \text{ MHz}$	0.5
5	$1820 \text{ MHz} \leq f \leq 3000 \text{ MHz}$	1

Internal Reference Frequency		
Reference frequency	10 MHz	
Temperature stability	In temperature range 0°C to 50°C, reference to 25°C	< 2 ppm
	With option OCXO-B08	< 5 ppb
Aging rate		< 1 ppm/year
	With option OCXO-B08	< 30 ppb/year
Internal reference frequency output	Frequency	10 MHz
	Level	+5 dBm to +10 dBm
External reference frequency input	Frequency	10 MHz
	Level	0 dBm to +10 dBm
	Maximum deviation	±5 ppm

Note: [1] Time from receipt of SCPI command or trigger signal to within 0.1 ppm of final frequency (final frequency $\geq 227.5 \text{ MHz}$) or within 100 Hz (final frequency $< 227.5 \text{ MHz}$).

[2] N is a factor used to help define certain specifications within the manual.

Frequency Sweep		
Sweep type	Step sweep (equally or logarithmically spaced frequency steps) List sweep (list with arbitrary frequency steps)	
Sweep mode	Single, continuous	
Sweep range	Full frequency range	
Sweep shape	Triangle, ramp	
Step change	Linear or logarithmic	
Number of sweep points	Step sweep	2 to 65535
	List sweep	1 to 6001
Dwell time	20 ms to 100 s	
Trigger mode	Auto, key, external, bus (USB, LAN)	

Spectral Purity			
		DSG815	DSG830
Harmonic	CW mode, $1 \text{ MHz} \leq f \leq 3 \text{ GHz}$, level $\leq +13 \text{ dBm}$	< -30 dBc	
Non-harmonic	CW mode, level > -10 dBm, carrier offset > 10 kHz		
	$100 \text{ kHz} \leq f \leq 1.5 \text{ GHz}$	< -60 dBc, < -70 dBc (typ.)	< -60 dBc, < -70 dBc (typ.)
	$1.5 \text{ GHz} < f \leq 3 \text{ GHz}$		< -54 dBc, < -64 dBc (typ.)
SSB phase noise	CW mode, carrier offset = 20 kHz, 1 Hz measurement bandwidth		
	$100 \text{ kHz} \leq f \leq 1.5 \text{ GHz}$	< -100 dBc/Hz, < -105 dBc/Hz (typ.)	< -100 dBc/Hz, < -105 dBc/Hz (typ.)
	$1.5 \text{ GHz} < f \leq 3 \text{ GHz}$		< -94 dBc/Hz, < -99 dBc/Hz (typ.)
Residual FM	CW mode, RMS value at $f = 1 \text{ GHz}$		
	0.3 kHz to 3 kHz	< 10 Hz rms, < 5 Hz rms (typ.)	
	0.03 kHz to 20 kHz	< 50 Hz rms, < 10 Hz rms (typ.)	

Amplitude

Setting Range			
		Specification level range	Setting range
Maximum output level ^[1]	$9 \text{ kHz} \leq f < 100 \text{ kHz}$		+5 dBm
	$100 \text{ kHz} \leq f \leq 3 \text{ GHz}$	+13 dBm	+20 dBm
Minimum output level	$9 \text{ kHz} \leq f \leq 100 \text{ kHz}$		-110 dBm
	$100 \text{ kHz} < f \leq 3 \text{ GHz}$	-110 dBm	-110 dBm
Setting resolution	0.01 dB		

Absolute Level Uncertainty			
Level uncertainty	Temperature range: 20°C to 30°C		
		+13 dBm to -60 dBm	-60 dBm to -110 dBm
	$100 \text{ kHz} \leq f \leq 3 \text{ GHz}$	$\leq 0.9 \text{ dB}$, $\leq 0.5 \text{ (typ.)}$	$\leq 1.1 \text{ dB}$, $\leq 0.7 \text{ (typ.)}$
VSWR ^[2]	$1 \text{ MHz} \leq f \leq 3 \text{ GHz}$	$< 1.8 \text{ (typ.)}$	

Level Setting		
Setting time ^[3]	Fixed frequency, temperature range: 20°C to 30°C	$\leq 5 \text{ ms (typ.)}$

Max. Reverse Power		
Max. reverse power	Max. DC voltage	50 V
	$1 \text{ MHz} < f \leq 3 \text{ GHz}$	1 W

Note: [1] Typical maximum output level up to +20 dBm (± 1 dB) when output frequency ≥ 10 MHz.

[2] 50 Ω measurement system, typical value, output level ≤ -10 dBm.

[3] Time from receipt of SCPI command or trigger signal to within 0.1 dB of final level.

Level Sweep		
Sweep type	Step sweep (equally spaced level steps) List sweep (list with arbitrary level steps)	
Sweep mode	Single, continuous	
Sweep range	Full level range	
Sweep shape	Triangle, ramp	
Step change	Linear	
Number of sweep points	Step sweep	2 to 65535
	List sweep	1 to 6001
Dwell time	20 ms to 100 s	
Trigger mode	Auto, key, external, bus (USB, LAN)	

Internal Modulation Generator (LF)

Internal Modulation Generator (LF)		
Waveform	Sine, square	
Frequency range	Sine	DC to 200 kHz
	Square	DC to 20 kHz
Resolution	0.01 Hz	
Frequency error	The same with that of the RF reference source	
Voltage range	AC	0 to 3 V _p
	DC	-3 V to 3 V
Voltage resolution	2 mV	

Modulation^[1]

Simultaneous Modulation				
	AM	FM	ØM	Pulse mod. (opt.)
AM	-	○	○	△
FM	○	-	×	○
ØM	○	×	-	○
Pulse mod. (opt.)	△	○	○	-

Note: ○: compatible; ×: not compatible; △: compatible, but the amplitude modulation performance will decrease when pulse modulation is turned on.

Amplitude Modulation		
Modulation source	Internal, external	
Modulation depth ^[2]	0% to 100%	
Resolution	0.1%	
Setting uncertainty	$f_{\text{mod}} = 1 \text{ kHz}$	$< \text{setting value} \times 4\% + 1\%$
Distortion	$f_{\text{mod}} = 1 \text{ kHz}$, $m < 30\%$, level = 0 dBm	$< 3\%$ (typ.)
Modulation frequency response	$m < 80\%$, DC/10 Hz to 100 kHz	$< 3 \text{ dB}$ (nom.)

Frequency Modulation		
Modulation source	Internal, external	
Max. deviation	$N \times 1 \text{ MHz}$ (nom.)	
Resolution	$< 0.1\%$ of the deviation or 1 Hz, take the greater one (nom.)	
Setting uncertainty	$f_{\text{mod}} = 1 \text{ kHz}$, internal modulation	$< \text{setting value} \times 2\% + 20 \text{ Hz}$
Distortion	$f_{\text{mod}} = 1 \text{ kHz}$, deviation = $N \times 50 \text{ kHz}$	$< 2\%$ (typ.)
Modulation frequency response ^[3]	DC/10 Hz to 100 kHz	$< 3 \text{ dB}$ (nom.)

Note: [1] Unless otherwise noted, the modulation source is sine. The temperature range is from 20°C to 30°C, carrier frequency $\geq 1 \text{ MHz}$.

[2] The envelop peak power is no greater than the maximum value of the specification output range.

[3] External modulation, measured at 100 kHz deviation.

Phase Modulation		
Modulation source	Internal, external	
Max. deviation	$N \times 5$ rad (nom.)	
Resolution	< 0.1% of the deviation or 0.01 rad, take the greater one (nom.)	
Setting uncertainty	$f_{\text{mod}} = 1$ kHz, internal modulation	< setting value \times 1% + 0.1 rad
Distortion	$f_{\text{mod}} = 1$ kHz, deviation = $N \times 5$ rad	< 1% (typ.)
Modulation frequency response ^[1]	DC/10 Hz to 100 kHz	< 3 dB (nom.)

Pulse Modulation (Option DSG800-PUM)		
Modulation source	External, internal	
On/off ratio	$100 \text{ kHz} \leq f < 3 \text{ GHz}$	> 70 dB
Rise/fall time (10%/90%)	< 50 ns, 10 ns (typ.)	
Pulse repetition frequency	DC to 1 MHz	

Pulse Generator (Option DSG800-PUM)		
Pulse mode	Single pulse, pulse train (option DSG800-PUG)	
Pulse period	Setting range	40 ns to 170 s
	Resolution	10 ns
Pulse width	Setting range	10 ns to (170 s - 10 ns)
	Resolution	10 ns
Trigger delay	Setting range	10 ns to 170 s
	Resolution	10 ns
Trigger mode	Auto, external trigger, external gate, key, bus (USB, LAN)	

Pulse Train Generator (Option DSG800-PUG)		
Pulse train generator	Number of pulse patterns	1 to 2047
	On/off time range	20 ns to 170 s
	Repetitions per pattern	1 to 256

Note: [1] External modulation, measured at 5 rad deviation.

Input and Output

Front Panel Connectors		
RF output	Impedance	50 Ω (nom.)
	Connector	N female
Internal modulation generator (LF) output	Impedance	50 Ω (nom.)
	Connector	BNC female

Rear Panel Connectors		
External trigger input	Impedance	1 k Ω (nom.)
	Connector	BNC female
	Trigger voltage	3.3 V TTL level
Signal valid output	Connector	BNC female
	Output voltage	0 V/3.3 V (nom.)
Pulse input or output	Impedance	50 Ω (nom.)
	Input/output voltage	0 V/3.3 V (nom.)
External modulation signal input	Impedance	100 k Ω /600 Ω /50 Ω (nom.)
	Coupling	AC/DC
	Sensitivity	1 V peak-peak for indicated modulation depth or deviation (nom.)
	Connector	BNC female
10MHz input (external frequency reference input)	Impedance	50 Ω (nom.)
	Connector	BNC female
10MHz output (external frequency reference output)	Impedance	50 Ω (nom.)
	Connector	BNC female

Rear Panel Communication Interfaces		
USB host	Connector	A plug
	Protocol	Version 2.0
USB device	Connector	B plug
	Protocol	Version 2.0
LAN	LXI Core 2011 Device	10/100Base, RJ-45

General Specifications

Display	
Type	TFT LCD
Resolution	320 (RGB) × 240
Size	3.5 inches

Mass Storage		
Mess storage	Flash non-volatile memory (internal); USB storage device (not supplied)	
Data storage space	Flash non-volatile memory (internal)	96 MB (nom.)

Power Supply		
Input voltage range, AC	100 V to 240 V (nom.)	
AC frequency range	45 Hz to 440 Hz	
Power consumption	With all the options	50 W (typ.), max. 60 W

Electromagnetic Compatibility and Safety		
Certificate of conformity	CE	
	cTUVus	
	EAC	
EMC	Conform to EN61326-1:2013	
	IEC 61000-4-2:2008	±4.0 kV (contact discharge), ±8.0 kV (air discharge)
	IEC 61000-4-3:2006+A1+A2	3 V/m (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2.0 GHz to 2.7 GHz)
	IEC 61000-4-4:2004+A1	1 kV power cable
	IEC 61000-4-5:2005	0.5 kV (Phase to Neutral) 0.5 kV (Phase to PE) 1 kV (Neutral to PE)
	IEC 61000-4-6:2008	3 V, 0.15 MHz to 80 MHz
	IEC 61000-4-8:2009	3 A/m (50 Hz, 60 Hz)
	IEC 61000-4-11:2004	Voltage dip: 0% UT during half cycle 0% UT during 1 cycle 70% UT during 25 cycles Short interruption:

		0% UT during 250 cycles
Safety regulation	Conform to: UL 61010-1:2012 CAN/CSA-C22.2 No. 61010-1-12 EN 61010-1:2010	

Environmental		
Temperature	Operating temperature range	0°C to 50°C
	Storage temperature range	-20°C to 70°C
Humidity	0°C to 30°C	≤ 95% RH
	30°C to 40°C	≤ 75% RH
	40°C to 50°C	≤ 45% RH
Altitude	Operating height	Below 3000 m

Dimensions	
W × H × D	261.5 mm × 112 mm × 318.4 mm (10.30 inch × 4.41 inch × 12.54 inch)

Weight	
	4.2 kg (9.3 lb)

Calibration Interval	
Recommended calibration interval	1 year