# R&S®SGT100A
# SGMA Vector RF Source
# Specifications


ROHDE&SCHWARZ

Test&Measurement

Data Sheet | 05.00

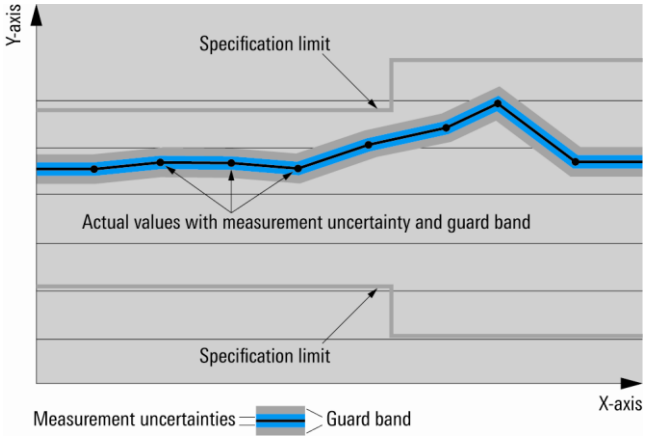
# CONTENTS

# Definitions

**General**
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

**Specifications with limits**
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.




**Specifications without limits**
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

**Typical data (typ.)**
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

**Nominal values (nom.)**
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

**Measured values (meas.)**
Characterize expected product performance by means of measurement results gained from individual samples.

**Uncertainties**
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: “parameter: value”.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

# Key features

**Dedicated ATE digital source**

- I/Q modulated RF source in the frequency range from 1 MHz to 3 GHz or 6 GHz
- Very fast frequency and level setting times via PCIe and Ethernet interface
- Maximum level of +22 dBm (typ.)
- Wear-free electronic attenuator
- Integrated ARB with up to 1 Gsample memory depth and 240 MHz RF bandwidth
- External software (R&S®SGMA GUI) for remote control of multiple instruments
- Field-upgradeable

**Compact, space-saving solution**

- Smallest signal generator in its class: 1 HU, ½ × 19"
- Lightweight

**High performance at an attractive price**

- Low SSB phase noise of typ. –133 dBc (measured, 20 kHz carrier offset, f = 1 GHz, 1 Hz measurement bandwidth)
- Wideband noise of < –145 dBc (CW)
- Nonharmonics of < –76 dBc (> 10 kHz carrier offset, f ≤ 1500 MHz, CW)
- Very high level accuracy and repeatability
- Optional pulse modulation capability and internal pulse generator
- Optional high-stability reference oscillator
- Optional coherent LO input/output

**Minimized total cost of ownership**

- Attractive initial cost
- Three-year calibration interval
- Simplified error diagnostics through built-in selftests

# Specifications

## RF performance

### Frequency

| | | |
|---|---|---|
| Frequency range | CW mode | 1 MHz to 3 GHz |
| | I/Q mode, internal baseband | 1 MHz to 3 GHz |
| | I/Q mode, external analog | 80 MHz to 3 GHz |
| | with R&S®SGT-KB106 option | |
| | CW mode | 1 MHz to 6 GHz |
| | I/Q mode, internal baseband | 1 MHz to 6 GHz |
| | I/Q mode, external analog | 80 MHz to 6 GHz |
| Resolution of setting | | 0.001 Hz |
| Resolution of synthesis | f = 1 GHz | 0.174 µHz (nom.) |
| Setting time<br>(measured from command at instrument to frequency settled within specified range) | to within < $2 \times 10^{-7}$ for f > 500 MHz or < 100 Hz for f ≤ 500 MHz<br>with PCIe or Ethernet (fast socket) remote control | |
| | arbitrary frequency change | < 500 µs |
| | baseband frequency offset change | < 150 µs |
| Resolution of phase offset setting | | 0.1° |

### Reference frequency

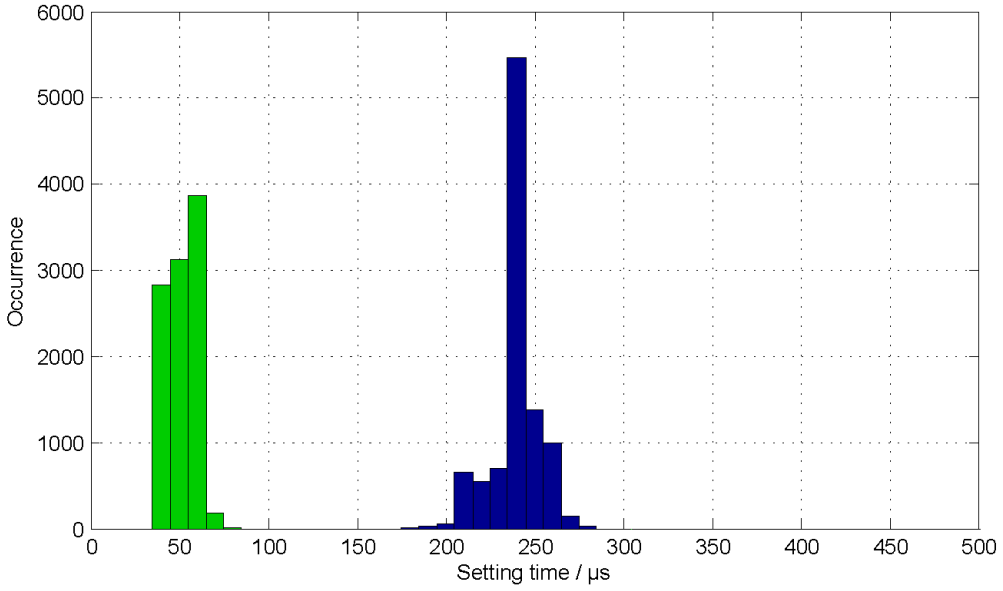
| | | |
|---|---|---|
| Frequency error | at time of calibration in production | < $1 \times 10^{-7}$ |
| | with R&S®SGT-B1 option | < $1 \times 10^{-8}$ |
| Aging<br>(after 30 days of uninterrupted operation) | | < $1 \times 10^{-6}$/year |
| | with R&S®SGT-B1 option | < $1 \times 10^{-9}$/day, < $1 \times 10^{-7}$/year |
| Temperature effect (0 °C to +50 °C) | | < $2 \times 10^{-6}$ |
| | with R&S®SGT-B1 option | < $1 \times 10^{-7}$ |
| Warm-up time | to nominal thermostat temperature<br>(with R&S®SGT-B1 option only) | ≤ 10 min |
| **Reference frequency output** | | |
| Connector type | REF/LO OUT on rear panel | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| Output frequency | sine wave | |
| | instrument set to internal reference | 10 MHz, 1000 MHz |
| | instrument set to external reference | applied external reference input frequency or 1000 MHz |
| Output level | | +6 dBm to +12 dBm; 9 dBm (typ.) |
| Source impedance | | 50 Ω (nom.) |
| **Reference frequency input** | | |
| Connector type | REF/LO IN on rear panel | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| Input frequency | | 10 MHz, 100 MHz, 1000 MHz |
| Frequency locking range | | ±10 × $10^{-6}$ |
| Input level range | | 0 dBm to +16 dBm |
| Input impedance | | 50 Ω (nom.) |

## Level

**Setting characteristic: auto –** The step attenuator is switched over automatically. The output level is specified over the full range from –120 dBm to +17 dBm.

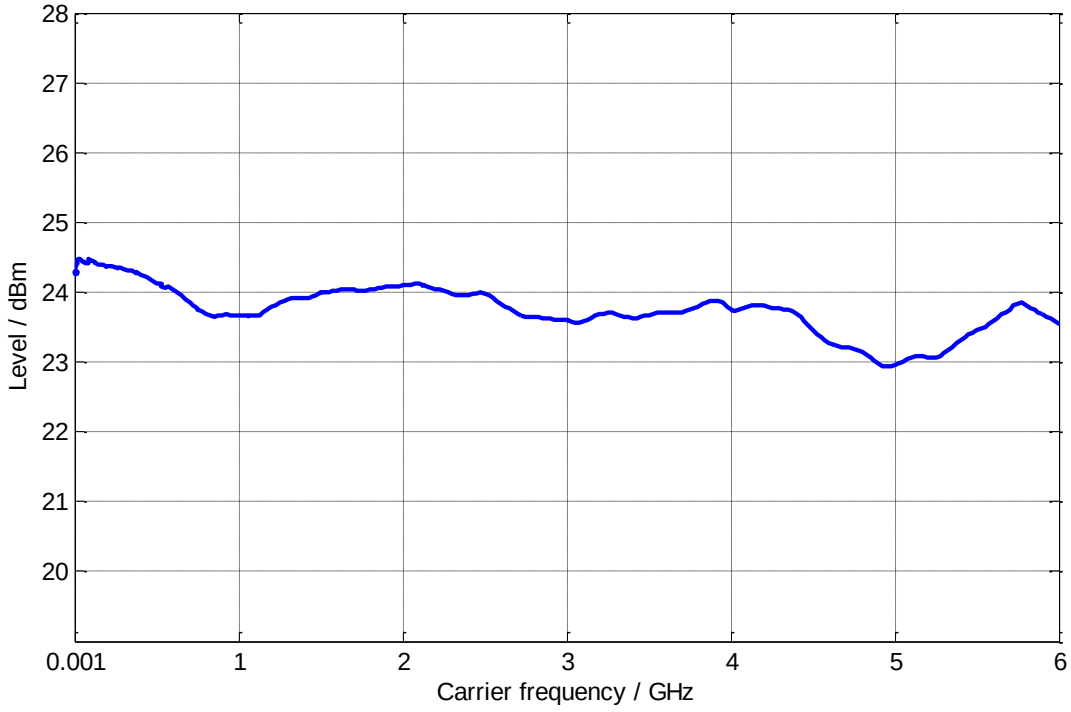
**Setting characteristic: uninterrupted level setting –** The level is set without changing the step attenuator. The step attenuator is fixed to the current setting. Level changes are performed without interruption. The maximum interruption-free setting range is limited. If this range is exceeded, the spectral purity of the output signal decreases.

| | | |
|---|---|---|
| Setting range | | –120 dBm to +25 dBm |
| Specified level range | | –120 dBm to +17 dBm (PEP) [1] |
| Resolution of setting | | 0.01 dB |
| Level error | setting characteristic: auto, temperature range from +18 °C to +33 °C, CW and I/Q (full-scale) | |
| | 1 MHz ≤ f ≤ 3 GHz, level ≤ 15 dBm | < 0.5 dB |
| | 1 MHz ≤ f ≤ 3 GHz, 15 dBm < level ≤ 17 dBm | < 0.7 dB |
| | 3 GHz < f ≤ 6 GHz | < 0.9 dB |
| Additional level error for pulse modulation | pulse width ≥ 100 ns | < 0.3 dB (meas.) |
| Output impedance VSWR in 50 Ω system | in full frequency range, setting characteristic: auto | < 1.8 |
| Setting time (measured from command at instrument to amplitude settled within specified range) | to < 0.1 dB deviation from final value, setting characteristic: auto, with PCIe or Ethernet (fast socket) remote control | |
| | arbitrary level change | < 500 µs |
| | digital attenuation (0 dB to –80 dB) | < 100 µs |
| Interruption-free level setting range | setting characteristic: uninterrupted level setting | 0 dB to +20 dB |
| Reverse power from 50 Ω | maximum permissible RF power in output | 0.5 W |
| Maximum permissible DC voltage | at RF power connector | 35 V |

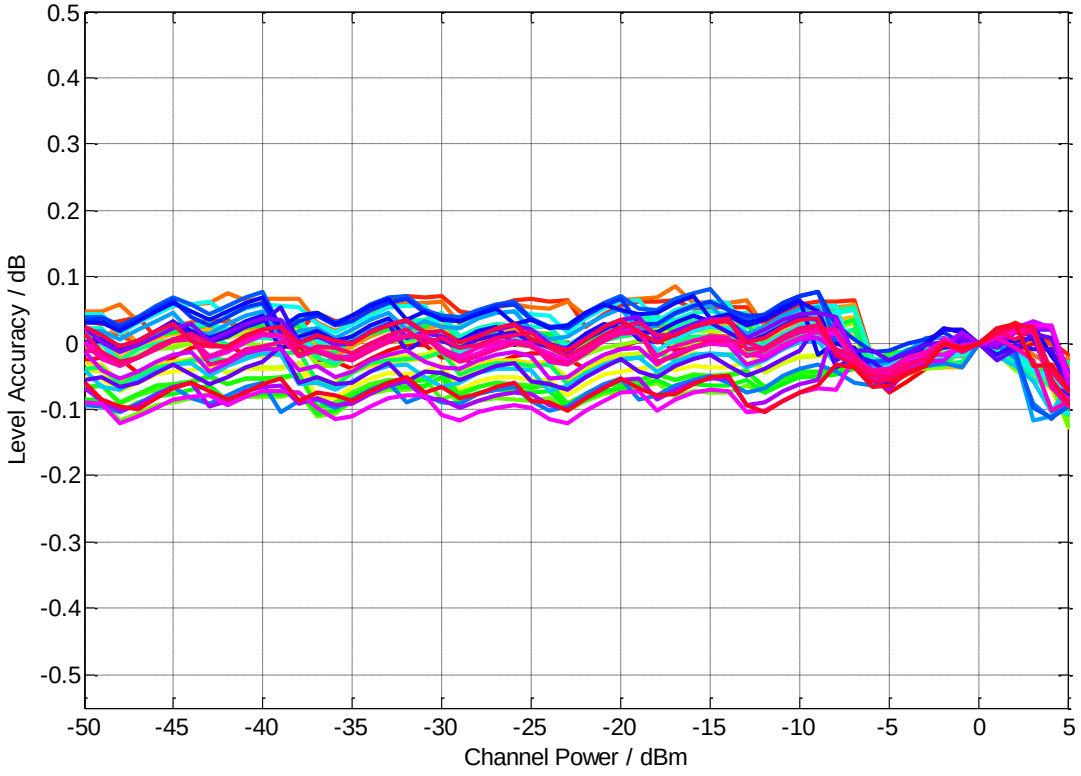



*Histogram of level setting times measured via PCIe/Ethernet interface, I/Q modulation from internal baseband, setting characteristic: auto. (green: with digital attenuation, blue: with arbitrary level setting)*

[1] PEP = peak envelope power.



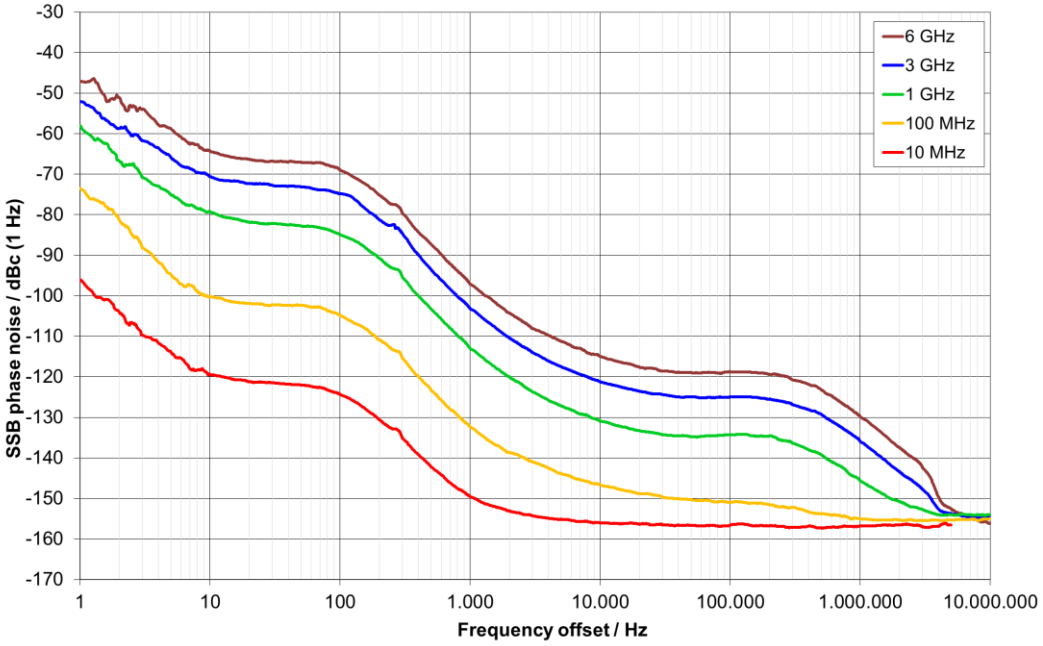

*Maximum available level in CW mode (without R&S®SGT-B88 option), setting characteristic: auto (meas.).*




*Level linearity for internally generated LTE uplink signal at various test frequencies (meas.).*

## Spectral purity

| | | |
|---|---|---|
| Harmonics | level ≤ 8 dBm, CW, I/Q wideband off | < –30 dBc |
| Nonharmonics | level > –10 dBm, offset > 10 kHz from carrier | |
| | f ≤ 1500 MHz | < –76 dBc |
| | 1500 MHz < f ≤ 3000 MHz | < –70 dBc |
| | 3000 MHz < f ≤ 6000 MHz | < –64 dBc |
| Subharmonics | level > –10 dBm | |
| | f ≤ 3000 MHz | < –76 dBc |
| | 3000 MHz < f ≤ 6000 MHz | < –68 dBc |
| Wideband noise | 1 MHz ≤ f ≤ 6 GHz,<br>10 MHz carrier offset, level > 5 dBm,<br>setting characteristic: auto,<br>1 Hz measurement bandwidth, CW | < –145 dBc |
| | 1 MHz ≤ f ≤ 6 GHz,<br>10 MHz carrier offset, level > 5 dBm,<br>setting characteristic: auto,<br>1 Hz measurement bandwidth, I/Q | < –135 dBc |
| SSB phase noise | 20 kHz carrier offset, 1 Hz measurement bandwidth | |
| | f = 1 GHz | < –126 dBc; –133 dBc (meas.) |
| | f = 2 GHz | < –120 dBc; –127 dBc (meas.) |
| | f = 6 GHz | < –110 dBc; –117 dBc (meas.) |




*SSB phase noise with the R&S®SGT-B1 internal OCXO option (meas.).*

### Phase coherence (R&S®SGT-K90 option)

The R&S®SGT-K90 option provides phase-coherent RF outputs for two or more instruments. This operating mode supports carrier frequencies greater than 80 MHz (CW, external analog I/Q) or greater than 100 MHz (internal baseband I/Q).

| | | |
|---|---|---|
| LO coupling modes | This mode corresponds to internal LO operation. The REF/LO OUT connector can provide the internal LO oscillator signal to enable phase-coherent coupling on other instruments. | internal |
| | This mode corresponds to external LO operation at the REF/LO IN connector. The REF/LO OUT connector can provide the external LO oscillator signal to enable phase-coherent coupling on additional instruments. | external |
| REF/LO OUT states | The active local oscillator signal can be routed to the REF/LO OUT connector (in order to couple two or more instruments). | REF/LO/OFF |
| Phase drift over temperature | drift of RF signal phase difference between two LO coupled R&S®SGT100A instruments when changing ambient temperature by +1 °C, f = 6 GHz, level = +10 dBm | 0.4° (meas.) |

| | | |
|---|---|---|
| **Input of phase coherence signal** | | |
| Connector type | REF/LO IN on rear panel | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| Input impedance | | 50 Ω (nom.) |
| Input level range of external local oscillator signal | | 7 dBm to 13 dBm |
| Frequency range of external local oscillator signal | CW and external analog I/Q | 80 MHz to 6 GHz |
| | internal baseband I/Q | 100 MHz to 6 GHz |
| **Output of phase coherence signal** | | |
| Connector type | REF/LO OUT on rear panel | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| Output impedance | | 50 Ω (nom.) |
| Output level range of internal local oscillator signal | | 7 dBm to 13 dBm |
| Frequency range of internal local oscillator signal | CW and external analog I/Q | 80 MHz to 6 GHz |
| | internal baseband I/Q | 100 MHz to 6 GHz |

## Simultaneous modulation

| | Pulse modulation | I/Q modulation, external analog | I/Q modulation, f > 100 MHz, internal baseband |
|---|---|---|---|
| Pulse modulation | | ● | ● |
| I/Q modulation, external analog | ● | | |
| I/Q modulation, f > 100 MHz, internal baseband | ● | | |

● = compatible

# Pulse modulation (R&S®SGT-K22 option)

The R&S®SGT-K22 option provides pulse modulation capabilities. The pulse modulator can be controlled by an internal pulse generator (comes with R&S®SGT-K22) or by an external pulse signal.

| | | |
|---|---|---|
| Modulation source | | external, internal |
| On/off ratio | | > 80 dB |
| Rise/fall time | 10 % to 90 % of RF amplitude | < 20 ns |
| External pulse modulation delay | | 45 ns (meas.) |
| Pulse repetition frequency | | 0 Hz to 10 MHz |
| Video feedthrough | level < 10 dBm | < 10 % of RF |
| Pulse overshoot | f ≥ 500 MHz | < 10 % |

## Input for external pulse modulation

| | | |
|---|---|---|
| Connector type | USER2 on rear panel | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| Input impedance | selectable | 10 kΩ or 50 Ω (nom.) |
| Threshold voltage | | 1 V (nom.) |
| Input damage voltage | | ±5 V |
| Input polarity | selectable | normal, inverse |

## Internal pulse generator

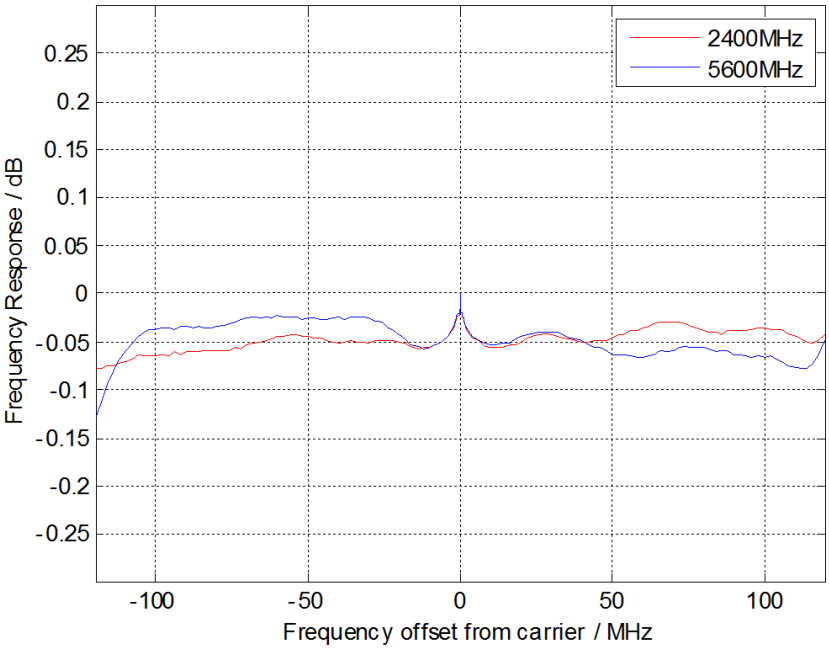
| | | |
|---|---|---|
| Pulse mode | | single pulse, double pulse |
| Trigger mode | free run, internally triggered | auto |
| | | externally triggered |
| | | externally gated |
| Active trigger edge | | positive or negative |
| Pulse period | | |
| Setting range | | 100 ns to 100 s |
| Setting resolution | | 10 ns |
| Pulse width | | |
| Setting range | pulse widths of double pulses can be set independently. | 20 ns to 100 s |
| Setting resolution | | 10 ns |
| Pulse delay | | |
| Setting range | with external trigger | 0 s to 100 s |
| Setting resolution | with external trigger | 10 ns |
| Double pulse delay | | |
| Setting range | | 40 ns to 100 s |
| Setting resolution | | 10 ns |
| External trigger delay jitter | | < 20 ns |
| Pulse/video output | available on USER2 connector on rear panel in trigger mode: auto | LVTTL signal, 3.3 V (nom.) |

# I/Q modulation

## I/Q modulator

| | | |
|---|---|---|
| Operating modes | | external analog I/Q |
| | | internal baseband I/Q |
| RF modulation bandwidth | with external analog I/Q inputs, I/Q wideband off | |
| | 80 MHz ≤ f ≤ 1 GHz | ±5 % of carrier frequency |
| | 1 GHz < f ≤ 6 GHz | ±50 MHz |
| | with external analog I/Q inputs, I/Q wideband on | |
| | 100 MHz < f ≤ 2.5 GHz | ±20 % of carrier frequency |
| | 2.5 GHz < f ≤ 6 GHz, I/Q wideband | ±500 MHz |
| | with internal baseband I/Q, I/Q wideband on | |
| | 1 MHz < f ≤ 100 MHz | frequency range from 1 MHz to 120 MHz |
| | 100 MHz < f ≤ 600 MHz | ±20 % of carrier frequency |
| | f > 600 MHz | ±120 MHz |
| RF frequency response | with external analog I/Q inputs, I/Q wideband off | |
| | 80 MHz < f ≤ 1 GHz, up to ±5 % of carrier frequency | < 3 dB (meas.) |
| | f > 1 GHz, up to ±50 MHz | < 3 dB (meas.) |
| | with external analog I/Q inputs, I/Q wideband on | |
| | 100 MHz < f ≤ 2.5 GHz, up to ±20 % of carrier frequency | < 6 dB (meas.) |
| | 2.5 GHz < f ≤ 6 GHz, up to ±500 MHz | < 9 dB (meas.) |
| | with internal baseband I/Q, I/Q wideband on, optimization mode high quality | < 1.0 dB; < 0.3 dB (meas.) |
| Carrier leakage | with external analog I/Q inputs, without input signal, referenced to full-scale input [2] | < –45 dBc; < –55 dBc (meas.) |
| Suppression of image sideband for entire instrument in modulation bandwidth | mode: internal baseband I/Q, up to 120 MHz I/Q bandwidth | > 45 dB; 60 dB (typ.) |
| I/Q impairment settings (analog) | These impairments are set within the analog I/Q modulator section. They can be used in external wideband I/Q mode and internal baseband I/Q mode for frequencies greater than 100 MHz. | |
| Offset setting range | | –5 % to +5 % |
| Offset setting resolution | | 0.01 % |
| Gain imbalance setting range | | –1.0 dB to +1.0 dB |
| Gain imbalance setting resolution | | 0.001 dB |
| Quadrature offset setting range | | –8° to +8° |
| Quadrature offset setting resolution | | 0.01° |

[2] Value applies after internal readjustment.




*I/Q modulation frequency response with internal baseband (meas.).*

## Baseband bypass mode for externally generated I/Q signals

The baseband bypass mode allows generation of modulated signals below the specified frequency range of the I/Q modulator. Externally generated signals applied to the I or Q baseband input connector can be leveled and amplified by the instrument and are provided at the RF output connector.

For the baseband bypass mode, only the data specified in this section is valid.

| | | |
|---|---|---|
| Level setting range | | –120 dBm to +25 dBm |
| Specified level range | | –120 dBm to +15 dBm |
| Frequency response | 1 MHz ≤ f ≤ 80 MHz, level = 10 dBm | < 3 dB; < 1 dB (meas.) |
| Level error | attenuator mode: auto, temperature range from +18 °C to +33 °C, referenced to full-scale input at I or Q connector, 1 MHz ≤ f ≤ 80 MHz | < 3 dB |
| Level linearity | attenuator mode: fixed, for setting range of 0 dB to +20 dB | < 2 dB; < 0.5 dB (meas.) |

## Analog I/Q inputs

| | | |
|---|---|---|
| Connector types | I, Q on rear panel | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| Input impedance | | 50 Ω (nom.) |
| VSWR | up to 100 MHz | < 1.2 |
| | 100 MHz up to 500 MHz | < 1.5 |
| Input voltage for full-scale input | | $\sqrt{V_i^2 + V_q^2} = 0.5\ V$ (nom.) |
| Input damage voltage | | ±1 V |

## Internal baseband I/Q

| | | |
|---|---|---|
| D/A converter | resolution | 16 bit |
| Aliasing filter | with amplitude, group-delay and Si correction | |
| | bandwidth (drop to –0.1 dB) | 120 MHz (nom.) |
| | D/A converter interpolation spectra | |
| | up to 120 MHz | < –80 dBc |
| I/Q impairments | I offset, Q offset | |
| | setting range | –10 % to +10 % |
| | resolution | 0.01 % |
| | gain imbalance | |
| | setting range | –1 dB to +1 dB |
| | resolution | 0.001 dB |
| | quadrature offset | |
| | setting range | –10° to +10° |
| | resolution | 0.01° |

# Analog I/Q outputs (R&S®SGT-K16 option)

| | | |
|---|---|---|
| Output impedance | | |
| Single-ended | | 50 Ω |
| Differential | | 100 Ω |
| Output voltage | output voltage depends on set modulation signal | |
| Single-ended | EMF | 0.02 V to 2 V ($V_p$) |
| Resolution | | 1 mV |
| Differential | EMF | 0.04 V to 4 V ($V_{pp}$) |
| Resolution | | 2 mV |
| Bias voltage (single-ended and differential) | EMF | –3.6 V to +3.6 V [3] |
| Resolution | | 0.1 mV |
| Uncertainty | | 1 % + 4 mV |
| Offset voltage | | |
| Differential | EMF | –300 mV to +300 mV |
| Resolution | | 0.1 mV |
| Uncertainty | | 1 % + 0.1 % × bias voltage + 1 mV |
| Single-ended | EMF | < 1 mV |
| Frequency response [4] | at $R_L$ = 50 Ω | |
| Magnitude | up to 10 MHz | < 0.15 dB; 0.03 dB (meas.) |
| | up to 120 MHz | < 0.3 dB; 0.05 dB (meas.) |
| I/Q balance | up to 10 MHz | < 0.05 dB; 0.02 dB (meas.) |
| | up to 120 MHz | < 0.15 dB; 0.05 dB (meas.) |
| Spectral purity [4] | at $R_L$ = 50 Ω | |
| SFDR (sine) | up to 2 MHz | > 70 dB |
| | up to 20 MHz | 60 dB (meas.) |
| Wideband noise [4] | 10 MHz sine wave at 1 MHz offset | –150 dBc (typ.) |

[3] The magnitude of the sum of the output voltage (EMF) and the bias voltage (EMF) must not exceed:
- 4 V for termination with 100 Ω from I to IN and Q to QN
- 3 V for termination with 50 Ω to ground

[4] Mode: fixed (output voltage = 1.0 V $V_p$ (EMF), bias voltage = 0.0 V, offset voltage = 0.0 V).

# Envelope tracking (R&S®SGT-K540 option)

| | | |
|---|---|---|
| **General** | | |
| Envelope voltage adaptation | | auto normalized, auto power, manual |
| Output type | | single-ended, differential |
| Bias voltage | see Differential analog I/Q outputs | |
| Offset voltage | see Differential analog I/Q outputs | |
| Envelope to RF delay | | |
| Setting range | | –1 µs to +1 µs |
| Setting resolution | | 1 ps |
| Shaping | | off, linear, from table, polynomial, detroughing |
| **Envelope voltage adaptation modes: auto normalized and auto power** | | |
| Power amplifier input power $P_{in}$ | | |
| Setting range | | –145.00 dB to +30.00 dB |
| Setting resolution | | 0.01 dB |
| Power amplifier supply voltage $V_{cc}$ | $V_{cc}$ = envelope voltage × DC modulator gain + $V_{CC\ Offset}$ | |
| DC modulator gain | | –20.00 dB to +20.00 dB |
| Power amplifier offset voltage $V_{cc\ Offset}$ | | 0 V to 30 V |
| **Envelope voltage adaptation mode: manual** | | |
| Pregain | | |
| Setting range | | –20.00 dB to 0.00 dB |
| Setting resolution | | 0.01 dB |

# Envelope ARB (R&S®SGT-K543 option)

The R&S®SGT-K510 option must be installed.

The R&S®SGT-K543 option allows configuring of two independent baseband signals in the arbitrary waveform generator for envelope tracking tests.

With the R&S®SGT-K543, the signals generated in baseband A are fixed mapped to the RF output. Signals generated in baseband B (ARB envelope) are mapped to the Analog I and I_Bar outputs (Analog Q is disabled).

Independent clock rates in both basebands can be adjusted and the ARB memory is shared.

## AM/AM, AM/φM predistortion (R&S®SGT-K541 option)

| | | |
|---|---|---|
| State | | on, off |
| Maximum input power ($PEP_{in}$ max.) | | |
| Setting range | | –145.00 dB to +30.00 dB |
| Setting resolution | | 0.01 dB |
| Shaping | | polynomial, from table |

# Arbitrary waveform generator (R&S®SGT-K510 option)

| | | |
|---|---|---|
| Waveform length | | 1 sample to 32 Msample<br>in one-sample steps |
| | with R&S®SGT-K511 option | 1 sample to 256 Msample<br>in one-sample steps |
| | with R&S®SGT-K511<br>and R&S®SGT-K512 options | 1 sample to 1 Gsample<br>in one-sample steps |
| Nonvolatile memory | | SSD 120 Gbyte |
| Sample rate | | 400 Hz to 75 MHz |
| | with R&S®SGT-K521 option | 400 Hz to 150 MHz |
| | with R&S®SGT-K521<br>and R&S®SGT-K522 options | 400 Hz to 200 MHz |
| | with R&S®SGT-K521<br>and R&S®SGT-K522<br>and R&S®SGT-K523 options | 400 Hz to 300 MHz |
| Sample resolution | equivalent to D/A converter | 16 bit |
| Sample clock source | | internal, external |
| Sample frequency error | internal clock | < (5 × $10^{-14}$ + reference frequency error)<br>× sample rate (nom.) |
| Bandwidth (RF) using the maximum sample rate | | 60 MHz (nom.) |
| | with R&S®SGT-K521 option | 120 MHz (nom.) |
| | with R&S®SGT-K521<br>and R&S®SGT-K522 options | 160 MHz (nom.) |
| | with R&S®SGT-K521<br>and R&S®SGT-K522<br>and R&S®SGT-K523 options | 240 MHz (nom.) |
| Bandwidth (RF) using a reduced sample rate (drop to –0.1 dB) | The waveform is automatically interpolated to the internal sample rate of 300 MHz. | |
| | | 0.8 × sample rate (nom.) |
| Frequency offset | setting range | |
| | | –30 MHz to 30 MHz |
| | with R&S®SGT-K521 option | –60 MHz to 60 MHz |
| | with R&S®SGT-K521<br>and R&S®SGT-K522 options | –80 MHz to 80 MHz |
| | with R&S®SGT-K521<br>and R&S®SGT-K522<br>and R&S®SGT-K523 options | –120 MHz to 120 MHz |
| | resolution | 0.01 Hz |
| | frequency accuracy | < (5 × $10^{-10}$ + reference frequency error)<br>× frequency offset (nom.) |
| Triggering | source | internal, external |
| | operating modes | auto, retrig, armed auto, armed retrig, single, next |
| | external trigger delay (in sample) | |
| | setting range | 0 to ($2^{16}$ – 1) |
| | resolution | 0.01 |
| | jitter | ±1.67 ns (nom.) |
| | external trigger inhibit (in sample) | |
| | setting range | 0 to ($2^{26}$ – 1) |
| | resolution | 1 |
| | external trigger pulse width | > 20 ns (nom.) |
| Marker outputs | number | 2 |
| | level | LVTTL |
| | operating modes | unchanged, restart, pulse, pattern, ratio, trigger |
| | marker delay (in sample) | |
| | setting range | 0 to (waveform length – 1) |
| | setting range without recalculation | 0 to 2000 |
| | resolution of setting | 1 |

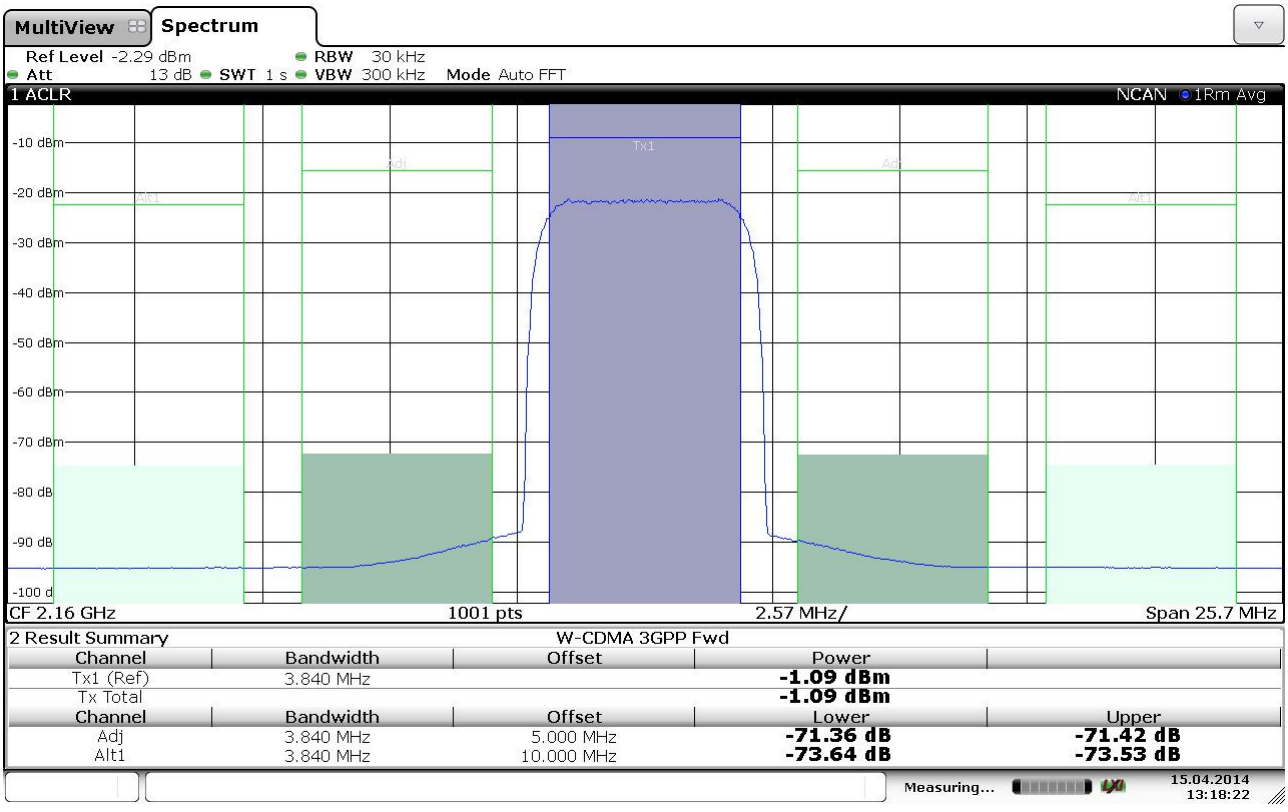
# Multisegment and multicarrier arbitrary waveform mode

| | | |
|---|---|---|
| Multisegment waveform | number of segments | 100 segments (max.) |
| | changeover modes | GUI, remote control, external trigger |
| | extended trigger modes | same segment, next segment,<br>next segment seamless, sequencer |
| | changeover time at 50 MHz clock rate<br>(external trigger, without clock change) | 11 µs (meas.) |
| | seamless changeover | output up to end of current segment,<br>followed by changeover to next segment |
| | sequencer play list length | 1024 (max.) |
| | sequencer segment repetitions | 65535 (max.) |
| Multicarrier waveform | number of carriers | 32 (max.) |
| | carrier spacing | |
| | setting range | depends on number of carriers and<br>bandwidth (RF) |
| | resolution | 0.01 Hz |
| | crest factor modes | maximize, minimize, off |
| | signal period modes | longest file, shortest file, user (max. 1 s) |
| | single carrier gain | |
| | setting range | –80 dB to 0 dB |
| | resolution | 0.01 dB |
| | single carrier start phase | |
| | setting range | 0° to 360° |
| | resolution | 0.01° |
| | single carrier delay | |
| | setting range | 0 s to 1 s |
| | resolution | 1 ns |

Operation with R&S®WinIQSIM2™: The software supports download of I/Q data and basic control of the arbitrary waveform generator.

## Modulation performance for GSM/EDGE and 3GPP FDD digital standards

| | | |
|---|---|---|
| GSM/EDGE | with R&S®SGT-K240 option,<br>level ≤ 13 dBm PEP, frequency range from 400 MHz to 2000 MHz | |
| Burst on/off ratio | | 100 dB (meas.) |
| Phase error | MSK, Gaussian filter B × T = 0.3 | |
| | RMS | < 0.4°; 0.15° (typ.) |
| | peak | 0.4° (meas.) |
| Error vector magnitude | 8PSK EDGE, Gaussian linearized filter, RMS | < 0.5 %; 0.25 % (typ.) |
| Power density spectrum | values measured with 30 kHz resolution bandwidth, referenced to level in band center without power ramping | |
| | 200 kHz offset | < –34 dB; –38 dB (typ.) |
| | 400 kHz offset | < –66 dB; –70 dB (typ.) |
| | 600 kHz offset | < –74 dB; –78 dB (typ.) |
| 3GPP FDD | with R&S®SGT-K242 option,<br>level ≤ 0 dBm RMS, frequency range from 1800 MHz to 2200 MHz | |
| Error vector magnitude | 1 DPCH, RMS | < 0.8 %; 0.4 % (typ.) |
| Adjacent channel leakage ratio (ACLR) | test model 1, 64 DPCHs | |
| | offset 5 MHz | > 68 dB; 71 dB (typ.) |
| | offset 10 MHz | > 70 dB; 73 dB (typ.) |




*Digital standard 3GPP FDD test model 1, 64 DPCHs ACLR (meas.).*

# Digital standards with R&S®WinIQSIM2™

R&S®WinIQSIM2™ requires an external PC.

The options are described in the R&S®WinIQSIM2™ data sheet (PD 5213.7460.22).

| **Cellular standards** |
|---|
| EUTRA/LTE (R&S®SGT-K255 option) |
| EUTRA/LTE Rel. 9 and enhanced features (R&S®SGT-K284 option; R&S®SGT-K255 option required) |
| EUTRA/LTE Rel. 10/LTE-Advanced (R&S®SGT-K285 option; R&S®SGT-K255 option required) |
| 3GPP FDD (R&S®SGT-K242 option) |
| 3GPP FDD/HSPA/HSPA+, enhanced BS/MS tests (R&S®SGT-K283 option; R&S®SGT-K242 option required) |
| GSM/EDGE (R&S®SGT-K240 option) |
| EDGE EVOLUTION (R&S®SGT-K241 option; R&S®SGT-K240 option required) |
| CDMA2000® (R&S®SGT-K246 option) |
| 1xEV-DO (R&S®SGT-K247 option) |
| 1xEV-DO Rev. B (R&S®SGT-K287 option; R&S®SGT-K247 option required) |
| TD-SCDMA (3GPP TDD LCR) (R&S®SGT-K250 option) |
| TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA (R&S®SGT-K251 option; R&S®SGT-K250 option required) |
| TETRA Release 2 (R&S®SGT-K268 option) |
| **Wireless connectivity standards** |
| IEEE 802.11 a/b/g/n (R&S®SGT-K254 option) |
| IEEE 802.11 ac (R&S®SGT-K286 option; R&S®SGT-K254 option required) |
| IEEE 802.16 (R&S®SGT-K249 option) |
| Bluetooth® EDR/low energy (R&S®SGT-K260 option) |
| NFC A/B/C (R&S®SGT-K289 option) |
| **Navigation standards** |
| GPS 1 satellite (R&S®SGT-K244 option) |
| Galileo 1 satellite (R&S®SGT-K266 option) |
| Glonass 1 satellite (R&S®SGT-K294 option) |
| BeiDou 1 satellite (R&S®SGT-K407 option) |
| **Broadcast standards** |
| DVB-H/DVB-T (R&S®SGT-K252 option) |
| DAB/T-DMB (R&S®SGT-K253 option) |
| **Other standards and modulation systems** |
| Multicarrier CW signal generation (R&S®SGT-K261 option) |
| Additive white Gaussian noise (AWGN) (R&S®SGT-K262 option) |

## Digital baseband connectivity (R&S®SGT-K18 option)

External digital I/Q signals can be fed in to the baseband section. The digital I/Q connectivity can be used for lossless connection of the R&S®SGT100A to the digital I/Q output of other Rohde & Schwarz instruments (e.g. the R&S®SMW200A vector signal generator). One R&S®SGT-K18 option can be installed.

**Input parameters**

| | | |
|---|---|---|
| Input level | peak level | |
| | setting range | –60 dB to +3 dB referenced to full scale |
| | resolution | 0.01 dB |
| | crest factor | |
| | setting range | 0 dB to +30 dB |
| | resolution | 0.01 dB |
| | The adjust level function automatically determines the peak level and crest factor of the input signal. | |
| Frequency offset | With the aid of the frequency offset, the center frequency of the input signal can be shifted in the baseband. The restrictions caused by the modulation bandwidth apply. | |
| | setting range | –30 MHz to 30 MHz |
| | with R&S®SGT-K521 option | –60 MHz to 60 MHz |
| | with R&S®SGT-K521 and R&S®SGT-K522 options | –80 MHz to 80 MHz |
| | with R&S®SGT-K521 and R&S®SGT-K522 and R&S®SGT-K523 options | –120 MHz to 120 MHz |
| | resolution | 0.01 Hz |
| | frequency accuracy | < (5 × $10^{-10}$ + reference frequency error) × frequency offset (nom.) |
| I/Q swap | I and Q signals swapped | on/off |
| Interface | standard | in line with Rohde & Schwarz standard for digital I/Q interface |
| | level | LVDS |
| | connector | 26-pin MDR |
| | data rate | up to 200 MHz |
| I/Q sample rate | With source ‘user-defined’, the sample rate must be entered via the parameter ‘sample rate’, no I/Q data clock being necessary. With source ‘digital I/Q in’, the sample rate will be estimated on the basis of the applied I/Q data clock. | |
| | source | user-defined, digital I/Q in |
| | sample rate | 400 Hz to 200 MHz, max. sample rate depending on interface data rate |
| | resolution (user-defined) | 0.001 Hz |
| | frequency uncertainty (user-defined) | < 5 × $10^{-14}$ |
| I/Q data | resolution | 18 bit |
| | logic format | two’s complement |
| Bandwidth (RF) | sample rate = 200 MHz (no interpolation, user-defined) | 160 MHz |
| | sample rate < 200 MHz (interpolation) | 0.8 × sample rate |
| Control signals | markers | 4 |
| | data valid | valid samples marked in data stream |

## Internal additive white Gaussian noise (AWGN, R&S®SGT-K62 option)

Addition of an AWGN signal of settable bandwidth and settable C/N ratio or $E_b/N_0$ to a wanted signal.

| | | |
|---|---|---|
| Noise | distribution density | Gaussian, statistical, separate for I and Q |
| | crest factor | > 15 dB |
| | periodicity | > ($2^{800}$ – 1)/300 MHz |
| C/N, $E_b/N_0$ | setting range | –30 dB to +30 dB |
| | resolution | 0.1 dB |
| | uncertainty for system bandwidth = symbol rate<br>–24 dB < C/N < 30 dB and<br>crest factor < 12 dB | < 0.1 dB |
| System bandwidth | bandwidth for determining noise power | |
| | setting range | |
| | | 1 kHz to 60 MHz |
| | with R&S®SGT-K521 option | 1 kHz to 120 MHz |
| | with R&S®SGT-K521<br>and R&S®SGT-K522 options | 1 kHz to 160 MHz |
| | with R&S®SGT-K521<br>and R&S®SGT-K522<br>and R&S®SGT-K523 options | 1 kHz to 240 MHz |
| | setting resolution | 100 Hz |

## Remote control

| | | |
|---|---|---|
| Systems | | PCI Express (single lane) |
| | | Ethernet (TCP/IP) 10/100/1000BASE-T |
| | | USB 2.0 |
| Command set | remote control via Ethernet, USB | SCPI 1999.5 or compatible command sets |
| | remote control via PCI Express | Rohde & Schwarz instrument driver |

# Connectors

## Rear panel connectors

| | | |
|---|---|---|
| RF 50 Ω | RF output<br>(only for instruments without R&S®SGT-B88 option) | SMA female |
| REF/LO IN | reference frequency input or external LO signal input | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| REF/LO OUT | reference frequency output or internal LO signal output | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| I, Q | input connector for I and Q baseband signals, input for I/Q vector-modulated IF signals up to 80 MHz | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| I, IN, Q, QN | output connector for differential I and Q baseband signals, output for envelope tracking signals | SMB male |
| DIG IQ IN | digital input connectivity in line with R&S®Digital I/Q interface | 26-pin MDR |
| USER1 | multipurpose input/output | SMB male |
| USER2 | pulse and multipurpose input/output | SMA female |
| | with R&S®SGT-B88 option | BNC female |
| USB IN | remote control of instrument | USB (micro USB) |
| LAN | remote control of instrument | RJ-45 |
| PCI Express | remote control of instrument | single lane, in line with PCI Express external cabling specification |

## Front panel connector (R&S®SGT-B88 option)

| | | |
|---|---|---|
| RF 50 Ω | RF output with R&S®SGT-B88 option | N female |

# General data

| | | |
|---|---|---|
| **Power supply** | | |
| AC input voltage range | | 100 V to 240 V ± 10 % |
| AC supply frequency | | 50 Hz to 60 Hz, –5 %/+5 % |
| Max. input current | | 1.7 A |
| Power consumption | | 65 W (meas.) |
| Power factor correction | | in line with EN 61000-3-2 |
| **Electrical safety** | | |
| Compliance | | in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1-04, UL 61010-1 |
| Test mark | | VDE-GS, $_{C}$CSA$_{US}$ |
| **EMC** | | |
| Electromagnetic compatibility | | in line with EN 55011 class A, EN 61326-1 (industrial environment), EN 61326-2-1 |
| **Mechanical resistance** | | |
| Vibration | sinusoidal | 5 Hz to 150 Hz, max. 2 g at 55 Hz, const. 0.5 g at 55 Hz to 150 Hz, in line with EN 60068-2-6 |
| | random | 10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64 |
| Shock | | 40 g shock spectrum, in line with MIL-STD-810E, method no. 516.4, procedure I, |
| **Environmental conditions** | | |
| Temperature range | operating temperature range | 0 °C to +50 °C, in line with EN 60068-2-1, EN 60068-2-2 |
| | storage temperature range | –40 °C to +71 °C |
| Climatic resistance | | +40 °C/95 % rel. humidity, in line with EN 60068-2-30 |
| Altitude | operating | up to 4600 m |
| | storage | up to 4600 m |
| **Dimensions** | W × H × D | 246 mm × 52.5 mm × 401 mm (9.69 in × 2.07 in × 15.79 in) 1 HU, ½ 19" rack width |
| | with R&S®SGT-B88 option | 246 mm × 98 mm × 401 mm (9.69 in × 3.86 in × 15.79 in) 2 HU, ½ 19" rack width |
| **Weight** | fully equipped (without R&S®SGT-B88 option) | 4.0 kg (8.82 lb) |
| | with R&S®SGT-B88 option | 4.6 kg (10.14 lb) |
| **Calibration interval** | | |
| Recommended calibration interval | 40 h/week operation in the full range of the specified environmental conditions | 3 years |

# Ordering information

| Designation | Type | Order No. |
|---|---|---|
| SGMA Vector RF Source, 1 MHz to 3 GHz RF, baseband hardware included | R&S®SGT100A | 1419.4501.02 |
| Including power cable, quick start guide and CD-ROM (with operating and service manual) | | |
| **RF options** | | |
| Frequency Extension to 6 GHz | R&S®SGT-KB106 | 1419.5708.02 |
| Reference Oscillator OCXO | R&S®SGT-B1 | 1419.5608.02 |
| Extension Unit | R&S®SGT-B88 | 1419.8207.02 |
| Pulse Modulation | R&S®SGT-K22 | 1419.6279.02 |
| Phase Coherent Input/Output | R&S®SGT-K90 | 1419.6333.02 |
| **Baseband options** | | |
| Digital Baseband Connectivity | R&S®SGT-K18 | 1419.6240.02 |
| Differential Analog I/Q Outputs | R&S®SGT-K16 | 1419.8007.02 |
| ARB Baseband Generator, 32 Msample, 60 MHz RF bandwidth | R&S®SGT-K510 | 1419.7500.02 |
| ARB Memory Extension to 256 Msample | R&S®SGT-K511 | 1419.6362.02 |
| ARB Memory Extension to 1 Gsample | R&S®SGT-K512 | 1419.6391.02 |
| ARB Bandwidth Extension to 120 MHz RF bandwidth | R&S®SGT-K521 | 1419.6427.02 |
| ARB Bandwidth Extension to 160 MHz RF bandwidth | R&S®SGT-K522 | 1419.6456.02 |
| ARB Bandwidth Extension to 240 MHz RF bandwidth | R&S®SGT-K523 | 1419.7952.02 |
| Envelope Tracking | R&S®SGT-K540 | 1419.7800.02 |
| AM/AM AM/PM Predistortion | R&S®SGT-K541 | 1419.7852.02 |
| Envelope ARB | R&S®SGT-K543 | 1419.7900.02 |
| **Noise generation** | | |
| Additive White Gaussian Noise (AWGN) | R&S®SGT-K62 | 1419.6304.02 |
| **Digital modulation systems using R&S®WinIQSIM2™ [5]** | | |
| GSM/EDGE | R&S®SGT-K240 | 1419.5950.02 |
| EDGE Evolution | R&S®SGT-K241 | 1419.6004.02 |
| 3GPP FDD | R&S®SGT-K242 | 1419.6056.02 |
| GPS | R&S®SGT-K244 | 1419.6104.02 |
| CDMA2000® incl. 1xEV-DV | R&S®SGT-K246 | 1419.6156.02 |
| 1xEV-DO Rev. A | R&S®SGT-K247 | 1419.6204.02 |
| IEEE 802.16 | R&S®SGT-K249 | 1419.6504.02 |
| TD-SCDMA | R&S®SGT-K250 | 1419.6556.02 |
| TD-SCDMA Enhanced BS/MS Tests | R&S®SGT-K251 | 1419.6604.02 |
| DVB-H | R&S®SGT-K252 | 1419.6656.02 |
| DAB/T-DMB | R&S®SGT-K253 | 1419.6704.02 |
| IEEE 802.11a/b/g/n | R&S®SGT-K254 | 1419.6756.02 |
| EUTRA/LTE | R&S®SGT-K255 | 1419.6804.02 |
| Bluetooth® EDR | R&S®SGT-K260 | 1419.6856.02 |
| Multicarrier CW Signal Generation | R&S®SGT-K261 | 1419.6904.02 |
| Additive White Gaussian Noise (AWGN) | R&S®SGT-K262 | 1419.6956.02 |
| Galileo | R&S®SGT-K266 | 1419.7000.02 |
| TETRA Release 2 | R&S®SGT-K268 | 1419.7052.02 |
| 3GPP FDD HSPA/HSPA+ | R&S®SGT-K283 | 1419.7100.02 |
| EUTRA/LTE Release 9, enhanced features | R&S®SGT-K284 | 1419.7152.02 |
| EUTRA/LTE Release 10 (LTE Adanced) | R&S®SGT-K285 | 1419.7200.02 |
| IEEE 802.11ac | R&S®SGT-K286 | 1419.7252.02 |
| 1xEV-DO Rev. B | R&S®SGT-K287 | 1419.7300.02 |
| NFC A/B/F | R&S®SGT-K289 | 1419.7352.02 |
| Glonass | R&S®SGT-K294 | 1419.7400.02 |
| BeiDou | R&S®SGT-K407 | 1419.7452.02 |
| LTE Release 11 + enhanced features | R&S®SGT-K412 | 1419.7600.02 |
| **Waveform package for signals from R&S®WinIQSIM2™ [5]** | | |
| 1 Waveform | R&S®SGT-K200 | 1419.5850.71 |
| 5 Waveforms | R&S®SGT-K200 | 1419.5850.72 |
| 50 Waveforms | R&S®SGT-K200 | 1419.5850.75 |
| **Digital standards using an external PC software or waveforms** | | |
| Pulse Sequencing | R&S®SGT-K300 | 1419.7652.02 |
| Enhanced Pulse Sequencing | R&S®SGT-K301 | 1419.7700.02 |
| DFS Signal Generation | R&S®SGT-K350 | 1419.8107.02 |

[5] R&S®WinIQSIM2™ requires an external PC.

| **Recommended extras** | | |
|---|---|---|
| Documentation of Calibration Values | R&S®DCV-2 | 0240.2193.18 |
| Hardcopy manuals (in English) | | 1176.8674.02 |
| 19" Rack Adapter, suitable for installation of two R&S®SGMA instruments (for two 1 HU instruments next to each other, only without R&S®SGT-B88 option) | R&S®ZZA-KN20 | 1175.3191.00 |
| 19" Rack Adapter (for one instrument and spacing module, only without R&S®SGT-B88 option) | R&S®ZZA-KN21 | 1175.3204.00 |
| R&S®SGMA Adapter (only without R&S®SGT-B88 option) | R&S®SGS-Z8 | 1416.2914.02 |
| R&S®SGT Adapter Cable Set | R&S®SGT-Z9 | 1419.8059.02 |
| Cable, for connecting digital baseband interfaces | R&S®SMU-Z6 | 1415.0201.02 |

| **Warranty** | | |
|---|---|---|
| Base unit | | 3 years |
| All other items | | 1 year |
| Options | | |
| Extended Warranty, one year | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended Warranty, two years | R&S®WE2 | |
| Extended Warranty with Calibration Coverage, one year | R&S®CW1 | |
| Extended Warranty with Calibration Coverage, two years | R&S®CW2 | |

**Extended warranty with a term of one and two years (WE1 and WE2)**
Repairs carried out during the contract term are free of charge [6]. Necessary calibration and adjustments carried out during repairs are also covered.

**Extended warranty with calibration coverage (CW1 and CW2)**
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [6] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.



**For product brochure, see PD 3607.0217.12 and www.rohde-schwarz.com**

[6] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

## Service that adds value

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

**About Rohde&Schwarz**

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, this independent company has an extensive sales and service network and is present in more than 70 countries. The electronics group is among the world market leaders in its established business fields. The company is headquartered in Munich, Germany. It also has regional headquarters in Singapore and Columbia, Maryland, USA, to manage its operations in these regions.

**Sustainable product design**

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001


**Rohde&Schwarz GmbH&Co. KG**
www.rohde-schwarz.com

**Rohde&Schwarz training**
www.training.rohde-schwarz.com

**Regional contact**

- Europe, Africa, Middle East | +49 89 4129 12345
  customersupport@rohde-schwarz.com
- North America | 1 888 TEST RSA (1 888 837 87 72)
  customer.support@rsa.rohde-schwarz.com
- Latin America | +1 410 910 79 88
  customersupport.la@rohde-schwarz.com
- Asia Pacific | +65 65 13 04 88
  customersupport.asia@rohde-schwarz.com
- China | +86 800 810 82 28 | +86 400 650 58 96
  customersupport.china@rohde-schwarz.com




PD 3607.0217.22 | Version 05.00 | June 2016 (as)
R&S®SGT100A SGMA Vector RF Source
Data without tolerance limits is not binding | Subject to change



3607021722


3607.0217.22 05.00 PDP 1 en