

S-Series

SGD Fast, Low Noise, Digital Signal Generator



AEROFLEX
A passion for performance.

Compact, easy to use, high performance signal generator for R&D, manufacturing and the field.

- Wide band cover:
 - SGD-3 - 100 kHz to 3 GHz
 - SGD-6 - 100 kHz to 6 GHz
- +13 dBm output (+20 dBm option)
- 3GPP ACLR -71 dBc
- IQ modulator with 300 MHz RF bandwidth
- Up to 250 MS/s dual channel arbitrary waveform generator with memory options up to 4 GBytes
- Embedded IQCreator® waveform generation tool
- Low SSB phase noise: -135 dBc/Hz at 1 GHz
- Fast frequency settling time: 100 μ s
- List mode with AWG waveform sequencing
- Synthesizer input/output for phase locking multiple signal generators
- Internal pulse modulator/generator (option)
- Comprehensive frequency and amplitude sweep capabilities
- Comprehensive analog modulation
- Half-rack width, 4U high with 8.5 inch touch screen user-interface
- Synchronization and interaction with S-Series modules and instruments
- "Aerolock" interlocking mechanism for multiple instrument applications
- USB, LAN and GPIB remote control
- Low cost of ownership through modular design
- Phase coherent LO input/output

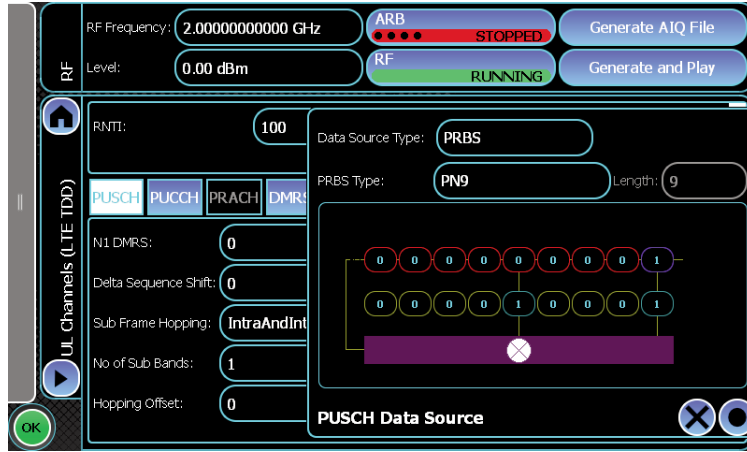
The SGD employs a large touch screen user-interface to provide a digital signal generator with unparalleled ease-of-use. The small form-factor and light weight ensure minimum footprint on the bench or test system and maximum portability. The wide bandwidth IQ modulator exhibits excellent dynamic range enabling the most demanding amplifier and receiver selectivity measurements to be performed. The use of Aeroflex's Fast Low Noise Synthesis (FLNS) technology, added to the experience gained through decades of developing leading-edge signal source products, ensures that signal purity and integrity have not been sacrificed in the quest for speed; the SGD excels in all respects. With a comprehensive range of features and options, the SGD meets the needs for a general-purpose signal generator while offering the high performance required of demanding, critical receiver measurements or rapid manufacturing.

For the very latest specifications visit www.aeroflex.com

Display and User-Interface

A large 8.5 inch touch-screen LCD enables all relevant set-up information to be displayed on one screen, and without the need to select configurations from lower level menu structures. It is quick to learn, easy to use, clear, with large characters and a wide viewing angle. Touch targets are sufficiently large to ensure usability even when wearing gloves.

A mouse and keyboard may also be connected to allow ease of use when using Windows™ features.



Using the touchscreen to define PUSCH data source in LTE FDD uplink signal

Vector Modulation

High quality wide bandwidth vector modulation is available with a maximum vector modulation bandwidth of 300 MHz at the RF output. With the internal dual channel arbitrary waveform generator fitted, an internal user initiated IQ calibration routine ensures carrier suppression of 55 dB and image suppression of 50 dB. The high dynamic range of the IQ modulators provides for an ACLR of -71 dBc on WCDMA signals.

Arbitrary Waveform Generator (AWG)

With sample rates up to 250 MHz per channel, high quality digital modulation is provided with I and Q bandwidths of up to ± 100 MHz, ideal for testing multi-channel power amplifiers and support for all forthcoming wideband wireless systems. The AWG has up to 4 GBytes (1 Gsample) sample memory, each 32-bit sample word consisting of 16-bit I, 16-bit Q, and up to 8 markers. The AWG memory can be used to store multiple waveforms up to the limit of the sample memory. Once loaded in the AWG, switching between waveforms is near instantaneous. Extending the playback time can be achieved by sequencing the AWG files in list mode. Waveform list mode sequencer supports multiple types of sequences: standard counter, external address based, programmable event driven and support for group sequences that may be used to perform inner loop power control of WCDMA systems.

The hard disk drive has up to 60 GB available to store AWG waveforms.

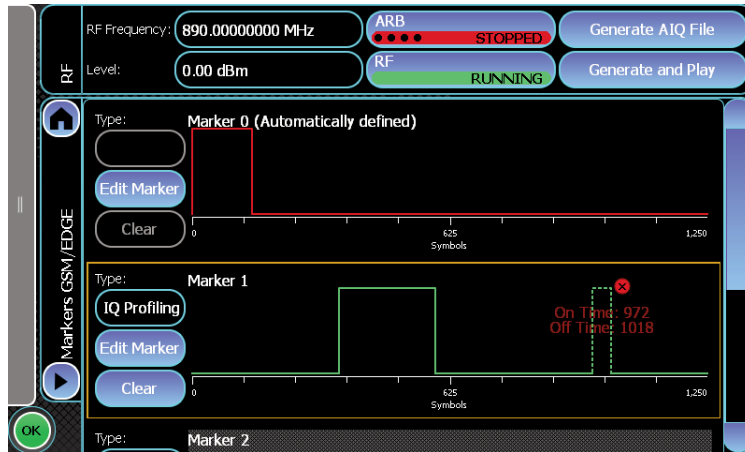
Embedded Waveform Creation Tool, IQCreator® (included with AWG option)

IQCreator® is a software utility that enables a user to set up a modulation scheme and then create an AWG file using modulation templates. The resulting file is downloaded into the AWG. All SGDs have generic modulation creation enabled. Options to enable the various wireless technologies are available.

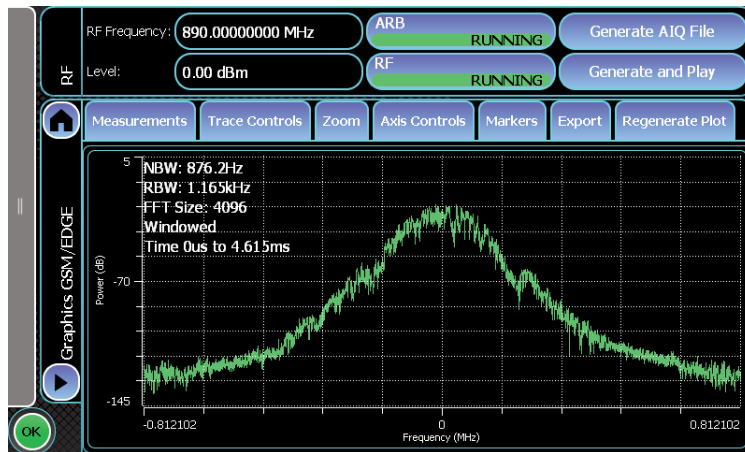


SGD UMTS DL configuration

In the SGD, IQCreator[®] is supplied embedded and all functions are controllable from the user-interface. Waveforms designed in IQCreator[®] can include signal impairments and time markers to aid synchronization. Graphical displays of the waveform, FFT, vector, constellation, I and Q phase and amplitude vs. time etc. can be previewed before playing and exported for use in other Windows applications. IQCreator[®] is also available as a Windows based software tool in its traditional form for the creation of waveforms remote from the instrument. See separate IQ Creator[®] brochure for more details at www.aeroflex.com/IQCreator.



Using the touchscreen to add, move and adjust markers



Graphical preview of GSM FFT

IQCreator[®] includes a utility which allows user-defined waveforms, created using simulation tools such as MATLAB, to be converted and packaged into a form that can be downloaded into the SGD's AWG.

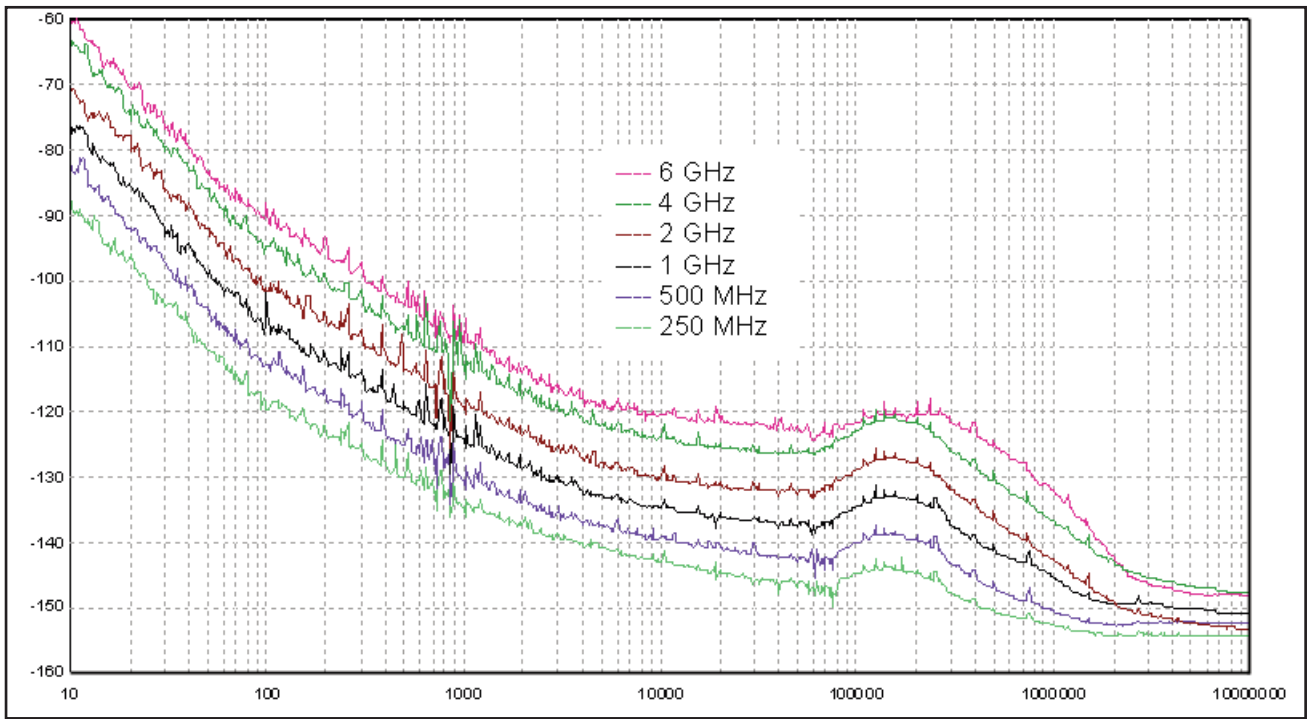
IQCreator[®] is continually updated to include new modulation capabilities and facilities as standards are updated or new standards released. Visit www.aeroflex.com/iqcreator to download the latest version.

Excellent Spectral Purity

The excellent noise characteristics and the low level of spurious signals of the SGD enable the instruments to be used with confidence for a wide range of critical measurements for the most demanding measurements on modern receivers and RF systems.

Low SSB Phase Noise

With SSB phase noise performance of -135 dBc/Hz at 20 kHz offset from a carrier of 1 GHz, the SGD signal generator is easily able to measure receiver selectivity beyond 80 dB. The low residual FM noise figure or less than 1 Hz RMS at 1 GHz gives the SGD the capability of measuring receiver signal-to-noise ratios as high as 80 dB.



Graph of typical phase noise performance

Fast Frequency and Level Settling Times

These are critical parameters to ensure maximum throughput in production applications. With frequency settling times of 3 ms in conventional frequency selection mode, or 100 μ s in list mode, the SGD is ideally suited for frequency hopping and semiconductor production test applications.

RF Output

RF output up to +13 dBm can be set to a resolution of 0.01 dB. A high power option is available to extend the maximum calibrated RF level to +20 dBm.

In the tradition of Aeroflex's excellence in RF signal generation, the ultimate attention has been given to ensure the quality of the RF performance extends beyond the specification. Such attributes are:

- that no positive RF level transients generated as a result of changing between any frequency or level
- class-leading source VSWR specification helps to ensure that the specified RF level accuracy is more likely to be met, particularly when the load match is not ideal
- excellent linearity and monotonicity even over fine RF level steps
- repeatability ensures the same RF level is produced every time

The fastest level switching speed with a long life is achieved by the use of an electronic attenuator ensuring suitability for use in the most demanding production test applications.

For the SGD-3, a reverse power protection (RPP) option provides additional protection for the instrument's RF output if excessive RF or DC power is accidentally applied ensuring a longer instrument life and lower cost of ownership.

Flexible Analog Modulation Capabilities

With one of the AWG options fitted, a wide selection of modulation modes is catered for using four internal oscillators with a frequency range of 0.1 Hz to 100 MHz. It is possible to have single AM, FM or PM (phase modulation), or dual AM and FM (or PM).

Typical Multiple Modulation Set-up

Wide AM and FM bandwidths support the testing of broadcast systems by allowing video signals to modulate the carrier with minimal distortion. Wideband FM also supports testing of equipment using frequency shift keying for high speed digital transmission and telemetry.

Sweep

The comprehensive sweep mode provides a digital sweep of carrier frequency and RF level in discrete steps. It is possible to set the start, stop, number of steps (or step size) and step time, up to a maximum of 65536 steps.

A sweep can be externally triggered via a rear panel BNC connector for Start, Start/Stop and Step, while up to six markers can be used to identify specific events within the sweep.

List Mode Sweep

With a minimum dwell time of 100 μ s, list mode provides the ultimate in frequency switching speed. A table of up to 65535 carrier frequency and RF level values may be created. Start address, stop address and dwell time can be controlled and can be externally triggered from a rear panel BNC connector.

Pulse Modulation (Option)

An optional pulse modulator with internal pulse generator allows the generation of fast rise time RF signals with on/off ratios that meet the most demanding tests on radar RF and IF stages and EMC/ECCM test applications.

Modular Instrument Concept Employing Aeroflex's "Aerolock" Interlocking Mechanism

The SGD is complemented by the SVA Vector Signal Analyzer and the two instruments are designed to work as a pair. The two instruments may be connected physically, using the "Aerolock" interlocking mechanism, and electrically via a USB interface. It is then possible to control the two units as a test system, with the settings of both instruments controlled via a common user-interface. Such a test system may be further enhanced with the addition of one or more of a selection of S-Series modules which mount above or below instruments. For instance, the addition of the SDX Duplexor module may be used to create a transceiver test system.

The addition of an SCO Combiner module can create a multisource test system for intermodulation testing or receiver selectivity. With such a system it is possible to couple the settings of one SGD (or SGA) with another, allowing quick and simple control across any frequency or level range where two sources with a defined relationship are required.

"Aerolock" is an ingenious, simple and strong interlocking mechanism allowing S-Series instruments and a full-rack width module, or two half-rack width modules, to be joined as one, creating a bespoke test solution. Weighing-in at less than 8 kg each, two S-Series instruments joined together may be easily carried within the laboratory, the factory or the field without necessitating a 2-person lift.

Many applications will be supported including tests for power amplifiers, receiver selectivity, intermodulation, adjacent channel power and mixer testing, with many more to come in the future.



Aerolock™ interlocking mechanism



Two SGDs joined together as one with SCO combiner

Remote Operation

USB, LAN and GPIB interfaces are all supported using SCPI format commands where possible. Remote desktop and VNC are also supported allowing off-site remote control.

Non-Volatile Memory

Hundreds of full instrument setting stores may be configured. Each store may be independently named allowing quick search of required memory. No settings data is stored in any other memory location within the instrument.

Removable Hard Disk (Option)

For use in secure areas, the optional removable hard disk allows easy removal of all sensitive instrument settings stores in the event the instrument has to leave the secure area.

Low Cost of Ownership

The SGD comes with a standard 2-year warranty and recommended 2-year calibration periodicity. Options to extend the warranty to five years are available.

The SGD's modular architecture means that repair can be effected in 30 minutes by replacement using calibrated exchange modules. A quick, "system level" RF adjustment using a USB power sensor restores the instrument's calibration integrity.

The instrument's software may be installed simply from a USB port so that upgrades and bug fixes can be performed with the minimum down-time and maximum convenience. The latest software version will always be available for download on Aeroflex's web site.

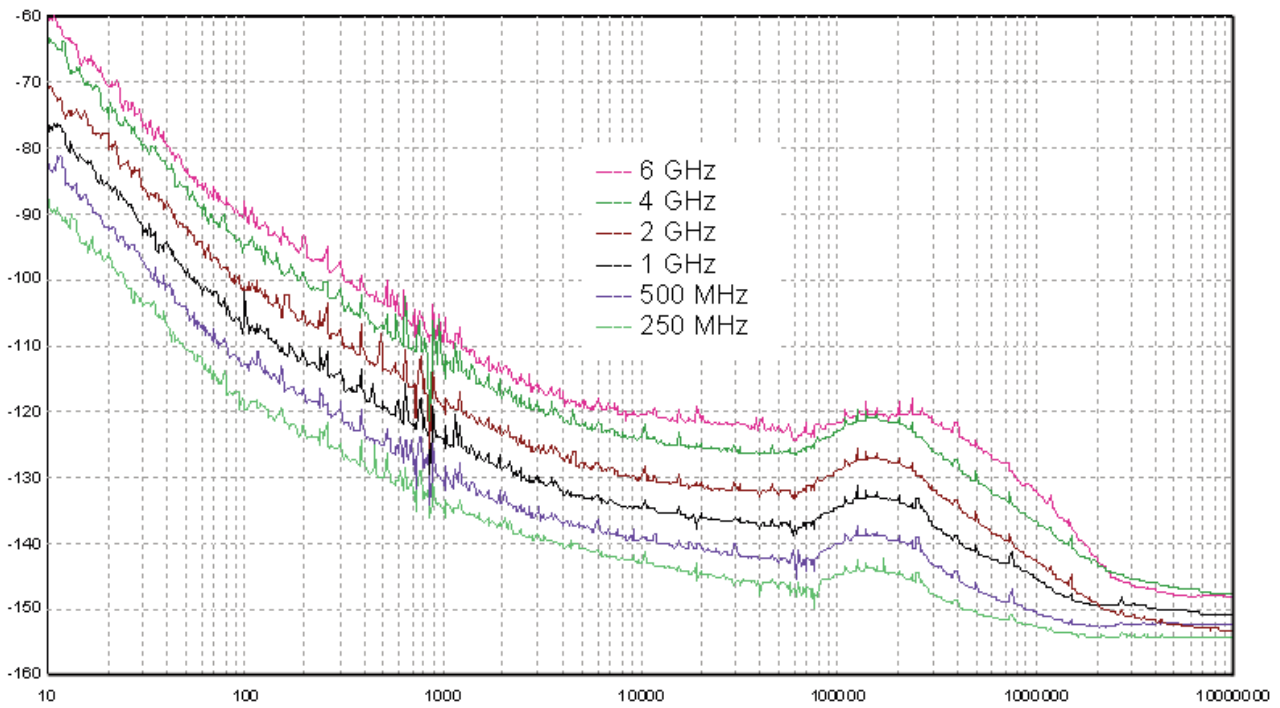
All specifications apply after a warm-up period of 20 minutes.

<i>Frequency</i>	
<i>Range</i>	<i>N</i>
100 kHz - <30 MHz	1
30.0 - <46.875 MHz	1/64
46.875 - <93.75 MHz	1/32
93.75 - <187.5 MHz	1/16
187.5 - <375 MHz	1/8
375 - <750 MHz	1/4
750 MHz - <1.5 GHz	1/2
1.5 - <3 GHz	1
3 - 6 GHz	2

<i>Range</i>	100 kHz to 3 GHz (SGD-3) 100 kHz to 6 GHz (SGD-6)
<i>Resolution</i>	0.01 Hz
<i>Accuracy</i>	As frequency reference
<i>Settling Time</i> (CW Mode)	Typical settling time to within 0.1 ppm of final frequency: 3 ms
<i>Settling Time</i> (List Mode)	Typical settling time to within 0.1 ppm of final frequency after trigger pulse in List Mode: <100 μ s for frequency changes exceeding 1.6 GHz within the frequency range above 3.2 GHz: >101 μ s
<i>Carrier Phase</i>	0 – 359.9 degrees in 0.01 degree steps Carrier phase controls the phase of the carrier with respect to the reference frequency standard, be it internal or external.

RF Level													
Range	-130 to +13 dBm When AM is selected, the maximum RF output level is linearly reduced by up to 6 dB depending on the requested AM depth. Step attenuator: 0 to 132.5 dB in 0.25 dB steps												
Range (option 003)	-130 to +20 dBm -130 to +17 dBm below 50 MHz -130 to +16 dBm below 10 MHz -130 to +13 dBm below 1 MHz												
Resolution	0.01 dB												
Accuracy	≤3 GHz <±0.5 dB (typ ±0.3 dB) <±0.6 dB from -110.01 to -120 dBm <±0.7 dB from -120.01 to -127 dBm >3 GHz <±0.7 dB <±0.8 dB from -120.01 to -127 dBm Temperature stability +0.01 dB/°C Add 0.2 dB for complex modulated signals												
Repeatability	Better than ±0.05 dB after warm up following a return from a change of frequency or level valid for at least 2 hours and excluding temperature influence												
Switching Time	<100 μs to within 0.1 dB of final value (23°C ±5°C) after trigger pulse in List Mode. <150 μs when changing carrier frequency.												
Output Impedance	50 Ω nominal												
Output VSWR	<table border="0"> <tr> <td></td> <td><+3.5 dBm</td> <td><+9.5 dBm</td> </tr> <tr> <td>>1 MHz - 3 GHz</td> <td><1.4:1</td> <td><1.5:1 typ.</td> </tr> <tr> <td></td> <td><+2.5 dBm</td> <td><+8.5 dBm</td> </tr> <tr> <td>>3 GHz</td> <td><1.6:1</td> <td><1.7:1 typ.</td> </tr> </table>		<+3.5 dBm	<+9.5 dBm	>1 MHz - 3 GHz	<1.4:1	<1.5:1 typ.		<+2.5 dBm	<+8.5 dBm	>3 GHz	<1.6:1	<1.7:1 typ.
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	<+2.5 dBm	<+8.5 dBm											
>3 GHz	<1.6:1	<1.7:1 typ.											
Reverse Power Damage Level	+25 dBm, ±16 V DC												
Reverse Power Protection SGD-3 only (option 002)	50 W (from a 50 Ω source) Maximum permissible DC voltage: 50 V												
RF Level Offsets	Up to 140 dB offset under the following: A given RF level offset over a given frequency band A profiled RF level offset between two given frequencies A selection of both of the above												

Spectral Purity				
SSB Phase Noise (CW Mode)	Carrier freq.	1 kHz	20 kHz	10 MHz
	250 kHz	-130	-140	n/a
	99 MHz	-130	-140	-150
	100 MHz	-130	-140	-150
	250 MHz	-129	-140	-150
	500 MHz	-123	-136	-150
	1 GHz	-117	-130 (-135 typ)	-148 (-152 typ)
	2 GHz	-111	-124	-148
	4 GHz	-105	-118	-140
	6 GHz	-101	-115	-135
<i>Phase noise below 100 Hz offset is dependent upon reference phase noise.</i>				
Non-Harmonic Related Spurious (CW Mode)	At offsets >10 kHz: Below 1 GHz, better than -80 dBc Below 2 GHz, better than -76 dBc Below 5 GHz, better than -70 dBc Below 6 GHz, better than -68 dBc			
Sub-harmonics	Below 2.5 GHz, better than -80 dBc Below 3 GHz, better than -75 dBc Below 6 GHz, better than -40 dBc			
Harmonics	1 MHz – 6 GHz ≤-2 dBm, better than -30 dBc ≤ +8 dBm, better than -30 dBc typ.			
Residual FM (CW Mode)	Less than 1 Hz RMS deviation in a 300 Hz to 3.4 kHz unweighted bandwidth at 1 GHz.			
RF Leakage	Less than 0.5 μV at the carrier frequency into a single turn 25 mm loop 25 mm or more from the case.			
RMS Jitter	Carrier Freq.	RMS Jitter Bandwidth		
	1 GHz	1 Hz – 10 MHz	450 fs typ.	
	155 MHz	100 Hz – 1.5 MHz	58 fs typ.	
	622 MHz	1 kHz – 5 MHz	31 fs typ.	
	2.488 GHz	5 kHz – 15 MHz	25 fs typ.	



Typical phase noise performance at 250 MHz, 500 MHz, 1 GHz, 2 GHz, 4 GHz and 6 GHz

Analog Modulation (available with options 010, 011 and 012)

Analog Mode Allowable Combinations	Digital Mode
AM1	Int IQ
AM1+AM2	Ext IQ
AM1+FM1	
AM1+FM1	
FMI	
FMI+FM2	
PM1	
PM1+PM2	
Pulse	

Range	<i>N</i>
100 kHz - <30 MHz	1
30.0 - <46.875 MHz	1/64
46.875 - <93.75 MHz	1/32
93.75 - <187.5 MHz	1/16
187.5 - <375 MHz	1/8
375 - <750 MHz	1/4
750 MHz - <1.5 GHz	1/2
1.5 - <3 GHz	1
3 - 6 GHz	2

Frequency modulation	
<i>Deviation</i>	<i>N x 10 MHz in wide mode</i> <i>N x 50 kHz in narrow mode</i>
<i>Resolution</i>	1 Hz
<i>Accuracy</i>	±3 % of set deviation (1 kHz mod rate)
<i>Total Harmonic Distortion</i>	<0.15% (at 1 kHz mod rate and 2% max deviation) <0.5% (at 1 kHz mod rate and 20% max deviation)
<i>Frequency Response (1 dB)</i>	Wide mode AC coupled, 10 Hz – 10 MHz DC coupled, DC – 10 MHz Narrow mode AC coupled, 10 MHz – 50 kHz DC coupled, DC – 50 kHz

When internally modulated, the FM mode is automatically selected for optimum performance. When external modulation is selected, the user can select wide or narrow-band FM mode as required.

Phase Modulation	
<i>Deviation</i>	<i>N x 100 rad</i>
<i>Resolution</i>	0.01 rad
<i>Accuracy</i>	±3 % of set deviation (1 kHz mod rate)
<i>Total Harmonic Distortion</i>	<0.1% (at 1 kHz mod rate and 1 rad deviation) <0.5% (at 1 kHz mod rate and 10 rad deviation)
<i>Frequency Response (1 dB)</i>	100 Hz – 10 kHz

Amplitude Modulation – up to 2 GHz	
<i>Depth</i>	0 to 99.9%
<i>Resolution</i>	0.1%
<i>Accuracy</i>	+3% of set depth +1%
<i>Total Harmonic Distortion</i>	(1 kHz mod rate, carrier frequency below 3 GHz) <1 % for depths <30 % <2 % for depths <80 %
<i>Frequency Response (1 dB)</i>	AC coupled, 10 Hz – 7 MHz DC coupled, DC – 7 MHz

Internal Modulation Sources

There are four independent modulation oscillators

Waveforms	Sine, 0 – 100 MHz Triangle, 0 – 12.5 MHz Square, 0 - 10 MHz +ve and -ve Ramp, 0 - 10 MHz
Resolution	0.1 Hz
Accuracy	As reference frequency oscillator
Total Harmonic Distortion	<0.1 %
Frequency Response (1 dB)	DC to 10 MHz

External Vector Modulation

Some parameters have improved performance if one of the AWG options (010 – 012) is fitted, as the AWG provides calibration signals to enhance the IQ modulation performance.

Carrier Frequency	50 MHz – 6 GHz	
Input Impedance	100 Ω differential	
Coupling	DC	
Input Voltage	± 0.707 Vpk on 'I or Q' or ± 0.5 Vpk 'I and Q' for calibrated output	
Offset Voltage Range	± 2 Vpk	
I and Q Bandwidth (3 dB) at RF Output	Carrier Frequency	Bandwidth
	<30 MHz	up to 20 MHz
	<46.875 MHz	20 MHz
	<93.75 MHz	30 MHz
	<187.5 MHz	80 MHz
	<375 MHz	100 MHz
	≥ 375 MHz	300 MHz
Residual Carrier Leak	-35 dBc typ.	
IQ Image Suppression	Tone frequency	
	100 kHz	-45 dBc typ.
	10 MHz	-40 dBc typ.
	30 MHz	-40 dBc typ.
	50 MHz	-40 dBc typ.
	75 MHz	-35 dBc typ.
Third order intermodulation distortion	2 tones at 0 dBm per tone	
	Tone spacing 25 kHz – 50 MHz	-50 dBc typ.

Internal Vector Modulation

The following specifications apply when using one of the internal AWG options (010-012)

<i>I and Q bandwidth (3 dB) at RF Output</i>	<table> <thead> <tr> <th>Carrier Frequency</th> <th>Bandwidth</th> </tr> </thead> <tbody> <tr> <td><30 MHz</td> <td>up to 20 MHz</td> </tr> <tr> <td><46.875 MHz</td> <td>20 MHz</td> </tr> <tr> <td><93.75 MHz</td> <td>30 MHz</td> </tr> <tr> <td><187.5 MHz</td> <td>80 MHz</td> </tr> <tr> <td><375 MHz</td> <td>100 MHz</td> </tr> <tr> <td>375 MHz</td> <td>300 MHz, 200 MHz with AWG</td> </tr> </tbody> </table>	Carrier Frequency	Bandwidth	<30 MHz	up to 20 MHz	<46.875 MHz	20 MHz	<93.75 MHz	30 MHz	<187.5 MHz	80 MHz	<375 MHz	100 MHz	375 MHz	300 MHz, 200 MHz with AWG
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<i>Residual Carrier Leak</i>	<p>-45 dBc typ.</p> <p>After IQ self-cal</p> <p>-55 dBc typ.</p>														
<i>IQ Image Suppression</i>	<p>After IQ Self Cal</p> <p>Tone Frequency</p> <table> <tbody> <tr> <td>100 kHz</td> <td>-55 dBc typ.</td> </tr> <tr> <td>10 MHz</td> <td>-50 dBc typ.</td> </tr> <tr> <td>30 MHz</td> <td>-46 dBc typ.</td> </tr> <tr> <td>50 MHz</td> <td>-43 dBc typ.</td> </tr> <tr> <td>75 MHz</td> <td>-40 dBc typ.</td> </tr> </tbody> </table>	100 kHz	-55 dBc typ.	10 MHz	-50 dBc typ.	30 MHz	-46 dBc typ.	50 MHz	-43 dBc typ.	75 MHz	-40 dBc typ.				
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Tone spacing 50 MHz - 150 MHz	-55 dBc typ.														
<i>Linearity</i>	-71 dBc typ. ACPR on WCDMA signals (downlink test model 1)														
<i>EVM</i>	<p>WCDMA signal 1% typ.</p> <p>GSM/EDGE signals 0.5% typ.</p> <p>IEEE 802.11 OFDM signals 1% typ.</p>														

Arbitrary Waveform Generator – (options 010 – 012)

<i>Channels</i>	4						
<i>Modes</i>	Single ended / differential						
<i>DAC Resolution</i>	16 bits						
<i>Sample Rate</i>	40 kHz – 250 MHz per channel						
<i>Latency (Digital I/O to analog outputs)</i>	TBD						
<i>Memory</i>	<table> <tbody> <tr> <td>512 MB, 128 Msamples</td> <td>(option 010)</td> </tr> <tr> <td>2 GB, 512 Msamples</td> <td>(option 011)</td> </tr> <tr> <td>4 GB, 1 Gsample</td> <td>(option 012)</td> </tr> </tbody> </table>	512 MB, 128 Msamples	(option 010)	2 GB, 512 Msamples	(option 011)	4 GB, 1 Gsample	(option 012)
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2 GB, 512 Msamples	(option 011)						
4 GB, 1 Gsample	(option 012)						
<i>Waveform Formats</i>	<p>IQ* 16-bit + no markers</p> <p>IQ* 15-bit + 2 markers</p> <p>IQ* 14-bit + 4 markers</p> <p>IQ* 13-bit + 6 markers</p>						

Frequency Response	
Bandwidth (-3 dB)	DC – 100 MHz
Pass Band Flatness	TBD typical to 40 MHz

Spectral Purity	
Spurious Free Dynamic Range	> 70 dB
SSB Phase Noise	< -130 dBc/Hz typ, 20 kHz offset, 100 MHz sine
Floor Noise (no output)	< -160 FS/Hz
Harmonics	2nd Harmonic < -70 dBc 3rd Harmonic < -65 dBc
Intermodulation Distortion	< -70 dBc

AWG Sequencer	
Sequencer Modes	Stepped / Sequenced
Number of Segments	1 to 65535
Segment Type	AWG file, CW (Mod Off) ¹ , RF Off ² ¹ When used in conjunction with List Mode
Number of AWG Files	1 to 65535
Number of Segment Repeats within a Sequence	1 to 65535

AWG Triggering	
AWG File Selection Time	AWG completion On – Seamless AWG completion Off – Defined by sample rate
Trigger Sources	Internal; Software AWG marker, List address, List strobe out, sequence start External; TTL, Digital I/O
Trigger Modes	Start only; Start & stop; Re-trigger
Start only; Start & stop; Re-trigger	Immediate / End of file
Immediate / End of file	+ve, -ve, ANY
AWG file play count	1 to 65535 or continuous
Trigger delay	0 to 17 s, resolution 4 ns

Sweep Facility

Provides a digital sweep of carrier frequency, RF level and modulation source in discrete steps.

Control of start, stop, number of steps and step time.

Sweep can be externally triggered from a rear panel BNC connector (TTL) for Start, Start/Stop and Step.

Modes	Continuous; single; externally triggered
Carrier sweep type	Linear, logarithmic
RF level step size	0.01 dB minimum
Maximum number of steps	65536
Marker "event" output	A TTL pulse will appear on the sweep marker output when specified parameter values have been reached. Up to 6 markers can be set.

List Mode Sweep Facility

Provides a table of carrier frequency, RF level values and AWG files.

Start address, stop address and dwell time can be controlled.

Can be externally triggered from a rear panel BNC connector (TTL).

Dwell time settings	10 us to 10 s
List size	Up to 65535 entries

Reference Frequency Oscillator

Type	OCXO
Frequency	10 MHz
Temperature stability (0 to 50C)	$< \pm 1 \times 10^{-8}$ typ.
Ageing rate	< 1 in 10^9 per day (< 0.001 ppm) < 1 in 10^7 per year (< 0.1 ppm)

Memory (80 GB Hard Disk)

Up to 500 full instrument setting stores

Each memory store can be given a unique name

Storage medium for all AWG files

Removable Hard Disk – (Option 005)

For use in secure areas, the removable hard disk may be extracted from the rear panel by releasing two screws.

The removable hard disk also contains the instrument's operating software.

Pulse Modulator/Generator (Option 004)

Pulse Modulator	
On/off ratio	> 80 dB
Rise/fall time	< 10 ns
Maximum PRF	10 MHz
Video Breakthrough	< 100 mV

Internal Pulse Generator	
Modes	Free-run; triggered; single pulse; double pulse; adjustable doublet; external trigger
PRF/pulse period	0.01 Hz-10 MHz/100 ns-100s
Width	10 ns-60 s
Delay	0-60 s
Double-pulse spacing	10 ns-60 s
Resolution (delay/width/period)	10 ns

Effect on RF level specification:

On instruments not fitted with option 003 (high power)
 Maximum specified RF level reduced to +7 dBm with pulse enabled
 Maximum specified RF level reduced to +10 dBm with pulse disabled

On instruments fitted with high power, option 003
 Maximum specified RF level reduced by +6 dBm with pulse enabled
 Maximum specified RF level reduced by +3 dBm with pulse disabled

GENERAL DATA

Remote Control	
Systems	GPIB (IEEE 488) Ethernet (TCP/IP)
GPIB (IEEE 488) Ethernet (TCP/IP) LXI class C compliant	SCPI
Interface functions	SH1; AH1; T6; L4; SR1; RL1; PPO; DC1; DT1; CO; E2

Recommended Calibration Cycle

24 months

Weight

<9 kg

Dimensions - H x W x D

177 mm (4U) x 222 mm x 490 mm, not including feet.

Height 195 mm inc. feet.

Instrument includes side strap handle and front tilt feet.

Instrument includes interlocking mechanism with modules mounted above and below, and to another S-Series instrument on either side.

FRONT PANEL CONNECTOR

RF Output	50 Ω N-type
4 x differential IQ inputs	I+, I-, Q+, Q-, 100 Ω differential BNC Damage levels: ± 4 V
2 x USB 2.0	Used with a memory stick for transferring memory stores, ARB waveforms or other files in or out of the instrument Mouse or keyboard input

REAR PANEL CONNECTORS

RF Output	50 Ω N-type (option 007)
Pulse Modulation Input (Option 004)	50 Ω BNC – TTL and CMOS compatible Damage levels: TBA
4 x USB 2.0	Used with a memory stick for transferring memory stores, ARB waveforms or other files in or out of the instrument Module plug & play connection
Sweep out	BNC – Generates 0 – 10 V when the generator is sweeping.
Event marker (Trig 1) Output	BNC - User selectable markers for frequency or level provide an indication when the specified parameter values have been reached. LVTTTL logic output levels. Damage levels: -5 / +10 V
Trigger / Pulse (Trig 1) input	BNC – Applying 0 V or a switch closure starts the sweep or steps from point to point on the sweep. LVTTTL logic input thresholds. Damage levels: -5 / +10 V
Reference frequency input	BNC- accepts 10 MHz at 200 mV to 2 V RMS into 50 Ω or 100 k Ω nominal.
Reference frequency output	BNC – 10 MHz at 2 V pk-pk into 50 Ω Damage levels: -0.5 / +3 V
LO input	50 Ω SMA +10 dBm ± 1 dB, 50 MHz to 6 GHz
LO output	50 Ω SMA +11 dBm ± 1 dB, 50 MHz to 6 GHz
Digital IO	Aurora interface
GPIB Interface	As described under Remote Control
LAN Interface	As described under Remote Control

ENVIRONMENTAL

Rated Range of Use	
Temperature	0 to 50 °C
Humidity	Up to 93% at 40 °C
Altitude	Up to 3050 m
Conditions of Storage and Transport	
Temperature	-40 to +71 °C
Humidity	Up to 95% at 40 °C
Altitude	Up to 4600 m
EMC	EN 61326-1:2006, Emissions Class B, Immunity Table 1 – Performance Criteria B
Safety	EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control and laboratory use-Part 1, General requirements.
Mechanical	MIL-PRF-28800F Class 3

POWER REQUIREMENTS

AC Supply	100 – 240 V ~ (Limit 90 - 264 V) 50 - 60 Hz ~ (Limit 45 - 66 Hz) 125 VA max.
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USER INTERFACE

Screen size	8.5 inch, 16:9 aspect ratio, colour touch screen
Keys / switches	Power on / standby Home key

Supports Remote Desktop, VNC and Webserver.

ORDERING INFORMATION

SGD-3	100 kHz to 3 GHz digital RF signal generator
SGD-6	100 kHz to 6 GHz digital RF signal generator
Option 002	Reverse Power Protection (SGD-3 only)
Option 003	High Power (+20 dBm)
Option 004	Fast Pulse Modulation
Option 005	Removable Storage Disk
Option 007	Rear panel connectors

Arbitrary Waveform Generator options (Each AWG option includes IQCreator with PSK, QAM, multi-carrier, tones enabled):

Option 010	AWG with 128 MSamples memory
Option 011	AWG with 512 MSamples memory
Option 012	AWG with 1 GSample memory

IQCreator waveform creation options:

Option 101	Waveform creation package- Basic (options 111 to 116)
Option 102	Waveform creation package- Advanced (options 101, 117 and 118)
Option 111	3GPP (GSM, EDGE, EGPRS, EGPRS2, WCDMA, HSPA, HSPA+)
Option 112	3GPP2 (1595, CDMA2000, 1xEVDO (0+A))
Option 113	TD-SCDMA (3GPP TDD-LCR)
Option 114	Bluetooth V.11 + V.21 + EDR + Version 4
Option 115	WLAN (a, b, g, n)
Option 116	WiMAX
Option 117	LTE FDD Rel. 8
Option 118	LTE TDD Rel. 8
Option 150	CDMA/OFDM licence

Extended Warranty Options

Option 203	3 year warranty
Option 204	4 year warranty
Option 205	5 year warranty

Supplied Accessories

AC supply lead

Getting Started manual

CD-ROM containing operating manual

CD-ROM containing factory test results

Optional Accessories

47000/132	Operating manual (paper format)
46880/124	Service manual supporting repair to module level (includes semi-automatic adjustment software)
43129/189	1.5 m GPIB lead
46662/836	Soft carry case
46662/835	Hard transit case
23448/030	USB Type A - Type B cable, 1.5 m
46885/505	Single instrument rack mounting kit (front panel brackets)
46885/506	Double instrument rack mounting kit (front panel brackets)
43139/042	RF double screened connector cable 50 Ω , 1.5 m, BNC (m)
54311/095	RF double screened connector cable 50 Ω , 1 m, type N connectors
54311/092	Coaxial adapter N male to BNC female
59999/163	Precision coaxial adapter N male to SMA female
TBA	2 x 50 Ω BNC terminations

Complementary S-Series Modules (see separate datasheets)

SCO-6	10 MHz - 6 GHz Combiner module
SPA-6	10 MHz - 6 GHz Power Amplifier module

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

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