R&S®SGS100A
SGMA RF Source
Compact – fast – reliable

ROHDE&SCHWARZ

Test & Measurement

Product Brochure | 02.00

R&S®SGS100A SGMA RF Source

At a glance

The R&S®SGS100A is an RF source designed to meet the requirements of automated test systems. It is available as a CW source or as a vector signal generator with an integrated I/Q modulator. With its frequency range of up to 12.75 GHz, the vector signal generation version covers the essential digital signals. The CW version can be used as a flexible local oscillator as well as for interference testing against mobile radio standards.

The very compact dimensions of only one height unit and ½ 19" rack width and the extremely fast frequency and level setting times are two features that demonstrate how consistently the R&S®SGS100A has been designed for use in systems. It can also be used in all applications that require either multiple RF signal sources, such as beamforming applications, or where an extremely compact RF generator is needed, e.g. an operating source in customer systems.

Though compact, the R&S®SGS100A provides uncompromising signal purity and level accuracy. It offers performance usually available only from high-end instruments, including high output power, level repeatability and modulation bandwidth. During development, particular emphasis was placed on the total cost of ownership. A long calibration interval, excellent serviceability and options for expansion maximize the availability of the RF source.

Since the RF source is typically remote-controlled, the front panel of the R&S®SGS100A has a minimalist design. However, it offers status LEDs as well as all of the keys necessary for controlling generator operation. When used as a benchtop instrument, the R&S®SGS100A is operated manually using the R&S®SGMA-GUI software included with the instrument.

Key facts

- Smallest fully integrated vector signal generator on the market, space-saving design for system integration
- Enables high throughput due to very short frequency and level setting times of typ. 280 µs via PCIe interface
- Excellent RF performance in a compact format
- Maximum output level of typ. +22 dBm for compensating losses in the setup
- Closed ALC loop for CW and I/Q modes for highest level repeatability
- High output frequency of up to 12.75 GHz for broad applicability
- Wear-free electronic attenuator for high reliability
- Very cost-efficient with low initial costs and low cost of ownership

R&S®SGS100A SGMA RF Source

Benefits and key features

Dedicated ATE signal source

- Smallest integrated signal generator: 1 HU, ½ 19" for minimized required space in the test system
- Very fast setting times via PCIe interface for high throughput
- Maximum level of typ. +22 dBm (with R&S®SGS-B26 electronic step attenuator option) for compensating losses in the setup
- Optional wear-free electronic attenuator up to 12.75 GHz for reliable operation

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High performance in the right package

- Very high level linearity and repeatability for constant test conditions
- Low SSB phase noise of typ. –130 dBc (20 kHz carrier offset, f = 1 GHz, 1 Hz measurement bandwidth)
- Optional high-stability reference oscillator for easy integration of a standard in the test system

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Minimized total cost of ownership

- Attractive initial cost
- Straightforward modular design for short repair times, minimizing test system downtime
- Long calibration interval for minimized service costs

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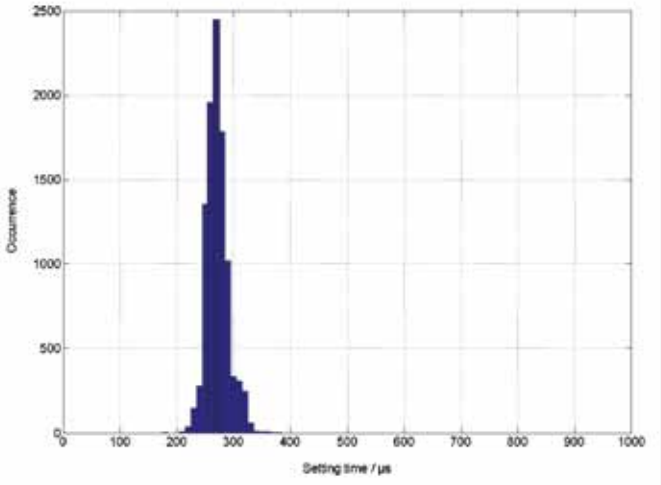
R&S®SGS100A model overview

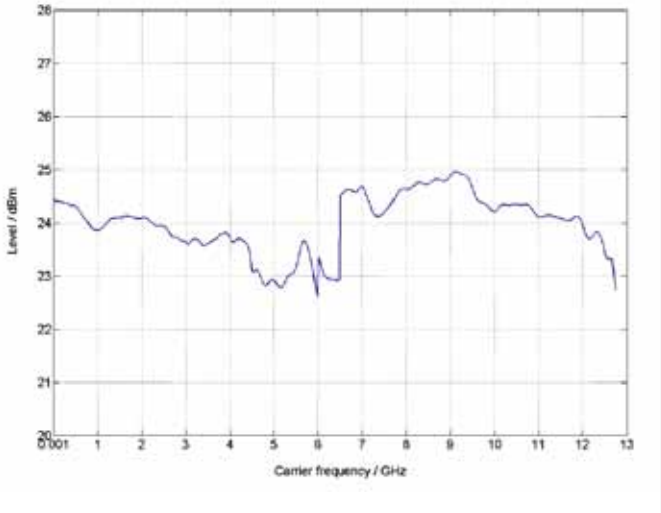
CW source as local oscillator		Vector signal generator for generating digital signals with an external baseband signal	
1 MHz to 6 GHz	**1 MHz to 12.75 GHz**	**80 MHz to 6 GHz**	**80 MHz to 12.75 GHz**
with R&S®SGS-B106	with R&S®SGS-B106 and R&S®SGS-B112	with R&S®SGS-B106V	with R&S®SGS-B106V and R&S®SGS-B112V

Dedicated ATE signal source

Histogram of 10 000 frequency setting times measured via PCIe interface, Setting Characteristic: AUTO



Maximum available level for a CW signal, Setting Characteristic: AUTO, with R&S®SGS-B26 electronic step attenuator option (measured)



Smallest integrated signal generator: 1 HU, ½ 19" for minimized required space in the test system

A look at the R&S®SGS100A confirms that it has been designed specifically for use in an automated environment. The small size of only one height unit and ½ 19" rack width saves space in the test system, and also reduces costs. Four RF paths can now be placed in the space previously needed for one RF path on average – a clear space management advantage. This makes the R&S®SGS100A ideal for ATE applications, even where multiple RF sources are required simultaneously, such as when testing phased array antenna systems. Low power consumption and the corresponding low heat dissipation make it possible to place the RF generators close to one another. The connectors are arranged as standard on the back of the instrument to allow simple integration. Status LEDs on the front panel clearly indicate the instrument operating status.

Very fast setting times via PCIe interface for high throughput

Production applications require speed during testing to ensure high throughput. The R&S®SGS100A meets this requirements in several ways. Its internal architecture and the software are designed for top speed. In addition, the PCIe interface transmits the remote control commands at maximum speed. Special commands (based on a Rohde&Schwarz driver) can be used to control the generator directly. This eliminates the need for a time-consuming translation of high-level commands in the instrument, again increasing the speed. With these optimizations, the R&S®SGS100A is able to achieve frequency and level setting times of typ. 280 µs. This was previously possible only by using vector signal generators with List modes, but not when issuing individual remote control commands directly. The test sequence can be adapted flexibly in the software without having to renew the frequency lists and the level lists.

Maximum level of typ. +22 dBm (with R&S®SGS-B26 electronic step attenuator option) for compensating losses in the setup

In a complex test system, typical level losses of several dB occur between the signal generator and the DUT. These result from the cable loss of long cables and from the use of switching matrices and filters. With its output level of typ. +22 dBm, the R&S®SGS100A provides sufficient margin to compensate for such losses. This eliminates the need for additional amplifiers that would not only increase the cost and take up more space, but also negatively affect signal purity, including wideband noise, level stability and impedance matching.

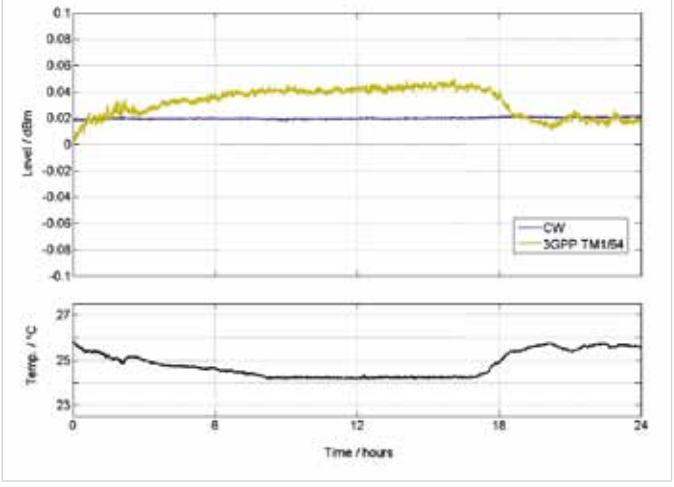
Optional wear-free electronic attenuator up to 12.75 GHz for reliable operation

The attenuator (R&S®SGS-B26 option) up to 12.75 GHz is fully electronic and wear-free. This allows continuous, long-term use in a test system, even when there is very frequent level switching, and, as a result, also minimizes service costs.

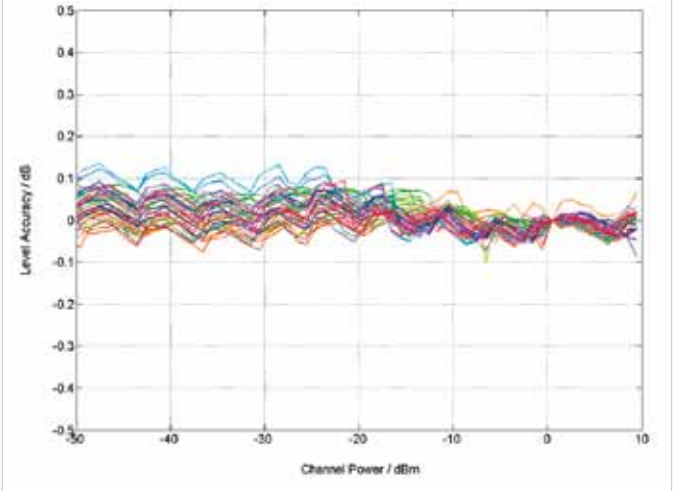
The R&S®SGS100A in a test system.

High performance in the right package

Level repeatability for a 3GPP TM1/64 signal with a crest factor of 10.55 dB, at 5 dBm (measured)



Level linearity for a 3GPP TM1/64 signal with a crest factor of 10.55 dB; the different colors are for different RF frequencies (measured)



Very high level linearity and repeatability for constant test conditions

The R&S®SGS100A, designed for speed and compactness, offers performance previously available only from high-end benchtop instruments. One example is the maximum output power of typ. +22 dBm with an electronic attenuator that can be used to compensate for losses in the system.

But maximum level isn't everything. Especially in a calibrated test system level repeatability and linearity are essential for a generator. High level repeatability ensures consistent test conditions and makes it possible to reduce tolerances when defining test limits. With narrower test limits, production yield increases. Level linearity is particularly important when testing amplifier chips to exactly determine their compression point across level. This requires precise mapping of even very small level steps.

Low SSB phase noise of typ. –130 dBc (20 kHz carrier offset, f = 1 GHz, 1 Hz measurement bandwidth)

An important characteristic for the signal quality of RF signal generators is SSB phase noise. This value is important for CW applications, for example when searching for a pure local oscillator, and also for digital modulations. SSB phase noise directly influences the error vector magnitude (EVM) of digital signals, a parameter that is significant for advanced OFDM-based systems such as LTE.

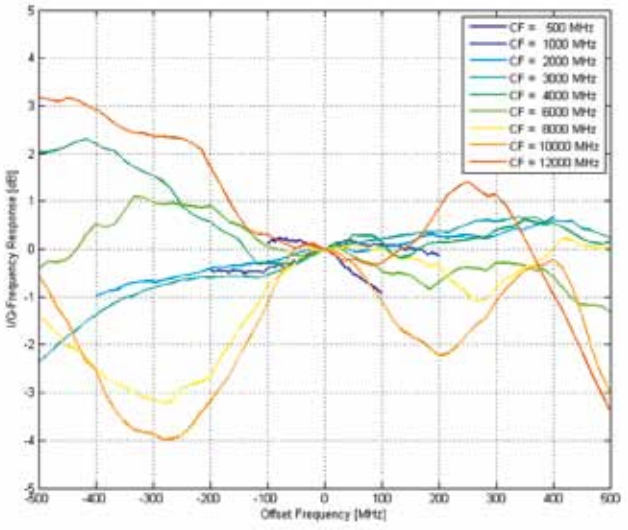
For interference and intermodulation tests, very low non-harmonics are an indispensable characteristic for the test source. The R&S®SGS100A is ahead of the game here as well, offering excellent values otherwise seen only with high-end instruments: At an output frequency lower than < 1.5 GHz, the R&S®SGS100A achieves < –76 dBc (offset > 10 kHz).

Optional high-stability reference oscillator for easy integration of a standard in the test system

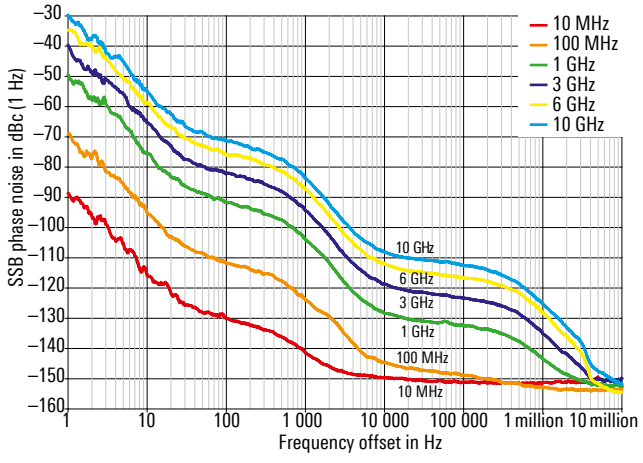
All of the test instruments in a system are typically linked via a 10 MHz reference so that their frequencies can be synchronized. The R&S®SGS100A can be used for this purpose when equipped with an optional, highly stable 10 MHz reference source. In addition, the R&S®SGS100A uses external reference signals of 100 MHz and 1 GHz for synchronization. The higher frequency ensures a more stable instrument interconnection, not only with respect to frequency but also with respect to phase stability. When running tests (for example, beamforming applications) that require absolutely phase-locked connections between multiple signal sources, the R&S®SGS100A can also be equipped with the R&S®SGS-K90 option that offers a coherent LO input and output.

With its very high I/Q modulation bandwidth, the R&S®SGS100A is not only flexible, it is also a secure investment. It is capable of generating signals with an RF bandwidth of 1 GHz above a 2.5 GHz carrier frequency. This covers all modern wideband communications standards. This bandwidth not only allows predistortion, it also makes it possible to obtain an exact description of digitally generated pulses with steep pulse edges for aerospace and defense applications.

Frequency response of the I/Q modulator (measured)



SSB phase noise with R&S®SGS-B1 internal OCXO option (measured)



Minimized total cost of ownership

Attractive initial cost

The total cost of ownership includes not only attractive initial costs, but also the service and calibration costs. The R&S®SGS100A is designed for optimal stability and minimal service effort. This is an important factor in ensuring maximum availability in the system. The low power consumption of 70 W has several benefits: The instrument temperature is decreased, which reduces component wear and tear and minimizes heat dissipation that would require venting throughout the system. The low power consumption translates into low operating costs.

Straightforward modular design for short repair times, minimizing test system downtime

If a repair is needed, the internal selftest identifies the affected component and minimizes troubleshooting time and effort. The low number of modules makes service even faster and easier.

Long calibration interval for minimized service costs

Another factor is the long-term stability of the generator: The longer the instrument operates without drift, the longer the calibration interval that can be selected. This is important because each time an instrument is calibrated, it must be removed from the test setup and sent to a calibration lab. The recommended calibration interval is three years, ensuring long availability.

Inside view.

Connectivity

All of the connectors are arranged as standard on the back of the instrument to allow simple integration into a test system. SMA ports provide functional connections, including RF output and analog I/Q inputs. The typically small cable diameters of this space-saving design facilitate cabling throughout the system.

Though small in size, the R&S®SGS100A provides multiple remote control options. PCIe is recommended for maximum setting speed together with a corresponding instrument driver from Rohde&Schwarz, which is available for Windows and Linux. The two additional remote control interfaces, i.e. LAN (Gigabit Ethernet) and USB 2.0, offer high speed to ensure short test times and high throughput.

The R&S®SGMA-GUI PC software, which comes standard with the instrument, is used for manual operation. It can control up to twelve R&S®SGS100A simultaneously, and also provides access to all instrument functions and settings via all interfaces.

The R&S®SGS100A with the R&S®SGMA-GUI PC software for controlling up to twelve instruments.

Ports on the rear panel.

Specifications in brief

Specifications in brief		
Frequency		
Frequency range	with the R&S®SGS-B106 option	1 MHz to 6 GHz
	with the R&S®SGS-B106 and R&S®SGS-B112 options	1 MHz to 12.75 GHz
	with the R&S®SGS-B106V option	80 MHz to 6 GHz (I/Q mode) 1 MHz to 6 GHz (CW mode)
	with the R&S®SGS-B106V and R&S®SGS-B112V options	80 MHz to 12.75 GHz (I/Q mode) 1 MHz to 12.75 GHz (CW mode)
Setting time	with PCIe remote control	< 500 µs
Input frequency for external reference		10 MHz, 100 MHz, 1000 MHz
Level		
Specified level range		–10 dBm to +15 dBm (PEP) [1]
	with the R&S®SGS-B26 option	–120 dBm to +15 dBm (PEP) [1]
Level error	Setting Characteristic: AUTO; temperature range from +18 °C to +33 °C	
	1 MHz ≤ f ≤ 3 GHz	< 0.5 dB
	3 GHz < f ≤ 12.75 GHz	< 0.9 dB
Output impedance VSWR in 50 Ω system	in full frequency range, Setting Characteristic: AUTO	< 2.0
	in full frequency range, with the R&S®SGS-B26 option	< 1.8
Setting time	with PCIe remote control, Setting Characteristic: AUTO	< 500 µs
Spectral purity		
Harmonics	level ≤ 8 dBm, CW, I/Q wideband OFF	< –30 dBc
Nonharmonics	level > –10 dBm [2], offset > 10 kHz from carrier, f ≤ 1.5 GHz	< –76 dBc
Subharmonics	level > –10 dBm [2], f ≤ 3 GHz	< –76 dBc
Wideband noise	1 MHz ≤ f ≤ 6 GHz and 10 MHz carrier offset, 6 GHz < f ≤ 12.75 GHz and 30 MHz carrier offset, AUTO mode, level > 5 dBm, 1 Hz measurement bandwidth, CW	< –145 dBc
SSB phase noise	20 kHz carrier offset, 1 Hz measurement bandwidth	
	f = 1 GHz	< –126 dBc, typ. –130 dBc
	f = 10 GHz	< –106 dBc, typ. –110 dBc
I/Q modulation		
I/Q modulator bandwidth (RF)	100 MHz < f ≤ 2.5 GHz, I/Q wideband	40 % of carrier frequency
	2.5 GHz < f ≤ 12.25 GHz, I/Q wideband	1 GHz
Error vector	measured with 16QAM, filter root cosine α = 0.5, 10 kHz symbol rate	
	f > 80 MHz, RMS	< (0.4 % + 0.2 % × f/GHz)
ACLR	WCDMA 3GPP FDD, TM 1/64	> 67 dB, 69.5 dB (meas.)
Baseband bypass mode		
Frequency range		1 MHz ≤ f ≤ 80 MHz
Specified level range		–5 dBm to +15 dBm
	with the R&S®SGS-B26 option	–120 dBm to +15 dBm
Remote control	using Rohde&Schwarz instrument driver	PCIe (single lane)
	using SCPI 1999.5 or compatible command sets	Ethernet (TCP/IP) 10/100/1000BaseT
	using SCPI 1999.5 or compatible command sets	USB 2.0
General data		
Power consumption		70 W (meas.)
Dimensions	W × H × D	250 mm × 52.5 mm × 401 mm (9.84 in × 2.07 in × 15.79 in) 1 HU, ½ 19" rack width
Weight	when fully equipped	4.0 kg (8.82 lb)

[1] PEP = peak envelope power.
[2] > 0 dBm for instruments without the R&S®SGS-B26 electronic step attenuator.

Ordering information

Designation	Type	Order No.
SGMA RF Source [1]	R&S®SGS100A	1416.0505.02
Including power cable, Quick Start Guide and CD-ROM (with R&S®SGMA-GUI, operating and service manual)		
Options		
1 MHz to 6 GHz, CW (no modulation)	R&S®SGS-B106	1416.2308.02
1 MHz to 6 GHz, I/Q (with vector modulation)	R&S®SGS-B106V	1416.2350.02
Frequency Extension to 12.75 GHz, CW [2]	R&S®SGS-B112	1416.1553.02
Frequency Extension to 12.75 GHz, I/Q (with vector modulation) [3]	R&S®SGS-B112V	1416.1576.02
Electronic Step Attenuator	R&S®SGS-B26	1416.1353.02
Reference Oscillator OCXO	R&S®SGS-B1	1416.2408.02
Phase Coherent Input/Output	R&S®SGS-K90	1416.2608.02
Recommended extras		
19" Rack Adapter (for two 1 HU instruments next to each other), suitable for installation of two Rohde&Schwarz SGMA instruments	R&S®ZZA-KN20	1175.3191.00
19" Rack Adapter (for one instrument and spacing module)	R&S®ZZA-KN21	1175.3204.00
Accessories		
Documentation of Calibration Values	R&S®DCV-2	0240.2193.18

[1] The base unit must be ordered together with an R&S®SGS-B106 or R&S®SGS-B106V frequency option.
[2] Requires R&S®SGS-B106.
[3] Requires R&S®SGS-B106V.

Service options		
Extended Warranty, one year	R&S®WE1SGS100A	Please contact your local Rohde&Schwarz sales office.
Extended Warranty, two years	R&S®WE2SGS100A	
Extended Warranty, three years	R&S®WE3SGS100A	
Extended Warranty, four years	R&S®WE4SGS100A	
Extended Warranty with Calibration Coverage, one year	R&S®CW1SGS100A	
Extended Warranty with Calibration Coverage, two years	R&S®CW2SGS100A	
Extended Warranty with Calibration Coverage, three years	R&S®CW3SGS100A	
Extended Warranty with Calibration Coverage, four years	R&S®CW4SGS100A	

For data sheet, see PD 5214.5703.22 and www.rohde-schwarz.com

Service you can rely on

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

About Rohde&Schwarz

Rohde&Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde&Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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