

# RF Signal Generator R&S<sup>®</sup> SM300

9 kHz to 3 GHz



  
Smart instruments<sup>™</sup>  
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**

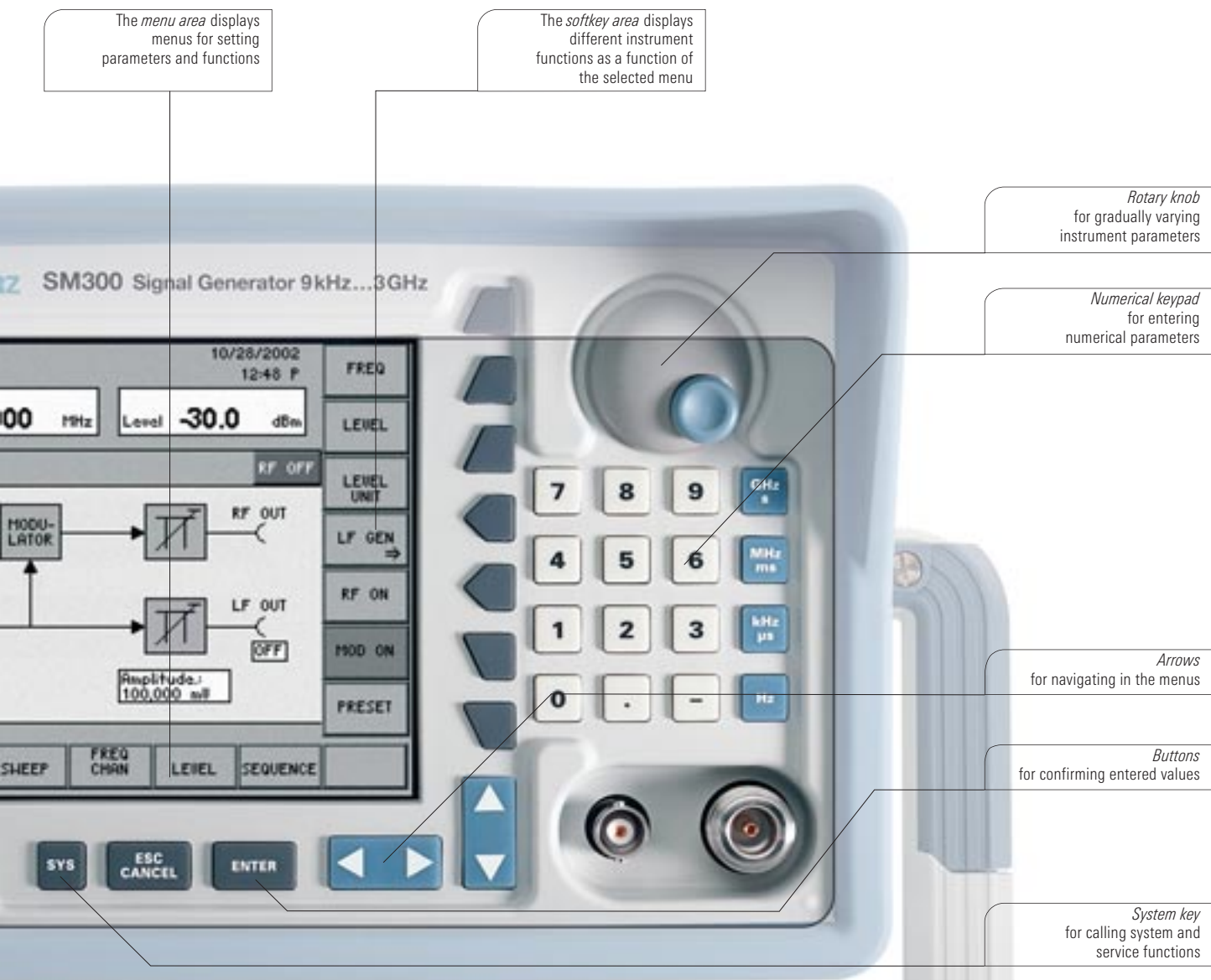
**High level accuracy**

**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 / $\varphi$ M / 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, $\Delta$ f = 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<sup>1</sup>

- 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.

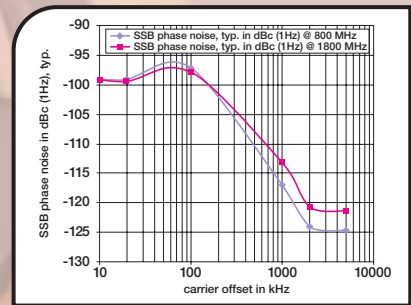
## EMC

- 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

<sup>1</sup> Requires an external baseband signal source, e.g. the R&S AMIQ.

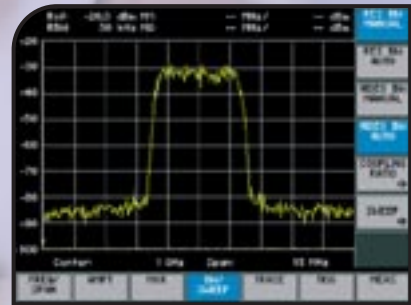
## High signal quality

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.



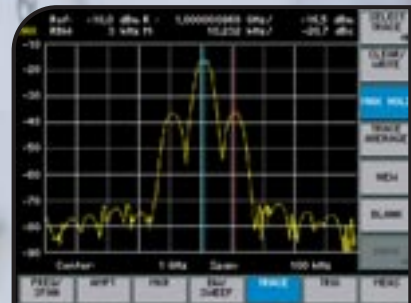
## Internal I/Q modulator for baseband signals

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.



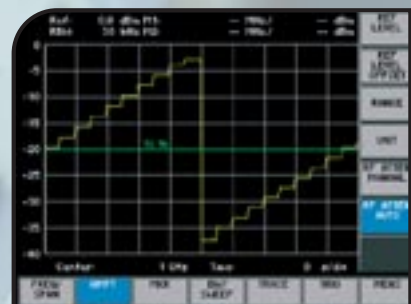
## Wide variety of analog modulation modes

The R&S SM300 can handle all analog modulation modes: AM / FM /  $\phi$ M / 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.



## The new instrument family – equipped for the future



### Versatile applications

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

## USB interfaces

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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

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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

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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](http://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 <sup>-6</sup> / year	
Temperature drift	1x10 <sup>-6</sup>	5°C to 30°C
Spectral purity		
Spurious		
Harmonics	<-30 dBc	level ≤0 dBm, f <sub>c</sub> >1 MHz
Subharmonics	<-50 dBc	f <sub>c</sub> >1 MHz
Nonharmonics	<-50 dBc	>10 kHz from carrier
Wideband noise	<-123 dBc	f <sub>c</sub> = 1 GHz, carrier offset >2 MHz
Single-sideband phase noise	<-95 dBc (1 Hz)	f <sub>c</sub> = 1 GHz, carrier offset 20 kHz
Residual FM, rms		f <sub>c</sub> = 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 <sub>c</sub> = 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	$f_{LF} = 1 \text{ kHz}$ , $m < 80 \%$ , level $\leq 0 \text{ dBm}$
AM total harmonic distortion	<2 %	$f_{LF} = 1 \text{ kHz}$ , $m < 80 \%$ , level $\leq 0 \text{ dBm}$
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	$f_{LF} = 1 \text{ kHz}$
FM total harmonic distortion	<1%	$f_{LF} = 1 \text{ kHz}$ , deviation = 50 kHz
Modulation frequency range	DC/20 Hz to 80 kHz	

### Phase modulation

Operating modes	internal	
Phase deviation	0 to 10 rad	$f_{LF} \leq 10 \text{ kHz}$
	0 to 5 rad	$10 \text{ kHz} < f_{LF} \leq 20 \text{ kHz}$
Resolution	<1 %, min. 0.001 rad	
Setting uncertainty	<5 % + 0.02 rad	$f_{LF} = 1 \text{ kHz}$
$\varphi\text{M}$ total harmonic distortion	<1.5%	$f_{LF} = 1 \text{ kHz}$ , 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	( $f_c = 1.8 \text{ GHz}$ )

### Pulse modulation/Pulse generator

operating modes	external, internal
Rise/fall time (10 %/90 %)	<500 ns
Delay time (external)	100 $\mu\text{s}$ to 1 s
Pulse width (internal)	100 $\mu\text{s}$ to 1 s
Pulse period (internal)	200 $\mu\text{s}$ to 2 s
Time resolution	1 $\mu\text{s}$

## 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 $\Omega$

### AM/FM modulator input

Connector	BNC female
Input voltage for max. modulation depth or modulation deviation	1 V
Input impedance	>100 k $\Omega$

### I/Q modulator inputs

I/Q inputs	BNC female
Input impedance	50 $\Omega$
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 $\Omega$
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 $\Omega$

<b>Interfaces</b>	
<b>USB host</b>	
Connector	B plug
Protocol	version 1.1
Command set	device-specific, remote control via supplied Windows driver (Windows XP, 2000)
<b>USB interface</b>	
Connector	A plug
Protocol	version 1.1

<b>Power supply</b>	
Input voltage range	100 V to 240 V (AC), 50 Hz to 60 Hz, autoranging
Power consumption	<35 VA

<b>General data</b>	
<b>Display</b>	
Type	5.4" active colour TFT display
Resolution	320 x 240 pixels
<b>Memory locations</b>	
Device setups	10
<b>Ambient conditions</b>	
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)
<b>Mechanical resistance</b>	
Vibration, sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz,      meets DIN EN 60068-2-6, DIN EN 61010-1 and 55 Hz to 150 Hz: 0.5 g constant      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
<b>Electromagnetic compatibility</b>	meets EN 55011 class B and EN 61326 (EMC Directive 89/336/EEC)
<b>EMI field strength</b>	<10 V/m
<b>Protection class</b>	DIN EN 61010-1 / IEC61010-1 UL3111-1; CSA22.2 No:1010.1
<b>Dimensions (W x H x D)</b>	219 mm x 147 mm x 350 mm
<b>Weight</b>	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



**ROHDE & SCHWARZ**

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