# RF Signal Generator
# R&S® SM300

**9 kHz to 3 GHz**


Smart instruments
The new product family from Rohde & Schwarz

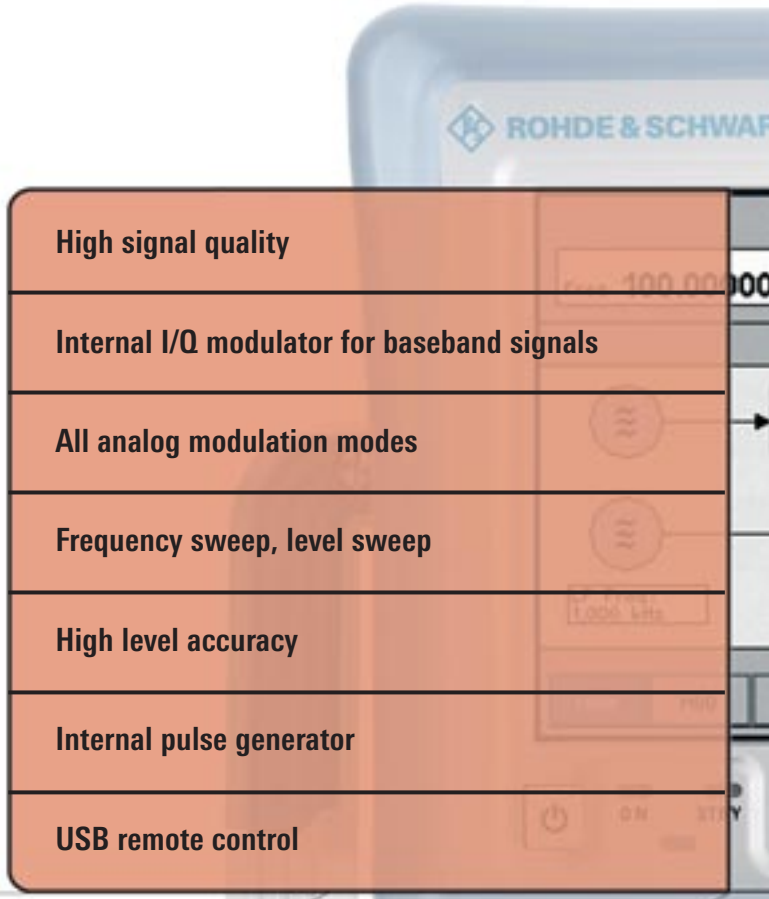
ROHDE&SCHWARZ

# Professional signal generator for production, laboratory and service

The R&S SM300 is a favourably priced signal generator for applications in the 9 kHz to 3 GHz frequency range. The instrument features a broad scope of functions, outstanding technical characteristics and compact design.

In addition to standard analog modulation modes, external I/Q signals can be fed in for RF signal modulation. Digitally modulated signals can thus be generated, as required in mobile radio, for example.

The R&S SM300 offers an immense range of applications — whether on the lab bench, in service or as a flexible measuring instrument in automatic production systems.




- **High signal quality**
- **Internal I/Q modulator for baseband signals**
- **All analog modulation modes**
- **Frequency sweep, level sweep**
- **High level accuracy**
- **Internal pulse generator**
- **USB remote control**

## Condensed data

| | |
|---|---|
| Frequency range | RF: 9 kHz to 3 GHz, LF: 20 Hz to 80 kHz |
| Frequency resolution | 0.1 Hz |
| Modulation modes | AM / FM / φM / pulse / IQ |
| Level resolution | 0.1 dB |
| Level uncertainty | <1 dB (for levels >–120 dBm) |
| Level range | –127 dBm to 13 dBm |
| Level and frequency setting time | <10 ms |
| Single-sideband (SSB) phase noise | <–95 dBm (1 Hz) (at f = 1 GHz, Δf = 20 kHz) |
| Internal modulation generator | 20 Hz to 80 kHz |


# Ergonomic user interface

Operation is menu-guided so that even untrained users will quickly obtain correct results. Clear structures simplify navigation within the menus. Users familiar with signal generators from Rohde & Schwarz will quickly find the menu items they know from other Rohde & Schwarz instruments.

The bright TFT colour display with 320 x 240 pixel resolution allows traces to be read even at odd angles or when the incidence of light is unfavourable.

# Applications

Its broad scope of functions makes the R&S SM300 the ideal instrument for diverse use, e.g. in digital and analog mobile radio or for EMC applications.

**Generation of precise test signals for the following applications: lab, service, production and quality assurance**

**Provision of digitally modulated signals in the 9 kHz to 3 GHz frequency range (e.g. with the R&S AMIQ as an external baseband signal source)**

**Signal generation and modulation (AM, pulse) for EMC measurements of components (EMS)**

**Functionality testing of components in production**

**Semi-automatic measurements by pressing a button to retrieve stored settings**

## Vector signal modulation[1]

- High I/Q bandwidth for W-LAN measurements in accordance with IEEE 802.11b and IEEE 802.11g
- Generation of WCDMA test signals for measuring ACLR, EVM and code domain power
  ACLR WCDMA 3GPP FDD (64 DPCH channels)
  Offset 5 MHz: –54 dBc typ.
  Offset 10 MHz: –55 dBc typ.
  Composite EVM (64 DPCH channels): 3.3 % typ.
- Generation of GSM signals for measuring phase error
  Phase error: 1.2° rms typ.

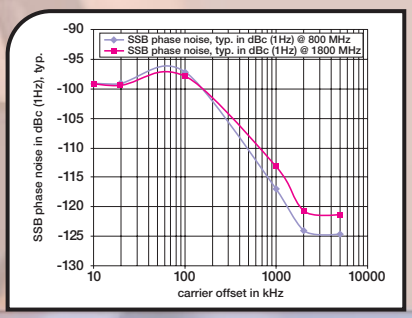
## EMC

- Provision of signal generator control level in 20 Hz to 3.0 GHz frequency range
- AM, pulse modulation modes
- Internal pulse generator
- EN61000-4-3/6 standards; MIL-STD-461E, ISO 11451 and ISO 11452, each up to 3 GHz

[1] *Requires an external baseband signal source, e.g. the R&S AMIQ.*

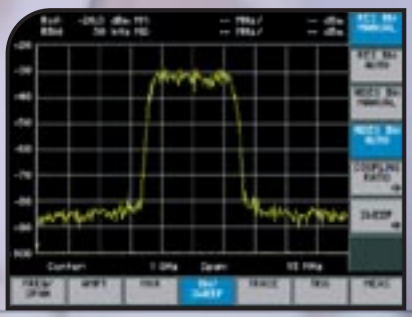
## High signal quality

The RF characteristics of the R&S SM300 set new standards in the lower price segment. Its low wideband and single-sideband phase noise make the R&S SM300 the ideal tool for use in labs, test sets at colleges and universities, in service and at production sites.



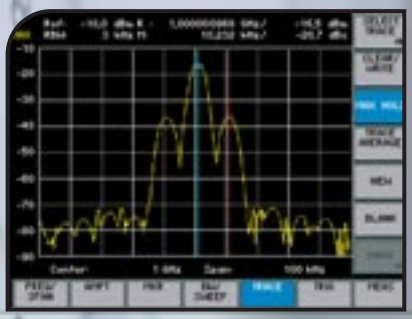

## Internal I/Q modulator for baseband signals

The internal I/Q modulator expands the range of R&S SM300 applications to mobile radio as well, thus making vector modulation of baseband signals possible for GSM, 3GPP or IEEE 802.11 b, g.



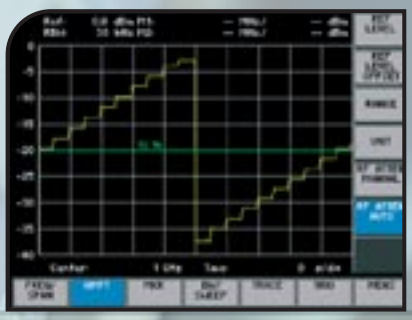
## Wide variety of analog modulation modes

The R&S SM300 can handle all analog modulation modes: AM / FM / φM / pulse. It is used for generating interference signals in EMC applications, e.g. automobile industry, military, avionics, or for commercial measurements.



## Frequency sweep, level sweep

The R&S SM300 makes it possible to sweep the internal LF generator as well as the RF frequency and the RF level in user-selectable steps.



R&S Smart instruments™

# The new instrument family – equipped for the future


## Versatile applications

- Desktop use
- Portable for mobile use
- Integration into 19-inch racks

## USB interfaces

The USB host interface provided as standard links the instruments to the PC world. The bus ensures high data transmission rates at low cost. Other peripherals (e.g. printers) can be addressed via another USB interface.

## Identical housing

All instruments based on the Family 300 concept have an almost identical "face", a 5.4-inch VGA TFT display, front-panel control elements, protective guards and a handle that can be adjusted to different positions. Only the connectors on the front and rear panel vary depending on the instrument type.

If the protective guards and the handle are removed, the R&S SM300 can be installed in a 19-inch rack. Owing to their slim design, two instruments of the Family 300 can be placed next to each other.

## Uniform operating concept

All instruments are similarly operated on the basis of the high-end devices from Rohde & Schwarz. Most operations are menu-controlled so that no device-specific keys are required. Only the four unit keys for entry confirmation are configured separately.

# Specifications

**Important:** As a highly innovative company, we continuously refine our products. Please check our homepage **www.sm300.rohde-schwarz.com** for new applications and features.

## RF frequency

| | | |
|---|---|---|
| Frequency range | 9 kHz to 3 GHz | |
| Resolution | 0.1 Hz | |
| Setting time | <10 ms | |
| Reference frequency | 10 MHz | |
| Aging | $2x10^{-6}$ / year | |
| Temperature drift | $1x10^{-6}$ | 5°C to 30°C |
| | | |
| **Spectral purity** | | |
| Spurious | | |
| Harmonics | <–30 dBc | level ≤0 dBm, $f_C$ >1 MHz |
| Subharmonics | <–50 dBc | $f_C$ >1 MHz |
| Nonharmonics | <–50 dBc | >10 kHz from carrier |
| Wideband noise | <–123 dBc | $f_C$ = 1 GHz, carrier offset >2 MHz |
| Single-sideband phase noise | <–95 dBc (1 Hz) | $f_C$ = 1 GHz, carrier offset 20 kHz |
| Residual FM, rms | | $f_C$ = 1 GHz |
| 0.3 Hz to 3 kHz | <10 Hz | |
| 0.03 kHz to 20 kHz | <60 Hz | |
| Residual AM, rms | | |
| 0.3 kHz to 3 kHz | <0.03% | $f_C$ = 1 GHz |

## RF level

| | | |
|---|---|---|
| Level range | –127 dBm to +13 dBm | |
| Setting time | <10 ms | |
| Resolution | 0.1 dB | |
| Level uncertainty | <1 dB | level >–120 dBm, 20°C to 30°C |

## LF generator

| | | |
|---|---|---|
| Frequency range | 20 Hz to 80 kHz | |
| Frequency resolution | 0.1 Hz | |
| Frequency response | <0.2 dB | 20 Hz to 20 kHz |
| Total harmonic distortion | < 0.1 % | |

## Modulation

| | | |
|---|---|---|
| **Amplitude modulation** | | |
| Operating modes | internal, external AC/DC | |
| Modulation depth | 0 to 100 % | |
| Resolution | 0.1 % | |
| Setting uncertainty | <5 % + residual AM | $f_{LF}$ = 1 kHz, m <80 %, level ≤0 dBm |
| AM total harmonic distortion | <2 % | $f_{LF}$ = 1 kHz, m <80 %, level ≤0 dBm |
| Modulation frequency range | DC/20 Hz to 20 kHz | |
| | | |
| **Frequency modulation** | | |
| Operating modes | internal, external AC/DC | |
| Frequency deviation | 20 Hz to 100 kHz | |
| Resolution | <1 % | |
| Setting uncertainty | <5 % + residual FM | $f_{LF}$ = 1 kHz |
| FM total harmonic distortion | <1% | $f_{LF}$ = 1 kHz, deviation = 50 kHz |
| Modulation frequency range | DC/20 Hz to 80 kHz | |
| | | |
| **Phase modulation** | | |
| Operating modes | internal | |
| Phase deviation | 0 to 10 rad | $f_{LF}$ ≤10 kHz |
| | 0 to 5 rad | 10 kHz < $f_{LF}$ ≤ 20 kHz |
| Resolution | <1 %, min. 0.001 rad | |
| Setting uncertainty | <5 % + 0.02 rad | $f_{LF}$ = 1 kHz |
| φM total harmonic distortion | <1.5% | $f_{LF}$ = 1 kHz, deviation = 50 kHz |
| Modulation frequency range | 300 Hz to 20 kHz | |
| | | |
| **I/Q modulation** | | |
| Operating modes | external | |
| Modulation frequency range (3 dB) | DC to 40 MHz | |
| Carrier suppression | –40 dBc | ($f_c$ = 1.8 GHz) |
| | | |
| **Pulse modulation/Pulse generator** | | |
| operating modes | external, internal | |
| Rise/fall time (10 %/90 %) | <500 ns | |
| Delay time (external) | 100 µs to 1 s | |
| Pulse width (internal) | 100 µs to 1 s | |
| Pulse period (internal) | 200 µs to 2 s | |
| Time resolution | 1 µs | |

## Sweep

| | | |
|---|---|---|
| **RF sweep, LF sweep** | | |
| Operating modes | continuous sweep, single sweep, single step | |
| Sweep range | RF: 9 kHz to 3 GHz | LF: 20 Hz to 80 kHz |
| Step width (log) | 0.01 % to 100 % | |
| Step width (lin) | RF: 0.1 Hz to 1 GHz | LF: 0.1 Hz to 80 kHz |
| **Level sweep** | | |
| Operating modes | continuous sweep, single sweep, single step | |
| Sweep range | –127 dBm to 13 dBm | |
| Step width | 1 dB to 20 dB | |
| Step time | 10 ms to 1 s | |

## Inputs

| | |
|---|---|
| **Reference frequency input** | |
| Connector | BNC female |
| Reference frequency | 10 MHz, 5 MHz, 2 MHz |
| Input voltage | 0.5 V to 2 V into 50 Ω |
| **AM/FM modulator input** | |
| Connector | BNC female |
| Input voltage for max. modulation depth or modulation deviation | 1 V |
| Input impedance | >100 kΩ |
| **I/Q modulator inputs** | |
| I/Q inputs | BNC female |
| Input impedance | 50 Ω |
| Input voltage | 0.5 V |
| VSWR | <1.5 |
| **Pulse modulator input** | |
| Connector | BNC female |
| Input voltage | TTL voltages |

## Outputs

| | |
|---|---|
| **RF output** | |
| Connector | N female on front panel |
| Characteristic impedance | 50 Ω |
| VSWR | <1.6 |
| Max. input level | +36 dBm |
| Max. DC voltage | 30 V |
| **LF output** | |
| Connector | BNC female on front panel |
| Output voltage | 1 mV to 2 V rms |
| Output voltage resolution | <1%, 1 mV minimum resolution |
| Spurious suppression | <–60 dBc |
| **Reference frequency output** | |
| Connector | BNC female |
| Reference frequency | 10 MHz |
| Output voltage | >0.5 V into 50 Ω |

## Interfaces

| | | |
|---|---|---|
| **USB host** | | |
| Connector | B plug | |
| Protocol | version 1.1 | |
| Command set | device-specific, remote control via supplied Windows driver (Windows XP, 2000) | |
| **USB interface** | | |
| Connector | A plug | |
| Protocol | version 1.1 | |

## Power supply

| | | |
|---|---|---|
| Input voltage range | | 100 V to 240 V (AC), 50 Hz to 60 Hz, autoranging |
| Power consumption | | <35 VA |

## General data

| | | |
|---|---|---|
| **Display** | | |
| Type | 5.4" active colour TFT display | |
| Resolution | 320 x 240 pixels | |
| **Memory locations** | | |
| Device setups | 10 | |
| **Ambient conditions** | | |
| Operating temperature range | +5°C to +45°C | meets DIN EN 60068-2-1/2 |
| Storage temperature range | –20°C to +70°C | |
| Relative humidity | 95 % at +40°C | meets DIN EN 60068-2-3 (no moisture condensation) |
| **Mechanical resistance** | | |
| Vibration, sinusoidal | 5 Hz to 150 Hz, max. 2 g at 55 Hz, 55 Hz to 150 Hz: 0.5 g constant | meets DIN EN 60068-2-6, DIN EN 61010-1 and MIL-T-28800D class 5 |
| Vibration, random | 10 Hz to 500 Hz: 1.9 g | meets DIN EN 60068-2-64 |
| Shock | shock spectrum | meets DIN EN 60068-2-27 and MIL-STD-810 |
| **Electromagnetic compatibility** | meets EN 55011 class B and EN 61326 (EMC Directive 89/336/EEC) | |
| **EMI field strength** | <10 V/m | |
| **Protection class** | DIN EN 61010-1 / IEC61010-1 UL3111-1; CSA22.2 No:1010.1 | |
| **Dimensions** (W x H x D) | 219 mm x 147 mm x 350 mm | |
| **Weight** | approx. 7 kg | |

# Ordering information

## RF Signal Generator R&S® SM300

| Designation | Type | Order No. |
|---|---|---|
| RF Signal Generator | R&S SM300 | 1147.1498.03 |
| Rack Adapter | R&S ZZA-300 | 1147.1281.00 |

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