RIGOL

DSG800 Series

RF Signal Generator

Highly cost-effective economical RF signal generator

- Up to -112 dBc/Hz (typical) phase noise
- Up to +20 dBm (typical) maximum output power
- Higher level of amplitude accuracy, up to 0.5 dB (typical)
- Superb signal stability

Functions almost matching those of high-level RF signal generators

- Flexible frequency and amplitude sweep functions
- Complete AM/FM/ØM analog modulation functions
- Standard LF output function
- Powerful pulse modulation function
- Open vector modulation function
- System flatness calibration function
- Simple and easy to operate

Special design ensuring its reliability and durability

- Use electronic attenuator to avoid wearing
- Specially designed protection functions
- Digital ALC circuit
- Simple structure

Smallest in size among the like products

- Occupy the least workbench space
- Occupy less rack space
- Light weight; the handle offers comfortable grip

▶ Specifications

The technical specifications are valid when the instrument is within the calibration period, is stored for at least two hours in 0℃ to 50℃ 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℃). This data is not warranted and does not include the measurement uncertainty.

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

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

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

Frequency

Frequency Range	
DSG815	9 kHz to 1.5 GHz
DSG821(A)	9 kHz to 2.1 GHz
DSG830	9 kHz to 3 GHz
DSG836(A)	9 kHz to 3.6 GHz

Frequency	
Frequency resolution	0.01 Hz
Setting time[1]	< 10 ms (typ.)

Frequency Band		
Band	Frequency range	N[2]
1	f < 227.5 MHz	0.25
2	227.5 MHz ≤ f < 455 MHz	0.125
3	455 MHz ≤ f < 910 MHz	0.25
4	910 MHz ≤ f < 1820 MHz	0.5
5	1820 MHz ≤ f ≤ 3600 MHz	1

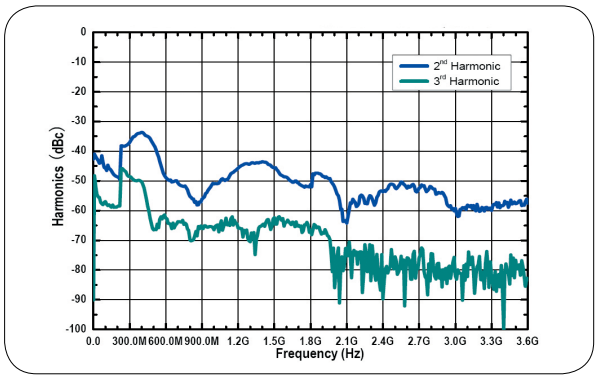
Internal Reference Frequency		
Reference frequency	10 MHz	
Temperature stability	In temperature range 0℃ to 50℃ , reference to 25℃	< 2 ppm
	With option OCXO-B08	< 5 ppb
Aging rate		< 1 ppm/year
	With option OCXO-B08	< 30 ppb/year
Internal reference frequency output	Frequency	10 MHz
	Level	+5 dBm to +10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

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

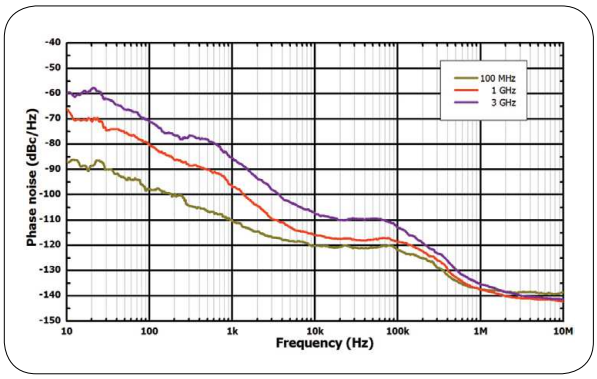
Number of points	Step sweep	2 to 65535
	List sweep	1 to 6001
Dwell time	20 ms to 100 s	
Trigger mode	Auto, key, external, bus (USB, LAN)	

Spectral Purity[3]		
Harmonic	CW mode, 1 MHz ≤ f ≤ 3.6 GHz, level ≤ +13 dBm	< -30 dBc
Non-harmonic	CW mode, level > -10 dBm, carrier offset > 10 kHz	
	100 kHz ≤ f ≤ 1.5 GHz	< -60 dBc, < -70 dBc (typ.)
	1.5 GHz < f ≤ 3.6 GHz	< -54 dBc, < -64 dBc (typ.)
SSB phase noise[4]	CW mode, carrier offset = 20 kHz, 1 Hz measurement bandwidth	
	100 kHz ≤ f ≤ 1.5 GHz	< -105 dBc/Hz, < -112 dBc/Hz (typ.)
	1.5 GHz < f ≤ 3.6 GHz	< -99 dBc/Hz, < -106 dBc/Hz (typ.)
Residual FM	CW mode, RMS value at f = 1 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.)

Measured at 0 dBm, Harmonics vs.frequency



Measured SSB phase noise



Note:

[1] Time from receipt of SCPI command or trigger signal to within 0.1 ppm of final frequency (final frequency ≥ 227.5 MHz) or within 100 Hz (final frequency < 227.5 MHz).

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

[3] Applicable to instrument without IQ function.

[4] Available for software version 00.01.07 or above.

Amplitude

Setting Range			
		Specification level range	Setting range
Maximum output level[1]	9 kHz ≤ f < 100 kHz		+5 dBm
	100 kHz ≤ f ≤ 3.6 GHz	+13 dBm	+20 dBm
Minimum output level	9 kHz ≤ f ≤ 100 kHz		-110 dBm
	100 kHz < f ≤ 3.6 GHz	-110 dBm	-110 dBm
Setting Resolution	0.01 dB		

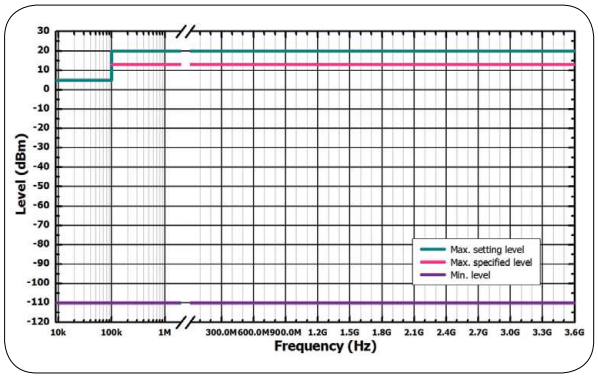
Absolute Level Uncertainty			
Level uncertainty	Temperature range: 20℃ to 30℃		
		+13 dBm to -60 dBm	-60 dBm to -110 dBm
	100 kHz ≤ f ≤ 3.6 GHz	≤ 0.9 dB, ≤ 0.5 (typ.)	≤ 1.1 dB, ≤ 0.7 (typ.)
VSWR[2]	1 MHz ≤ f ≤ 3.6 GHz	< 1.8 (typ.)	

Level Setting		
Setting time[3]	Fixed frequency, temperature range: 20℃ to 30℃	≤ 5 ms (typ.)

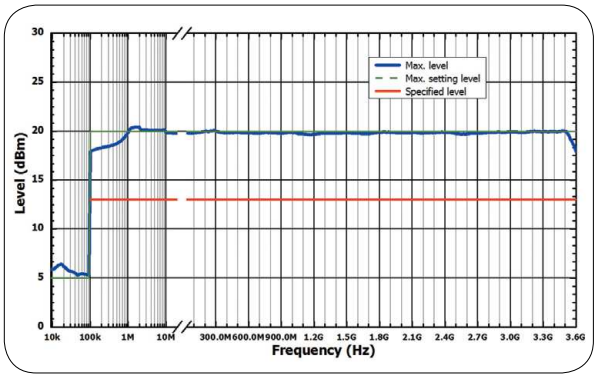
Max. Reverse Power		
Max. reverse power	Max. DC voltage	50 V
	1 MHz < f ≤ 3.6 GHz	1 W

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 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)	

Maximum and minimum level vs. frequency

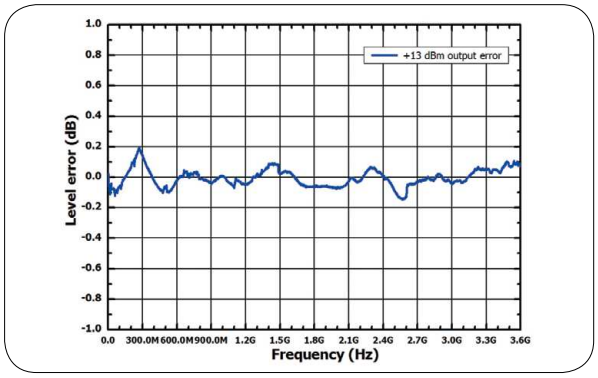


Measured maximum level vs.frequency

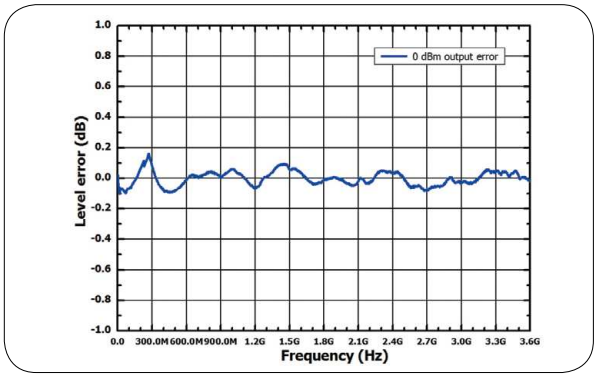


Note:
[1] Typical maximum output level up to +20 dBm (±1 dB) when output frequency ≥ 10 MHz.
[2] In 50 Ω measurement system, typical value, output level ≤ -10 dBm.
[3] Time from receipt of SCPI command or trigger signal to within 0.1 dB of final level.

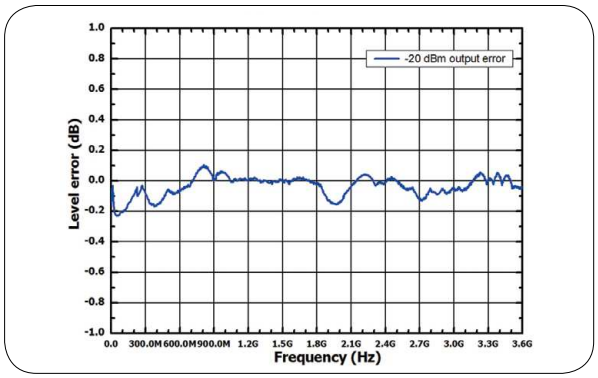
Measured at +13 dBm,level error vs.frequency



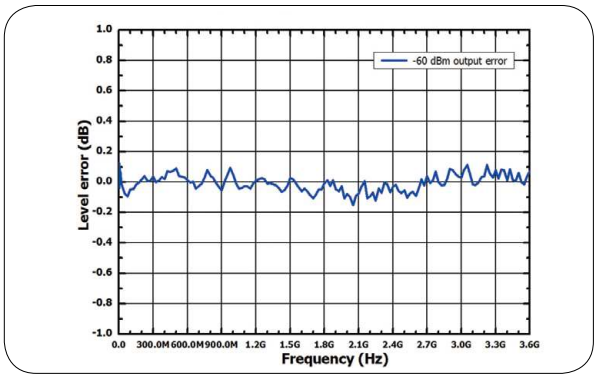
Measured at 0 dBm,level error vs.frequency



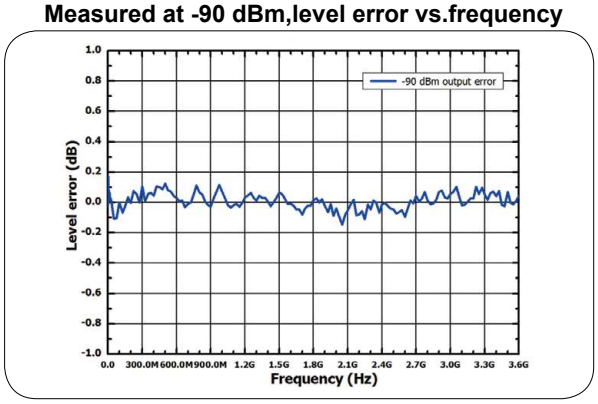
Measured at -20 dBm,level error vs.frequency



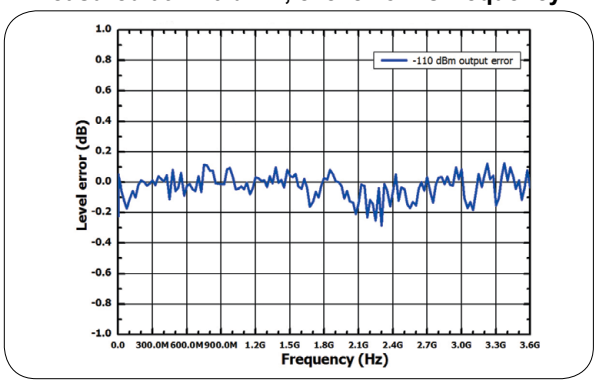
Measured at -60 dBm,level error vs.frequency



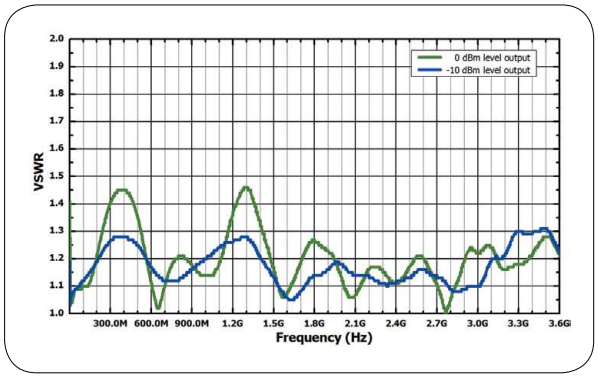
Measured at -90 dBm,level error vs.frequency



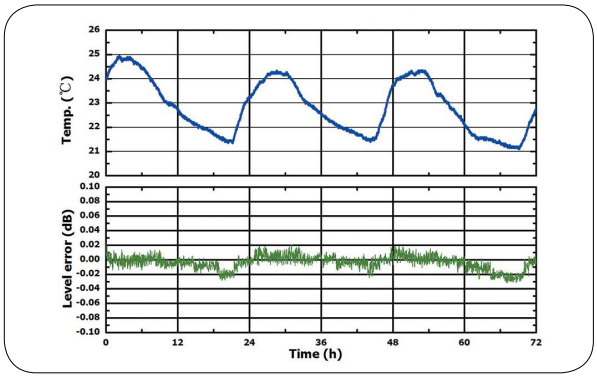
Measured at -110 dBm,level error vs.frequency



Measured VSWR vs.frequency



Measured level repeatability @ 1 GHz,0 dBm



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.)	I/Q mod. (opt.)
AM	-	○	○	△	×
FM	○	-	×	○	○
ØM	○	×	-	○	○
Pulse mod. (opt.)	△	○	○	-	○
I/Q mod. (opt.)	×	○	○	○	-

Note: ○: compatible; ×: not compatible; △ : compatible, but the AM 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_{mod} = 1 kHz	< setting value × 4% + 1%
Distortion	f_{mod} = 1 kHz, m < 30%, level = 0 dBm	< 3% (typ.)
Modulation frequency response	m < 80%, DC/10 Hz to 100 kHz	< 3 dB (nom.)

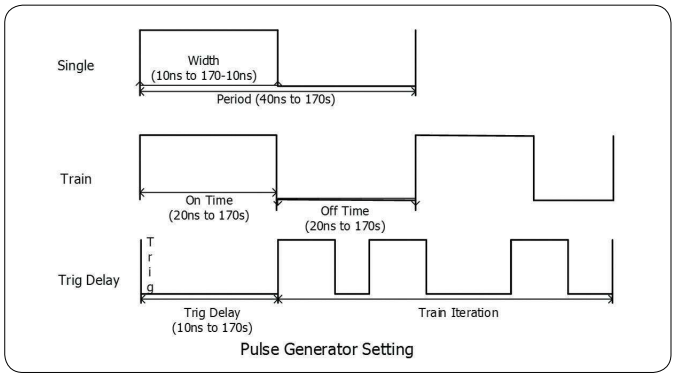
Frequency Modulation		
Modulation source	Internal, external	
Max. deviation	N × 1 MHz (nom.)	
Resolution	< 0.1% of the deviation or 1 Hz, take the greater one (nom.)	
Setting uncertainty	f_{mod} = 1 kHz, internal modulation	< setting value × 2% + 20 Hz
Distortion	f_{mod} = 1 kHz, deviation = N × 50 kHz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

Phase Modulation		
Modulation source	Internal, external	
Max. deviation	N × 5 rad (nom.)	
Resolution	< 0.1% of the deviation or 0.01 rad, take the greater one (nom.)	
Setting uncertainty	f_{mod} = 1 kHz, internal modulation	< setting value × 1% + 0.1 rad
Distortion	f_{mod} = 1 kHz, deviation = N × 5 rad	< 1% (typ.)
Modulation frequency response[4]	DC/10 Hz to 100 kHz	< 3 dB (nom.)

Pulse Modulation (Option DSG800-PUM)		
Modulation source	External, internal	
On/off ratio	100 kHz ≤ f < 3.6 GHz	> 70 dB
Rise/fall time (10%/90%)	< 50 ns	
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
	Number of repetitions per pattern	1 to 256

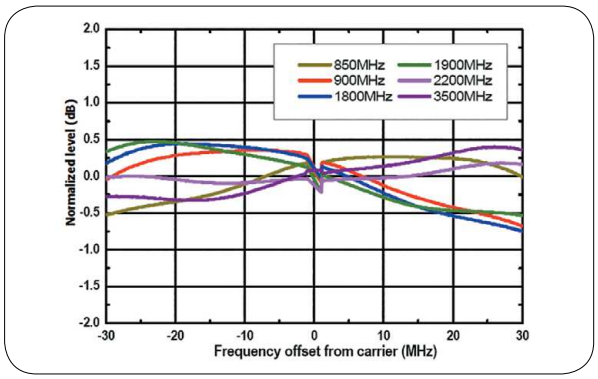


Pulse Generator Setting

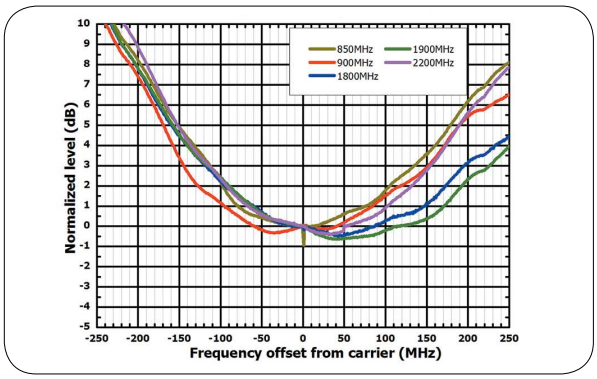
I/Q Modulation (only available for DSG821A and DSG836A)		
Carrier frequency range	DSG821A	50 MHz ≤ f ≤ 2.1 GHz
	DSG836A	50 MHz ≤ f ≤ 3.6 GHz
Modulation source	External, internal	
Bandwidth (RF)	External modulation	
	Baseband (I or Q)	≤ 60 MHz (nom.)
	RF (I + Q)	≤ 120 MHz (nom.)
	Internal modulation	
	Baseband (I or Q)	≤ 30 MHz (nom.)
	RF (I + Q)	≤ 60 MHz (nom.)
Carrier suppression[5]	≥ 40 dBc (typ.)	
Image sideband suppression[5,6]	≥ 40 dBc (typ.)	
External I/Q input	VSWR	< 1.5
	Full range input	$\sqrt{I^2+Q^2}=0.5Vrms$
Internal modulation		
EVM[5]	16QAM, root cosine filter (α = 0.22), 4 MSps, output level ≤ +4 dBm	≤ 2%rms (typ.)
	QPSK, root cosine filter (α = 0.22), 4 MSps, output level ≤ +4 dBm	≤ 2%rms (typ.)
External modulation		
EVM[5]	CDMA2000/1xEV-D0, 1.2288 Mcps, frequency: 800 to 900 MHz, 1800 to 1900 MHz, output level ≤ +4 dBm	≤ 2%rms (typ.)
ACPR		≥ 70 dB

I/Q Baseband Generator (only available for DSG821A and DSG836A)			
Output impedance	50 Ω (nom.)		
Output voltage	Setting range		0.02 V_p to 1.5 V_p
	Resolution		1 mV
Frequency response	Reference: 1 MHz	≤ 10 MHz	< 0.5 dB (nom.)
		≤ 30 MHz	< 1 dB (nom.)
I/Q imbalance	Amplitude	≤ 10 MHz	< 0.1 dB (nom.)
		≤ 30 MHz	< 0.2 dB (nom.)
	Nonlinear phase	≤ 10 MHz	200 ps (nom.)
		≤ 30 MHz	500 ps (nom.)
SFDR	Sine	≤ 30 MHz	> 50 dB (nom.)
Waveform memory	Waveform length		1 sample to 16 Msample in one-sample steps
	Resolution		14 bits
	Loading time (1 Msample)		< 10 s[7] (nom.)
	Non-volatile memory		96 MB (nom.)
Sample rate	Setting range		1 kHz to 50 MHz
	Resolution		0.01 Hz
Trigger	Trigger mode		Auto, key, external, bus (USB, LAN)
	Operation mode		Retrig, arm auto, arm retrig, single
	External trigger delay		
	Setting range		0 to (2^{16} - 1)
	Resolution		1
	External trigger inhibit		
	Setting range		0 to (2^{16} - 1)
	Resolution		1
	External trigger pulse width		> 20 ns (nom.)

Measured internal IQ bandwidth



Measured external IQ bandwidth



Note:
[1] Unless otherwise noted, the modulation source is sine. The temperature range is from 20℃ to 30℃ , carrier frequency ≥ 1 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.
[4] External modulation, measured at 5 rad deviation.
[5] The parameter is measured under room temperature. When the temperature is different from the room temperature, the specification will deteriorate.
[6] Baseband frequency ≤ 10 MHz.
[7] Load from the flash of the internal non-volatile memory.

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 kΩ (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 modulating signal input	Impedance	100 kΩ/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
I/Q baseband input/output signal (only available for DSG821A and DSG836A)	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		
Mass 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 EMC instruction (2014/30/EU), Conform to or exceed IEC61326-1: 2013/EN61326-1: 2013 Group 1 Class A standard	
	CISPR 11/EN 55011	
	IEC 61000-4-2:2008/EN 61000-4-2	±4.0 kV (contact discharge), ±8.0 kV (air discharge)
	IEC 61000-4-3:2002/EN 61000-4-3	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/EN 61000-4-4	1 kV power cable
	IEC 61000-4-5:2001/EN 61000-4-5	0.5 kV (Phase to Neutral) 1 kV (Phase to PE) 1 kV (Neutral to PE)
	IEC 61000-4-6:2003/EN 61000-4-6	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/EN 61000-4-11	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: IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 NO. 61010-1-12+ GI1+ GI2	

Environmental		
Temperature	Operating temperature range	0℃ to 50℃
	Storage temperature range	-20℃ to 70℃
Humidity	0℃ to 30℃	≤ 95% rel. humidity
	30℃ to 40℃	≤ 75% rel. humidity
	40℃ to 50℃	≤ 45% rel. humidity
Altitude	Operating height	Below 3,000m

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	18 months

Ordering Information

	Description	Order Number
Models	RF Signal Generator, 9 kHz to 1.5 GHz	DSG815
	RF Signal Generator, 9 kHz to 2.1 GHz	DSG821
	RF Signal Generator, 9 kHz to 2.1 GHz, I/Q Modulation (Standard Configuration)	DSG821A
	RF Signal Generator, 9 kHz to 3 GHz	DSG830
	RF Signal Generator, 9 kHz to 3.6 GHz	DSG836
	RF Signal Generator, 9 kHz to 3.6 GHz, I/Q Modulation (Standard Configuration)	DSG836A
Standard Accessories	Quick Guide (Hard Copy)	--
	Power Cable	--
Options	Pulse Modulation, Pulse Generator	DSG800-PUM
	Pulse Train Generator[1]	DSG800-PUG
	High Stable Reference Clock	OCXO-B08
	Rack Mount Kit (For one Instrument)	RM-1-DG1000Z
	Rack Mount Kit (For two Instruments)	RM-2-DG1000Z

Note: [1] The option DSG800-PUM will be installed automatically after this option is installed.

HEADQUARTER

RIGOL TECHNOLOGIES, INC.
No.8 Keling Road, New District,Suzhou,
JiangSu,P.R.China
Tel:+86-400620002
Email:info@rigol.com

EUROPE

RIGOL TECHNOLOGIES EU GmbH
Lindbergh str. 4
82178 Puchheim
Germany
Tel: 0049-89/89418950
Email: info-europe@rigol.com

NORTH AMERICA

RIGOL TECHNOLOGIES, USA INC.
8140 SW Nimbus Ave.
Beaverton, OR 97008
Tel: 877-4-**RIGOL**-1
Fax: 877-4-**RIGOL**-1
Email: info@rigol.com

JAPAN

RIGOL TECHNOLOGIES JAPAN, LLC
MJ Bldg. 3F, 1-7-4 Minato, Chuou-ku,
Tokyo, Japan 104-0043
Tel: +81-3-6262-8932
Fax: +81-3-6262-8933
Email: info-japan@rigol.com

DSR02100-2019-08