

R&S®SMB100B RF Signal Generator

Perfect combination of
performance and usability
in a compact size



R&S®SMB100B

RF Signal Generator

At a glance

The new R&S®SMB100B RF signal generator is all about performance and versatility in a small footprint. Outstanding spectral purity and very high output power combined with comprehensive functionality and very simple operation are some of the impressive features of the R&S®SMB100B.

The R&S®SMB100B sets new standards in spectral purity and output power in the mid-range segment. These characteristics have been integrated into a very compact and lightweight form factor.

Even without extra options, the R&S®SMB100B delivers outstanding performance. This outstanding performance can be enhanced for a specific application. For example, the R&S®SMBB-B1 option (OCXO) reduces the aging and temperature dependency of the reference frequency and improves single sideband (SSB) phase noise. The R&S®SMBB-B1H high performance OCXO option further improves these performance parameters. Compared to the standard instrument, the aging and temperature dependency are improved by more than a power of ten.

Two optional high output power levels are available. The base unit alone provides 20 dBm of output power at 1 GHz. The R&S®SMBB-K31 high output power option provides 8 dB more output power with 28 dBm. This first "high output power" level can be activated using a keycode directly on the instrument with no added service costs. Additionally installing the R&S®SMBB-B32 ultra high output power option gives the instrument another 6 dB. The ultra high output power of 34 dBm is unique for an instrument in this class (all values are measured at 1 GHz).

The R&S®SMB100B covers a frequency range from 8 kHz to 1 GHz, 3 GHz or 6 GHz. Besides pure CW signals, the R&S®SMB100B with R&S®SMBB-K720 option can generate amplitude, frequency and phase modulated signals.

Pulse generator and pulse modulator options allow generation of high-quality pulses. With the additional R&S®SMBB-K27 pulse train option, users can generate single pulses, double pulses and configurable pulse trains.

The R&S®SMB100B is an ideal choice for a wide range of applications in R&D, production, service and maintenance where a good price/performance ratio is also a key factor.

Key facts

- Frequency range from 8 kHz to 1 GHz, 3 GHz or 6 GHz
- Outstanding single sideband (SSB) phase noise of -134 dBc (meas.) at 1 GHz and an offset of 20 kHz
- Very low wideband noise of -153 dBc (typ.) at $15 \text{ MHz} < f \leq 6 \text{ GHz}$ and an offset of 30 MHz
- Ultra high output power of 34 dBm (meas.) at 1 GHz
- Compact form factor with 2 HU and $\frac{3}{4}$ 19" width
- Large, state-of-the-art 5" GUI with touchscreen



R&S®SMB100B

RF Signal Generator

Benefits and key features

Perfect for signal quality

- ▮ Very low SSB phase noise of -134 dBc (meas.) at 1 GHz and an offset of 20 kHz
- ▮ Very low close-in SSB phase noise of -94 dBc (meas.) at 1 GHz and offset of 10 Hz
- ▮ Very low wideband noise of -153 dBc (typ.) at $15 \text{ MHz} < f \leq 6 \text{ GHz}$ and an offset of 30 MHz
- ▮ Very low nonharmonic signal components of < -76 dBc (spec.) at 1 GHz

▷ [page 4](#)

Perfect for output power

- ▮ The R&S®SMBB-K31 high output power option provides 28 dBm at 1 GHz and 24 dBm at 6 GHz (measured values) – easy keycode activation
- ▮ Ultra high output power of 34 dBm at 1 GHz and 31 dBm at 6 GHz with additional R&S®SMBB-B32 ultra high output power option (measured values)

▷ [page 6](#)

Perfect for use

- ▮ Ergonomic operation thanks to state-of-the-art GUI with touchscreen
- ▮ Support of R&S®NRP power sensors and display of measured power on the generator display
- ▮ Easy integration into existing test environments using versatile reference frequency inputs and outputs
- ▮ Sanitizing of user data for secured areas

▷ [page 8](#)

R&S®LegacyPro: refresh your T&M equipment

- ▮ R&S®Legacy Pro program: replacement and emulation of obsolete signal generators using the R&S®SMB100B in an automated test environment without modifying the control software

▷ [page 11](#)

Perfect for signal quality

In order to improve a DUT, the signal quality of the signal source has to be significantly better than the DUT's performance. Thanks to its innovative synthesizer design, the R&S®SMB100B has very low SSB phase and wideband noise and excellent suppression of nonharmonic signal components.

Very low SSB phase noise

The R&S®SMB100B has a very low SSB phase noise of -134 dBc at 1 GHz and an offset of 20 kHz (measured; 1 Hz bandwidth). The R&S®SMBB-B1 option (OCXO) and the R&S SMBB-B1H option reduce the close-in phase noise.

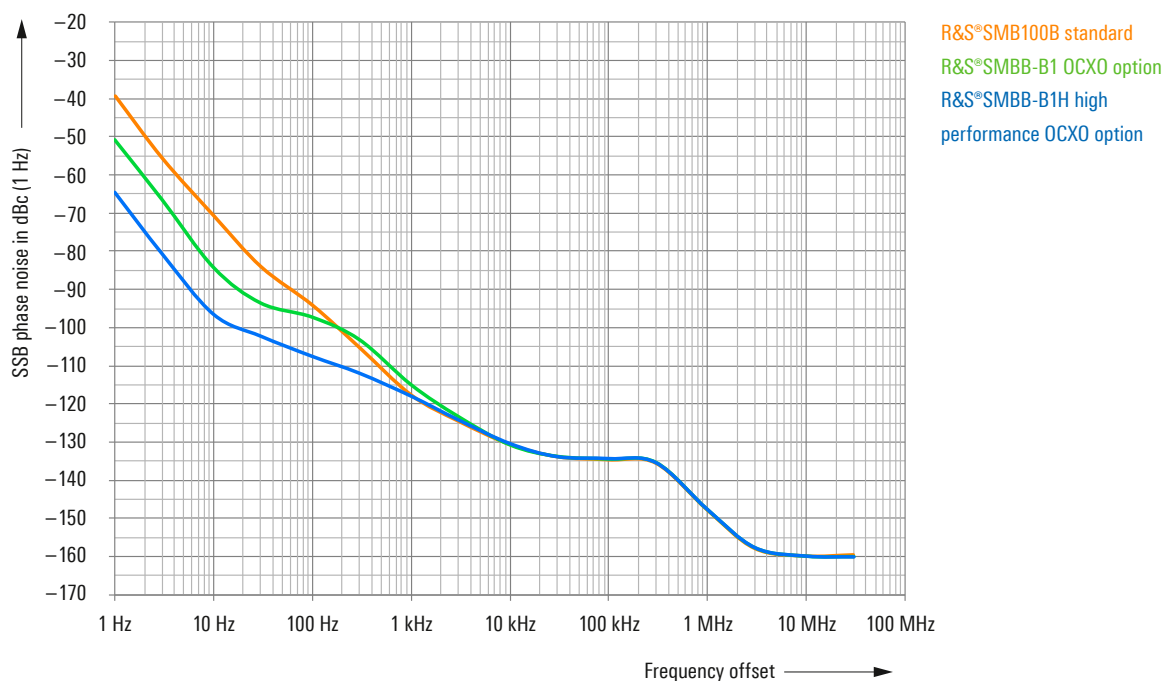
Also wideband noise is very low. The R&S®SMB100B achieves -153 dB/Hz (typ.) for a 1 GHz carrier at a frequency offset of 30 MHz.

Other benefits of these options include significantly improved long-term stability of the reference frequency and much less temperature dependency.

Purest 1 GHz reference output

In addition to its RF output, the R&S®SMB100B has a separate 1 GHz reference input and output. A 1 GHz reference signal provides better phase stability between the output signals of multiple coupled instruments than a 10 MHz reference signal. The SSB phase noise of this 1 GHz reference signal is shown in the diagram.

Single-sideband phase noise (1 GHz, 1 Hz bandwidth, measured)



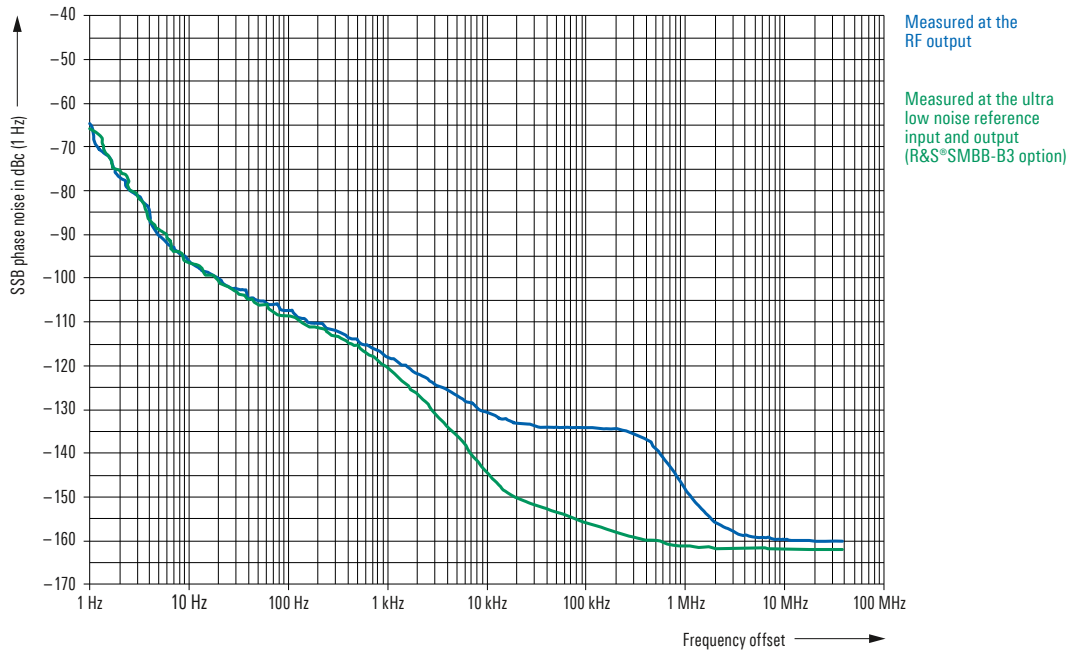
SSB phase noise of the R&S®SMB100B base unit, with the R&S®SMBB-B1 option (OCXO) and with the R&S®SMBB-B1H option (high performance OCXO).

Lowest nonharmonics

For signal generators, the nonharmonic signal components are often considered more critical than the harmonic signal components. This is because the frequency where a nonharmonic signal component occurs cannot be predicted, making it impossible to provide appropriate filtering.

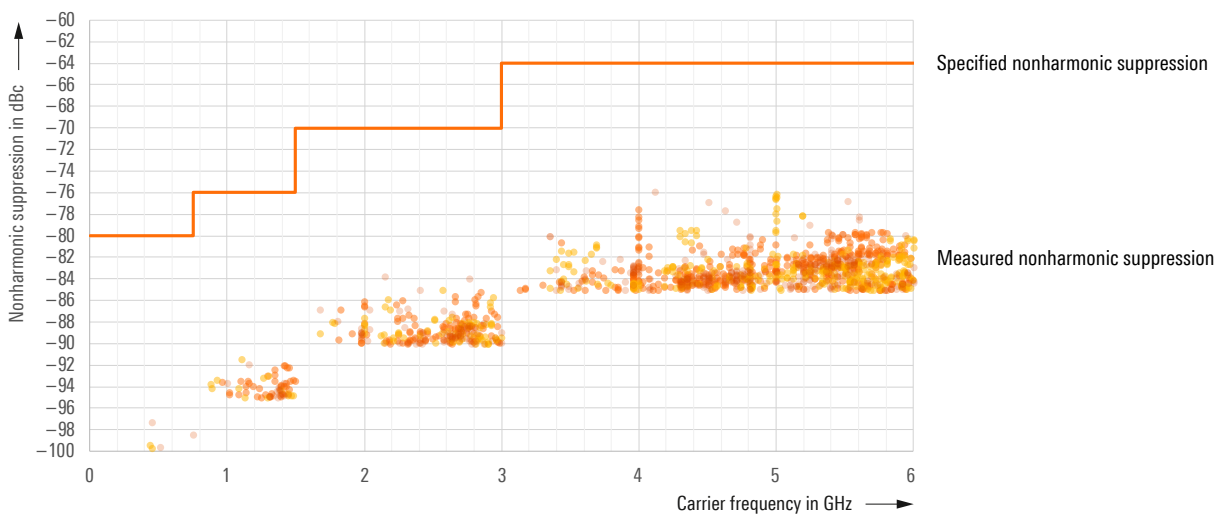
When testing ADCs, for example, excessively high non-harmonic components in the analog signal can lead to problems. The R&S®SMB100B excels with very low non-harmonic signal components of < -76 dBc (specified) at 1 GHz. Measurements show significantly better results.

Single-sideband phase noise with the R&S®SMBB-B1H option (1 GHz, 1 Hz bandwidth, measured)



Measured SSB phase noise at 1 GHz (R&S®SMB100B equipped with R&S®SMBB-B1H option). The blue curve shows the measurement at the RF output and the green curve shows the measurement at the separate 1 GHz reference output (R&S®SMBB-B3 option).

Measured values for nonharmonics (frequency offset > 10 kHz)



Measured R&S®SMB100B nonharmonic signal components (measured on several R&S®SMB100B instruments).

Perfect for output power

The need for very high output power often means that a signal generator must be combined with an amplifier connected to its output. The R&S®SMB100B offers a better alternative. With the R&S®SMBB-B32 ultra high output power option, it is a calibrated one-box solution that saves space and money.

Ultra high output power

Since the R&S®SMB100B provides very high output power, no external amplifier is required downstream. This simplifies the test setup and results in high absolute level accuracy. When equipped with the appropriate options, the R&S®SMB100B delivers +34 dBm at 1 GHz and +31 dBm at 6 GHz (measured values).

Very high dynamic range

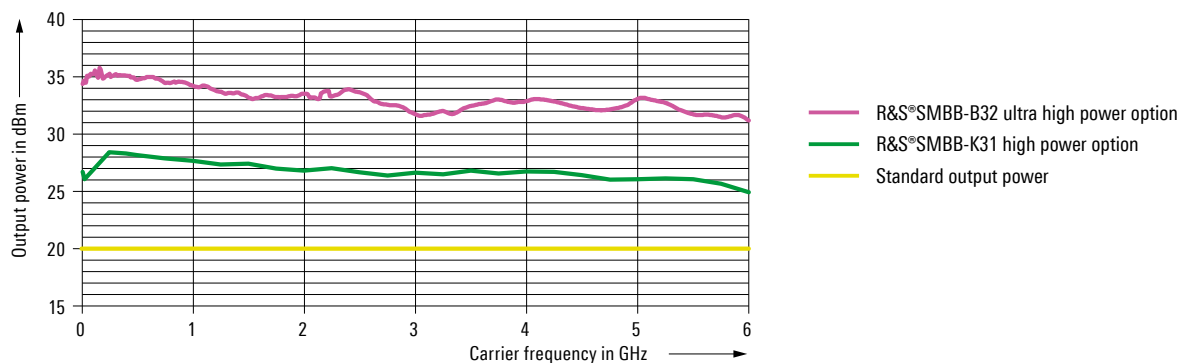
The usable dynamic range is defined by the difference between the maximum and minimum adjustable power. As soon as the lower end of the electronic setting range is reached, a switchable attenuator is activated to provide further attenuation. The R&S®SMB100B has a minimum specified power of -127 dBm as standard (for $f > 10$ MHz). With its specified maximum adjustable power of +26 dBm ($1 \text{ MHz} < f \leq 6 \text{ GHz}$), it has a very wide dynamic range of 153 dB.

The user always has the desired output power, regardless of whether the user is e.g. testing receiver sensitivity or needs high power levels for amplifier tests. The attenuator used in the R&S®SMB100B is fully electronic. Compared to a mechanical attenuator, it is wear-free, noiseless and changes the power level significantly faster.

Unmatched level repeatability

Not only absolute level accuracy, but also level repeatability plays an important role. Especially for frequently repeated test sequences where the level is often changed, it is essential to be able to reproduce each individual level value during every repeated sequence. Here again the R&S®SMB100B is best in class with a level repeatability of ± 0.02 dB (1 GHz, 0 dBm, meas.).

Maximum output power (measured)



Measured output power for the base unit, with the high power option (R&S®SMBB-K31) and with the additional ultra high power option (R&S®SMBB-B32).

High absolute level accuracy

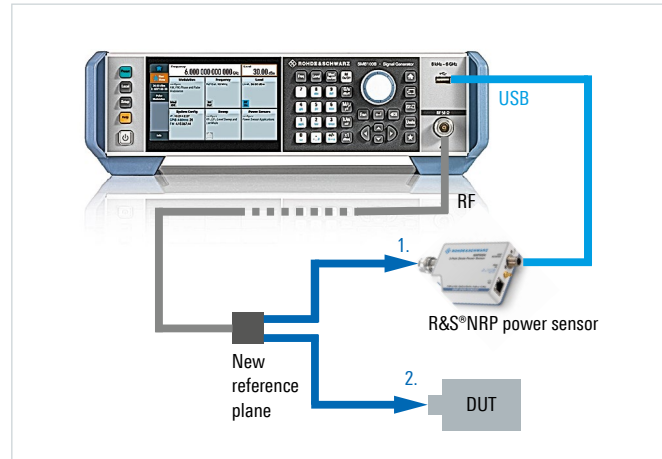
The R&S®SMB100B features excellent absolute level accuracy. The specified values of < 0.5 dB (200 kHz $< f \leq 3$ GHz) and < 0.7 dB ($f > 3$ GHz) at a level of > -90 dBm are best in class.

A DUT is rarely connected directly to the generator. There are often cables and other components between the generator and the DUT.



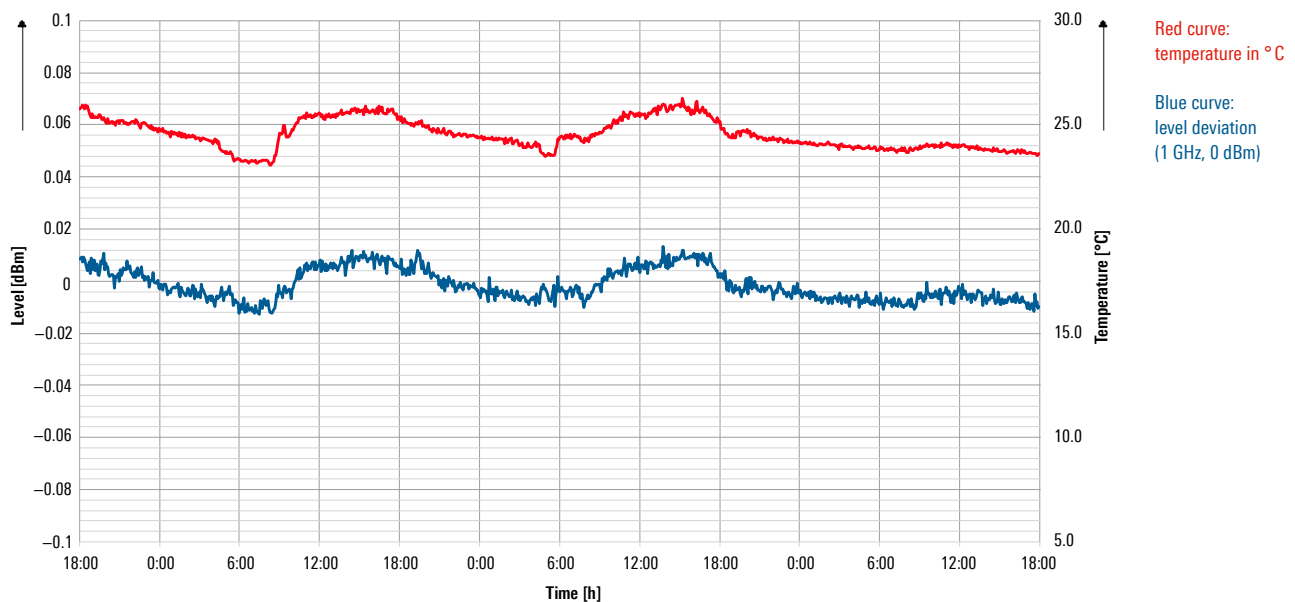
R&S®SMB100B with connected R&S®NRP power sensor (via USB).

This shifts the reference plane from the generator's RF output to the DUT. An R&S®NRP power sensor can be connected to the R&S®SMB100B to allow extremely precise calibration (tenth of a dB) at this new reference plane. The measured power can be directly read from the generator's display. The RF output power can be adjusted until the desired power at the new reference plane is reached.



R&S®SMB100B with external devices: R&S®NRP power sensor (via USB); setup for setting the target power at the new reference plane.

Measured level repeatability



Measured level repeatability at different temperatures over a very long time period of three days. The graph shows the accuracy with which a 0 dBm level at 1 GHz is repeated (another level is always selected between two 0 dBm settings).

Perfect for use

The user friendliness of the R&S®SMB100B is evident in many ways. The RF signal generator is simple to operate, supports working with a connected R&S®NRP power sensor and can emulate legacy instruments.

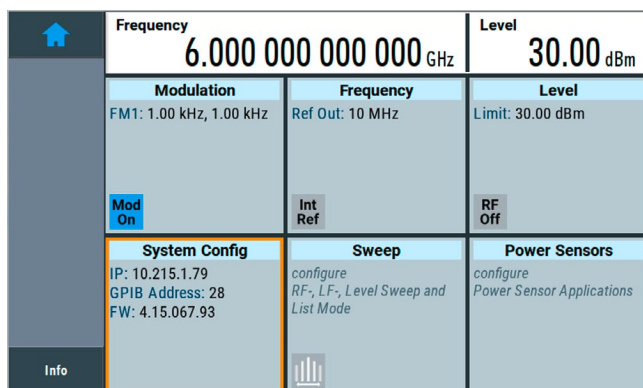
Ergonomic operation thanks to state-of-the-art GUI with touchscreen

The graphical user interface with high-resolution touchscreen makes the R&S®SMB100B very easy to use. The main screen clearly displays all important parameters and information to save the user time when looking for functions.

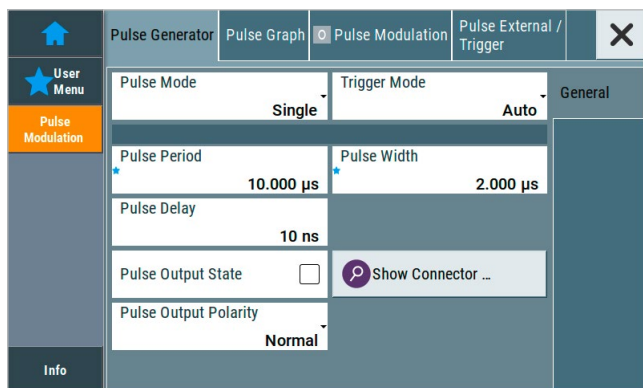
The ability to save a user menu on the R&S®SMB100B simplifies working with the instrument. Frequently used menu items can be added to the user menu so that the user can quickly and directly access all needed settings from a single menu.

Context-sensitive online help provides comprehensive information. It describes each parameter and setup menu in detail, states the setting range and shows the associated remote control command. Users can also search for specific parameters in the user manual installed on the instrument.

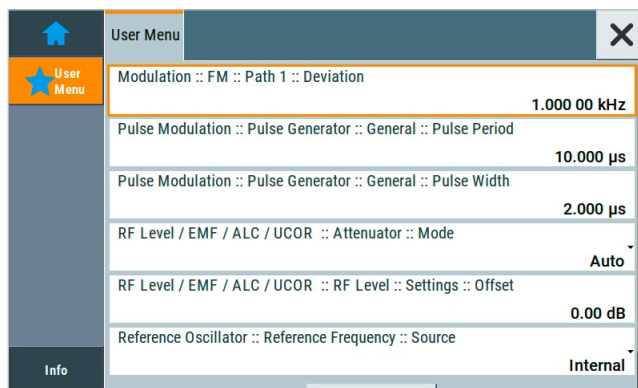
The R&S®SMB100B helps users quickly and correctly create remote control programs. The instrument's built-in SCPI macro recorder with code generator can automatically record all manual settings and create an executable MATLAB® script.



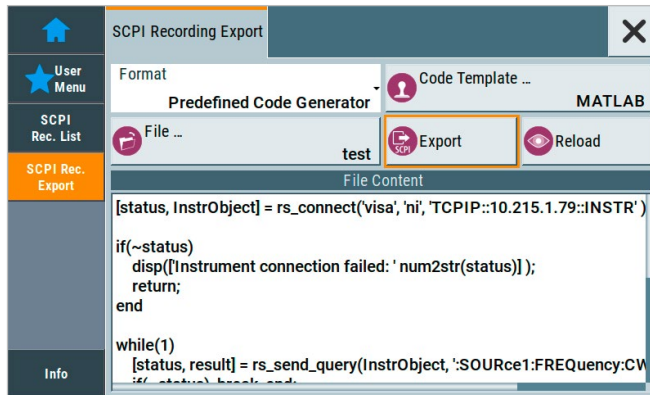
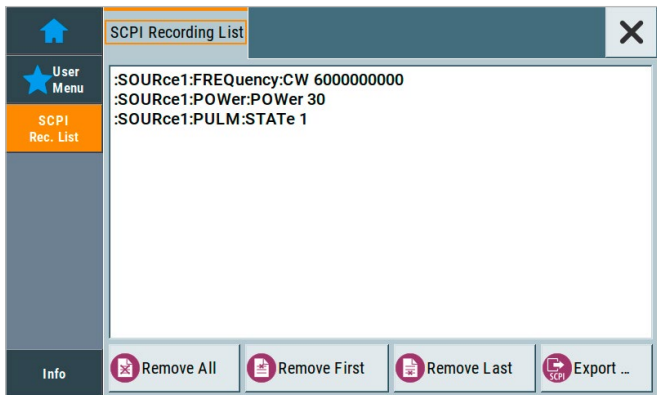
The main screen with all important parameters and information.



Individual menu items can be added to the user menu. Added items are marked with a blue star.



Example of a user menu. The individually composed parameters can be directly set in this menu.

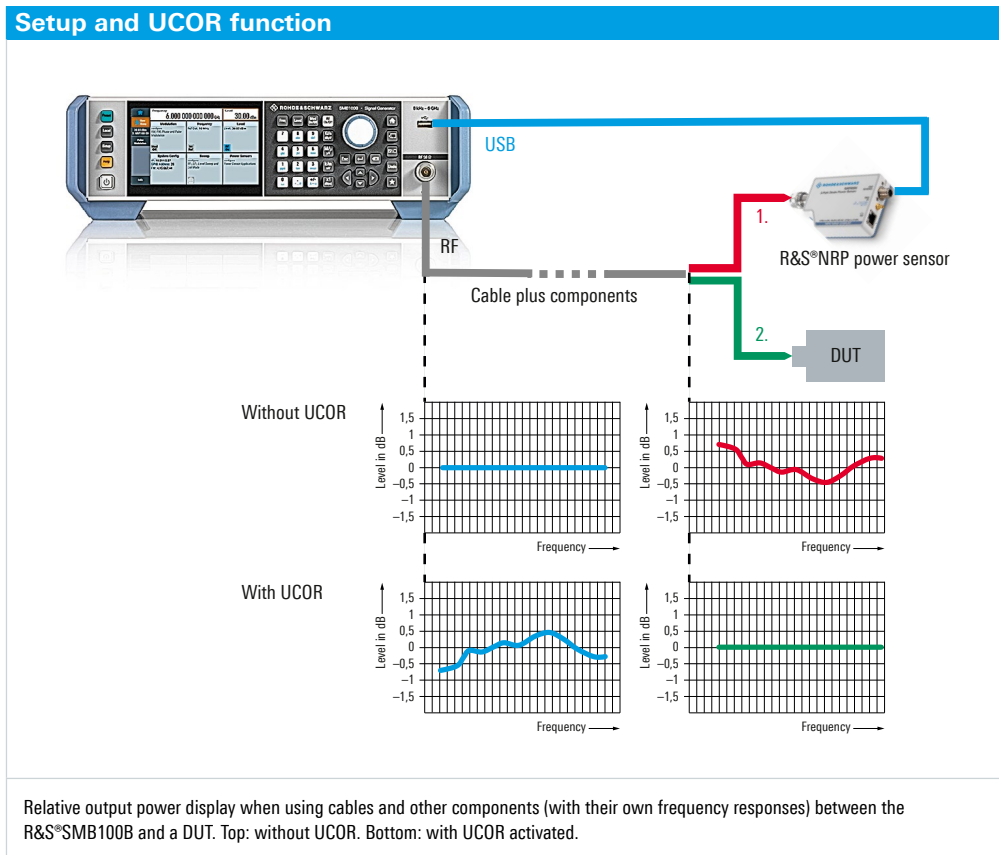


The built-in SCPI macro recorder and code generator supports fast, easy generation of SCPI program sequences.

Support of R&S®NRP power sensors

DUTs are often connected to the signal generator via long cables or other frequency-dependent components. It is therefore very important to compensate the frequency response. The R&S®SMB100B provides a user correction (UCOR) function for this purpose. If the frequency response of external components is known, level correction values for different frequencies can be entered in the R&S®SMB100B. The correction values between these frequency points are automatically interpolated.

The R&S®NRP power sensor offers a much more user-friendly solution than manual entry. The power sensor is connected as shown in the figure. At the push of a button, the level correction values are automatically determined and saved in the UCOR table. When UCOR is activated, a frequency response compensated RF signal is available at the new reference plane for the DUT.



Variable reference frequency inputs/outputs

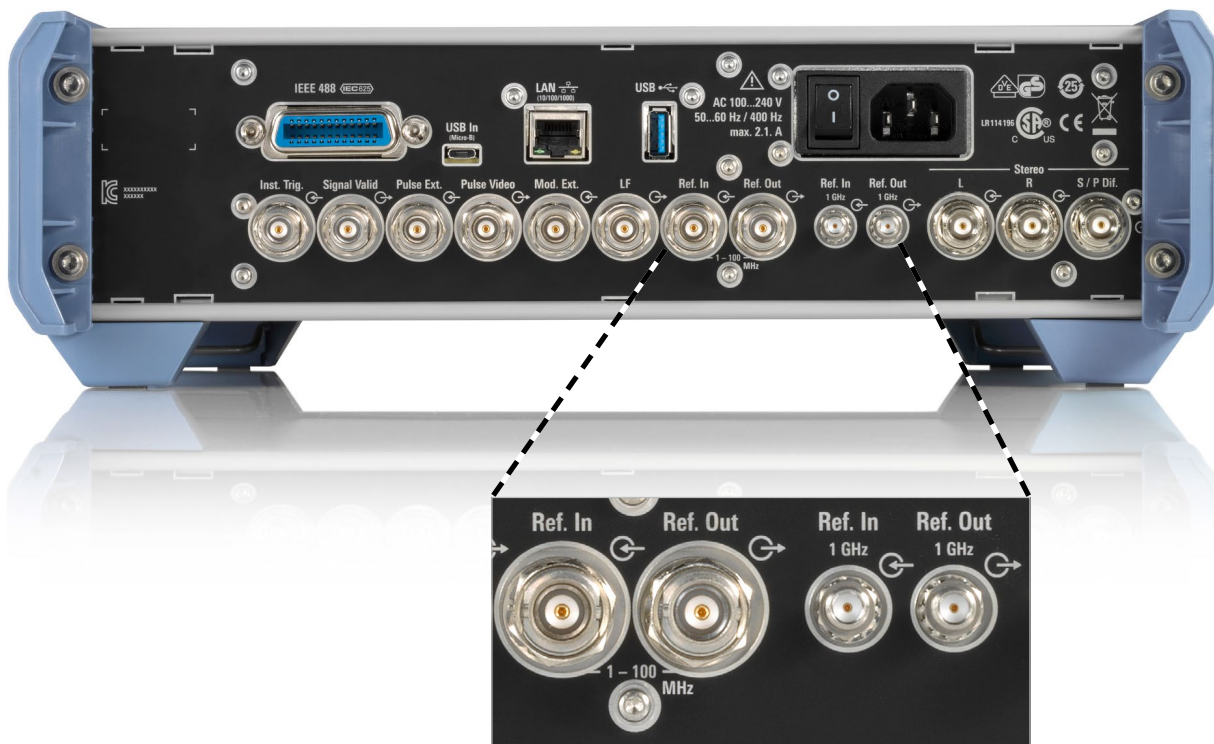
The R&S®SMB100B provides various ways to output (or input) reference signals. The 1 MHz to 100 MHz variable external reference frequency input (R&S®SMBB-K704 option) allows the R&S®SMB100B to be easily integrated into existing test environments. The received reference frequency can also be output to a separate reference output.

Extremely good phase stability between multiple R&S®SMB100B instruments can be achieved with the optional 1 GHz reference frequency input and output (R&S®SMBB-B3 option).

Sanitizing of user data for secured areas

To meet requirements for secured areas, the R&S®SMB100B can be configured to prevent user data from being saved to the instrument's internal nonvolatile memory. An easy-to-use erasure and sanitization procedure is available to remove user data from the instrument. As an additional precaution, a dedicated password can be used to disable the LAN and USB ports. The display can also be disabled. This ensures that no sensitive data will leave the secured area.

Rear panel reference frequency inputs and outputs



R&S® LegacyPro: refresh your T&M equipment

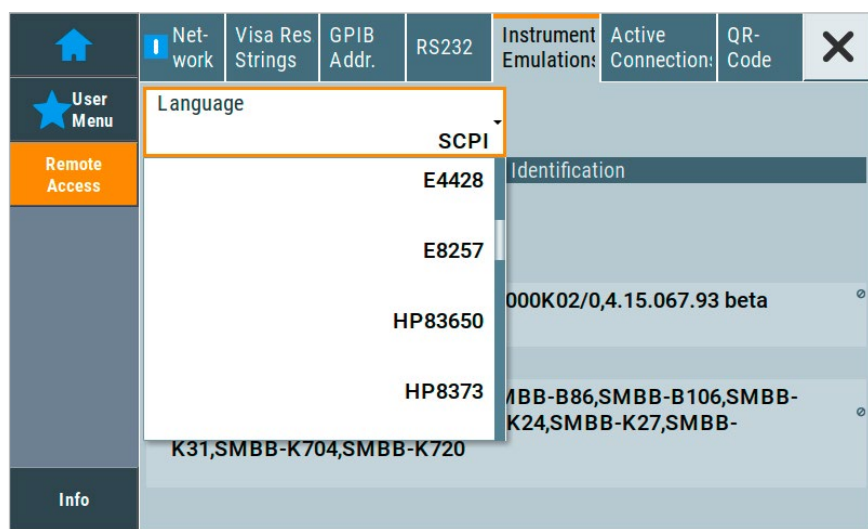


Replace your legacy signal generator

For older test systems, obsolescence is a common topic. When individual pieces of equipment become obsolete before the entire ATE system does, regular calibration and repair of obsolete equipment is an expensive, time-consuming and challenging task. Replacing obsolete test equipment with equivalent state-of-the-art instruments should be straightforward and require minimal hardware and software changes.

The R&S®SMB100B with R&S®LegacyPro code emulation fulfills these requirements, reducing the workload and eliminating risks. R&S®LegacyPro enables the R&S®SMB100B to reliably emulate a wide range of legacy generators from vendors such as Keysight, Agilent, HP, Anritsu and Rohde&Schwarz. As a result, the R&S®SMB100B can be deployed in legacy ATE systems without major software changes, effectively increasing uptime, lowering the cost of ownership and extending the test system's useful life.

Enjoy plug & play replacement of your legacy signal generator with the R&S®LegacyPro program and the R&S®SMB100B.



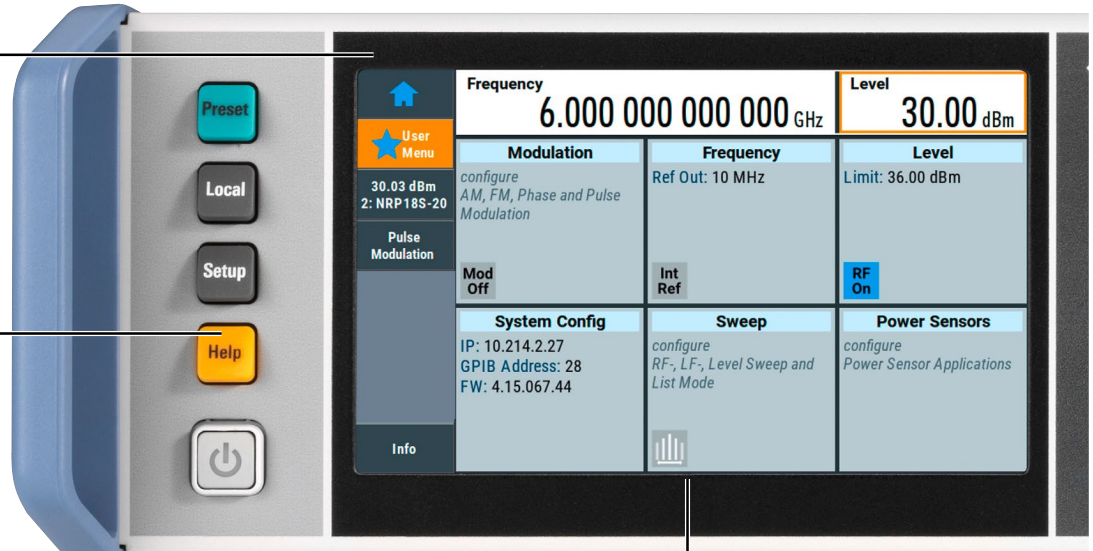
Emulation of legacy generators from Rohde & Schwarz and other vendors.

Front and rear panel overview

High-resolution touchscreen with easy-to-use graphical user interface

Context-sensitive help system and comprehensive user manual

The main screen clearly displays modulation, frequency and level settings as well as the system configuration, the sweep mode and power sensor related parameters



Remote control via LAN (GPIB and USB with R&S®SMBB-B86 option)

Input for external pulse modulation signal (R&S®SMBB-K22 option)

Variable LF output (R&S®SMBB-K24 option)





Standard USB connector for the R&S®NRP power sensors

RF output connector (N female)

Favorite key for simplified and fast operation via customizable user menu



FM stereo connectors (R&S®SMBB-B5 option)

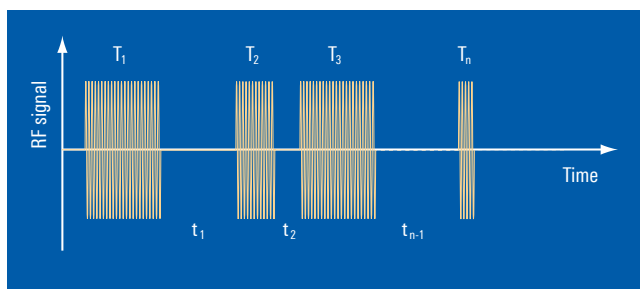
1 GHz reference input/output (R&S®SMBB-B3 option)

Variable reference input/output from 1 MHz to 100 MHz (R&S®SMBB-K704 option)

Radar pulse generation

Optional high-performance pulse modulator and pulse generator

Pulsed signals are frequently required in aerospace and defense applications to test radar systems. To meet this need, the R&S®SMB100B can be equipped with an R&S®SMBB-K22 integrated pulse modulator and an



Pulse train.

R&S®SMBB-K23 pulse generator with superb characteristics such as a minimum pulse width of 20 ns (for radar system testing). The pulse modulator makes it possible, for example, to perform radar tests with a high on/off ratio of > 80 dB and very short rise/fall times of meas. < 5 ns. The pulse modulator is either controlled by an external pulse signal or it is supplied by the internal pulse generator as modulation signals with single or double pulses or pulse trains.

Versatile pulse trains for complex test cases

An optional feature of the built-in pulse generator is the ability to generate pulse trains (R&S®SMBB-K27 option), which are commonly used for radar applications. An example of a pulse train is shown in the figure below. Unlike a single or double pulse, a pulse train is a combination of different pulses. It can be a periodical or non-periodical set of pulses. Pulse width and pulse pause can be set independently and separately for each pulse. This makes it possible to generate staggered pulses or to apply jitter to the pulse width and pulse pause. Up to 2047 different pulses with a repetition of 1 to 65 535 are possible. This yields very long pulse train sequences for testing.

Edit Pulse Train Data			
	ON-Time/ μ s	OFF-Time/ μ s	Count
0	10.00	20.00	1
1	1.00	0.50	3
2	3.50	5.10	1
3	11.00	1.30	2
4	4.36	3.40	1



Pulse train tables and their graphical representation.

Testing of FM stereo and RDS receivers

FM stereo is still a major audio broadcasting medium – especially in the automotive sector where millions of car radios are produced every year. For testing FM stereo receivers, audio test signals are modulated onto an RF carrier and measured after demodulation by the DUT. Test signals are also needed for the radio data system (RDS) that has been established in many countries for a long time.

Optional stereo/RDS coder

The optional stereo/RDS coder (R&S®SMBB-B5) meets all the above requirements. Built into the R&S®SMB100B, the solution is based on equipment that features an excellent price/performance ratio as well as top-class specifications and fully covers the required frequency range.

Automatic synchronization of measurement results

The stereo/RDS coder also works with external signals applied to its analog (left and right) or digital (S/P DIF) modulation inputs. Combining the R&S®SMB100B signal generator with the R&S®UPV or R&S®UPP audio analyzer creates

a general-purpose test system for FM receivers. The great advantage is the automatic synchronization of measurement results. As in other audio measurements, the test signals are produced in the generator section of the audio analyzer, routed to the DUT through the R&S®SMB100B as a modulator and measured in the analyzer section of the R&S®UPV or R&S®UPP. Since generation and analysis are optimally timed, measurement times are considerably shorter than with separately operating instruments.

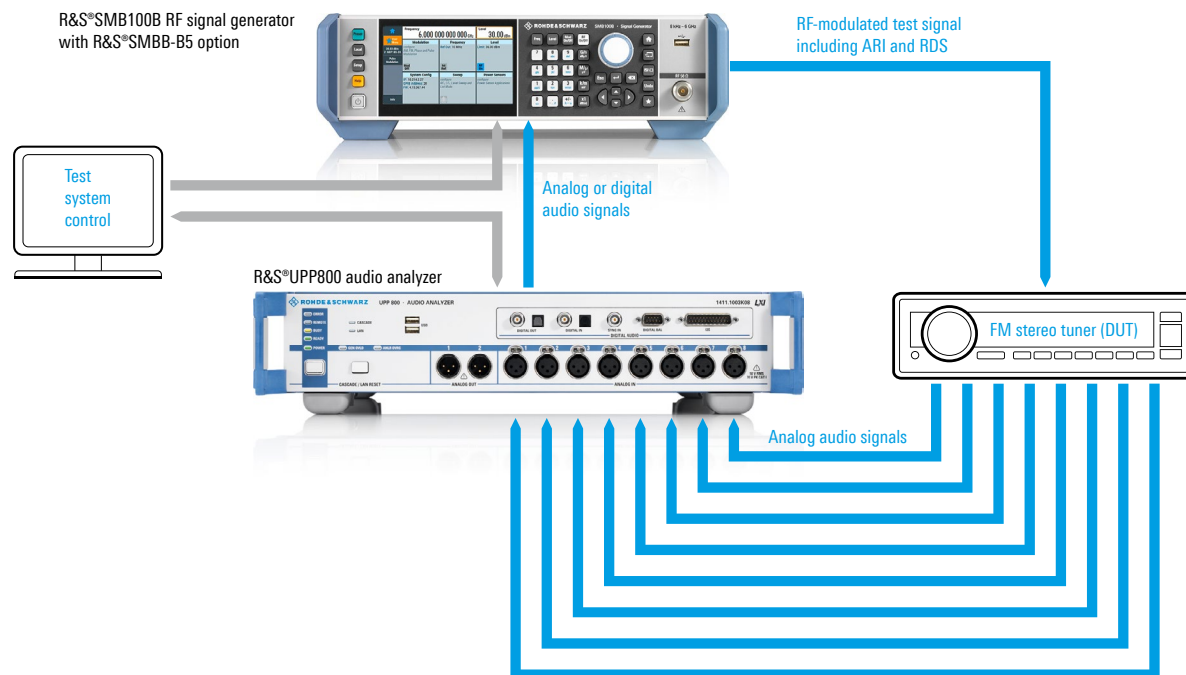
Up to five different RDS sequences

The R&S®SMB100B with the R&S®SMBB-B5 option generates stereo multiplex signals, including ARI and RDS information, and outputs the signals at the RF output. It is possible to choose between traffic announcement identification and standardized area identification A to F. The RDS traffic program and RDS traffic announcement can be switched on and off. Up to five different RDS sequences can be loaded. With a length of up to 64 000 characters per sequence, longer RDS applications such as radio text can also be tested.

Versatile internal LF generator

The internal LF generator, which is suitable for general receiver tests, is part of the basic R&S®SMB100B configuration. It generates sinusoidal signals at fixed or swept LF frequencies, allowing basic functional tests to be carried out without an external signal.

Typical production test setup to measure FM car radios with eight audio channels



The R&S®UPP800 audio analyzer generates all required audio test signals and transfers them to the R&S®SMB100B, which adds the ARI and RDS test signals and modulates the entire test signal onto the RF carrier. The DUT demodulates the received test signal and outputs the audio signals on all amplifier channels. Measuring these signals with the R&S®UPP800 closes the loop and makes it possible to analyze the overall sound quality of the car radio under test.

Specifications in brief

Specifications in brief		
Frequency range	R&S®SMBB-B101	8 kHz to 1 GHz
	R&S®SMBB-B103	8 kHz to 3 GHz
	R&S®SMBB-B106	8 kHz to 6 GHz
Level		
Maximum specified output power (PEP)	R&S®SMBB-B101/-B103/-B106 standard	
	200 kHz < f ≤ 1 MHz	-110 dBm to +13 dBm
	1 MHz < f ≤ 10 MHz	-110 dBm to +18 dBm
	10 MHz < f ≤ 6 GHz	-127 dBm to +18 dBm
	with R&S®SMBB-K31 option	
	200 kHz < f ≤ 1 MHz	-110 dBm to +13 dBm
	1 MHz < f ≤ 10 MHz	-110 dBm to +21 dBm
	10 MHz < f ≤ 4 GHz	-127 dBm to +21 dBm
	4 GHz < f ≤ 6 GHz	-127 dBm to +20 dBm
	with R&S®SMBB-B32 and R&S®SMBB-K31 options	
	200 kHz < f ≤ 10 MHz	-110 dBm to +21 dBm
	10 MHz < f ≤ 6 GHz	-127 dBm to +26 dBm
	Spectral purity	
SSB phase noise	f = 1 GHz, 20 kHz offset, 1 Hz measurement bandwidth	< -126 dBc, -132 dBc (typ.)
Harmonics	1 MHz < f ≤ 6 GHz; level ≤ 13 dBm	< -30 dBc
Nonharmonics	CW, level > +10 dBm; offset > 10 kHz from carrier	
	f ≤ 750 MHz	< -80 dBc
	750 MHz < f ≤ 1500 MHz	< -76 dBc
	1500 MHz < f ≤ 3 GHz	< -70 dBc
	3 GHz < f ≤ 6 GHz	< -64 dBc
Modulation	with R&S®SMBB-K720 option	AM, FM, φM
	with R&S®SMBB-K22 option	pulse modulation
	rise/fall time	10% to 90% of RF amplitude, f > 80 MHz
	transition type: fast	< 15 ns, 5 ns (meas.)
	on/off ratio	> 80 dB
	minimum pulse width	50%/50% of RF amplitude,
	transition type: fast	< 20 ns
Compatible command sets	command sets can be used to emulate another instrument; a subset of common commands is supported	Aeroflex (IFR/Marconi), Agilent/Keysight Technologies, Hewlett Packard, Anritsu, Panasonic, Racal Dana (more details in the data sheet)

Always up-to-date

The firmware can be updated using an USB storage device or the LAN port.

Free firmware updates are downloadable from the Internet at www.rohde-schwarz.com.

Ordering information

Designation	Type	Order No.
R&S®SMBB-Bxxx = hardware option		
R&S®SMBB-Kxxx = software/keycode option		
Base unit		
Signal Generator, including power cable and quick start guide	R&S®SMB100B	1422.1000.02
Frequency options ¹⁾		
8 kHz to 1 GHz	R&S®SMBB-B101	1422.5005.02
8 kHz to 3 GHz	R&S®SMBB-B103	1422.5105.02
8 kHz to 6 GHz	R&S®SMBB-B106	1422.5205.02
Reference oscillator options		
OCXO Reference Oscillator ²⁾	R&S®SMBB-B1	1422.5305.02
High Performance OCXO Reference Oscillator ²⁾	R&S®SMBB-B1H	1422.5405.02
100 MHz, 1 GHz Ultra Low Noise Reference Input and Output	R&S®SMBB-B3	1422.5505.02
Variable Reference Input from 1 MHz to 100 MHz	R&S®SMBB-K704	1422.6301.02
Output power options		
High Output Power, 1/3/6 GHz	R&S®SMBB-K31	1422.5705.02
Ultra High Output Power 1/3/6 GHz ³⁾	R&S®SMBB-B32	1422.5740.02
Analog modulation options		
High Performance Pulse Modulator	R&S®SMBB-K22	1422.5905.02
Pulse Generator	R&S®SMBB-K23	1422.6001.02
Multifunction Generator	R&S®SMBB-K24	1422.6053.02
Pulse Train ⁴⁾	R&S®SMBB-K27	1422.6101.02
AM/FM/φM	R&S®SMBB-K720	1422.6201.02
Stereo/RDS Coder ⁵⁾	R&S®SMBB-B5	1422.5605.02
Other options		
Remote Control Interface (GPIB and USB)	R&S®SMBB-B86	1422.5805.02
Recommended extras		
19" Rackmount Kit	R&S®ZZA-KNA23	1177.8084.00
Power Sensor, 10 MHz to 18 GHz, for levels up to 15 W	R&S®NRP18S-20	1424.6738.02
USB Interface Cable for R&S®NRPS18-20	R&S®NRP-ZKU	1419.0658.02
USB Serial Adapter for RS-232 remote control	R&S®TS-USB1	6124.2531.00
Documentation		
Documentation of Calibration Values	R&S®DCV-2	0240.2193.18
R&S®SMB100B Accredited Calibration	R&S®SMBB-ACA	1422.6147.02

Warranty		
Base unit		3 years
All other items ⁶⁾		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 Accredited Calibration Coverage, one year	R&S®AW1	
Extended Warranty with Accredited Calibration Coverage, two years	R&S®AW2	

¹⁾ The base unit must be ordered together with an R&S®SMBB-B101, R&S®SMBB-B103 or R&S®SMBB-B106 frequency option.

²⁾ Only one of the R&S®SMBB-B1 or R&S®SMBB-B1H options can be installed.

³⁾ Requires the R&S®SMBB-K31 option.

⁴⁾ Requires the R&S®SMBB-K23 option.

⁵⁾ Requires the R&S®SMBB-K720 option.

⁶⁾ For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

R&S®SMB100B Signal Generator Specifications



Version 02.00, July 2019

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Definitions

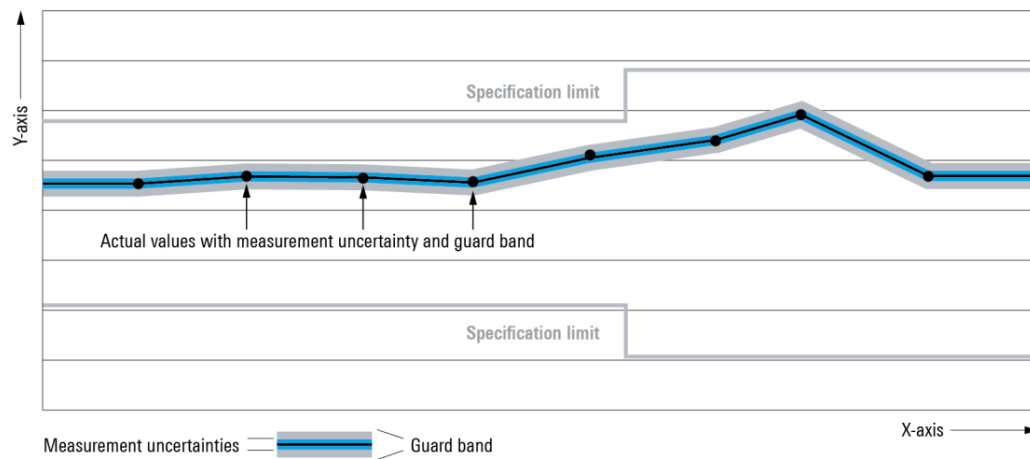
General

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 $<$, \leq , $>$, \geq , \pm , 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 designated with the format "parameter: value".

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

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RF characteristics

Frequency

Range	R&S®SMBB-B101	8 kHz to 1 GHz
	R&S®SMBB-B103	8 kHz to 3 GHz
	R&S®SMBB-B106	8 kHz to 6 GHz
Resolution of setting		0.001 Hz
Resolution of synthesis	f = 1 GHz	0.163 µHz (nom.)
Settling time	to within $< 1 \times 10^{-7}$ for f > 200 MHz or < 20 Hz for f ≤ 200 MHz with GUI update stopped	
	after IEC/IEEE bus delimiter with R&S®SMBB-B86 option, level setting characteristic: auto	< 1.1 ms (0.8 ms meas.)
Range and resolution of phase offset setting		-36 000° to +36 000°, 0.01° resolution

Frequency sweep

Operating mode		digital sweep in discrete steps
Trigger mode	execute sweep continuously with internal trigger source	auto
	execute one full sweep	single / extern single
	execute one step	step / extern step
	sweep start and stop controlled by external trigger signal	extern start / stop
Trigger source		external trigger signal (INST TRIG at rear), rotary knob, touch panel, remote control
Trigger slope		positive, negative
Sweep range		full frequency range
Sweep shape		sawtooth, triangle
Step spacing		linear, logarithmic
Step size	linear	full frequency range, min. 0.001 Hz
	logarithmic	0.01 % to 100 %
Dwell time setting range		5 ms to 100 s
Dwell time resolution		0.1 ms

Reference frequency

Frequency error	at time of calibration in production	
	standard	$< 1 \times 10^{-7}$
	with R&S®SMBB-B1 or R&S®SMBB-B1H option	$< 1 \times 10^{-8}$
Aging	after 30 days of uninterrupted operation	
	standard	$\leq 1 \times 10^{-6}/\text{year}$
	with R&S®SMBB-B1 option	$\leq 1 \times 10^{-9}/\text{day}$ $\leq 1 \times 10^{-7}/\text{year}$
	with R&S®SMBB-B1H option	$\leq 5 \times 10^{-10}/\text{day}$ $\leq 3 \times 10^{-8}/\text{year}$
Temperature effect	in temperature range from 0 °C to +55 °C	
	standard	$\pm 2 \times 10^{-6}$
	with R&S®SMBB-B1 option	$\pm 1 \times 10^{-7}$
	with R&S®SMBB-B1H option	$\pm 1 \times 10^{-8}$
Warm-up time	to nominal thermostat temperature, with R&S®SMBB-B1 or R&S®SMBB-B1H option	≤ 10 min

Source		internal, external
External reference frequency modes	standard	10 MHz
	R&S®SMBB-B3 option required	100 MHz
	R&S®SMBB-B3 option required	1 GHz
	R&S®SMBB-K704 option required	variable
Reference frequency input		
Connector type	REF IN on rear panel	BNC female
Input frequency	external reference frequency mode: 10 MHz	10 MHz
	external reference frequency mode: 100 MHz	100 MHz
	external reference frequency mode: variable	1 MHz to 100 MHz
Input frequency setting resolution	external reference frequency mode: variable	0.1 Hz
Minimum frequency locking range	external reference frequency modes: 10 MHz, 100 MHz	$\pm 100 \times 10^{-6}$
	external reference frequency mode: variable	
	without R&S®SMBB-B1/-B1H option	$\pm 6 \times 10^{-6}$
	with R&S®SMBB-B1/-B1H option	$\pm 0.3 \times 10^{-6}$
Input level range		0 dBm to +16 dBm
Input impedance		50 Ω (nom.)
Reference frequency output		
Connector type	REF OUT on rear panel	BNC female
Output frequency	sine wave	
	source mode: internal	10 MHz
	source mode: external	
	external reference frequency modes: 10 MHz, 1 GHz	10 MHz
	external reference frequency mode: 100 MHz	100 MHz
	external reference frequency mode: variable	10 MHz, applied external reference frequency ¹
Output level		+7 dBm to +13 dBm, +10 dBm (typ.)
Source impedance		50 Ω (nom.)
1 GHz reference frequency input (R&S®SMBB-B3 option)		
Connector type	REF 1G IN on rear panel	SMA female
Input frequency		1 GHz
Minimum frequency locking range		$\pm 100 \times 10^{-6}$
Input level range		0 dBm to +16 dBm
Input impedance		50 Ω (nom.)
1 GHz reference frequency output (R&S®SMBB-B3 option)		
Connector type	REF 1G OUT on rear panel	SMA female
Output frequency	sine wave	1 GHz
Output level		0 dBm to +13 dBm, +10 dBm (typ.)
Source impedance		50 Ω (nom.)

¹ Works only within the input frequency ranges of 5 MHz to 13 MHz and 95 MHz to 100 MHz.

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Reference frequency option concept

		without option	with R&S®SMBB-K704 option flexible reference input	with R&S®SMBB-B3 option 100 MHz/1 GHz reference
INPUT	10 MHz input frequency	•	•	•
	100 MHz input frequency	–	–	•
	1 MHz to 100 MHz input frequency	–	•	–
	1 GHz input frequency	–	–	•
OUTPUT	10 MHz output frequency ²	•	•	•
	'Loop through' of input to output ³	•	•	•
	1 GHz output frequency	–	–	•

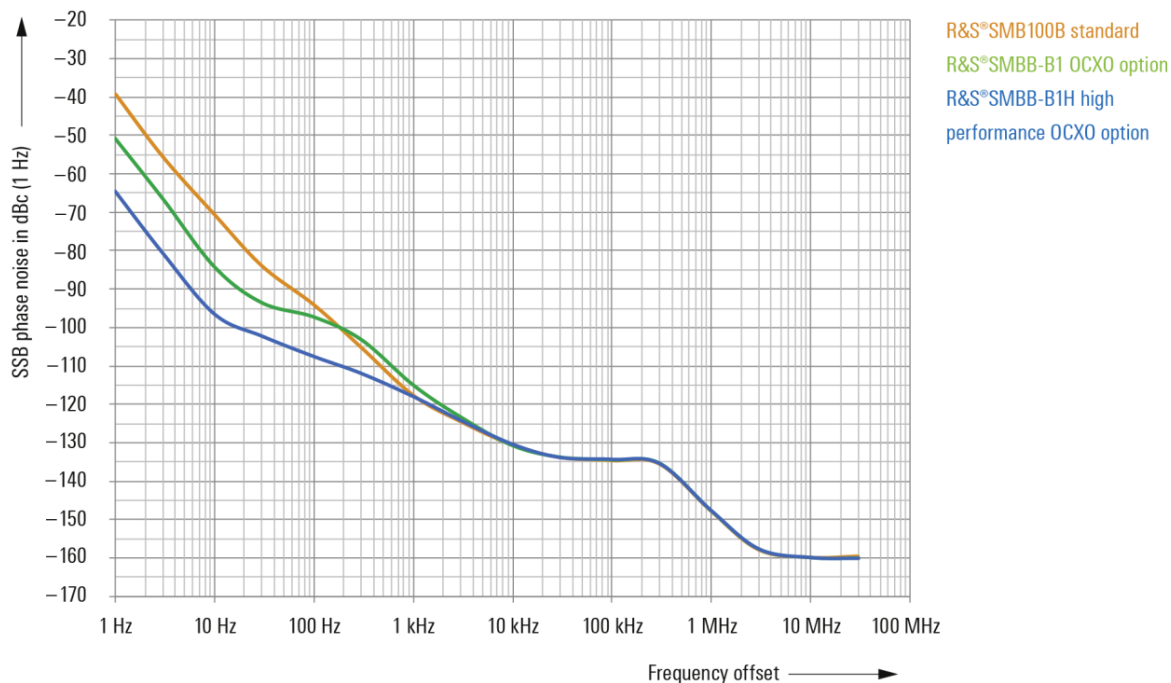
Option R&S®SMBB-K704 flexible reference input from 1 MHz to 100 MHz

When this option is installed, the user can set the variable reference input frequency in 0.1 Hz steps between 1.0 and 100 MHz. The signal generator will lock its internal 10 MHz reference oscillator on the input frequency.

Option R&S®SMBB-B3 100 MHz, 1 GHz ultra low noise reference input/output

When this option is installed, the user can apply a 1 GHz reference signal to the dedicated SMA connector. The signal generator will lock its internal 500 MHz reference oscillator on the 1 GHz reference. This option should be used if a very high phase stability between multiple generators is required.

Also, the '100 MHz' input frequency mode is only available with this option. The signal generator will lock its internal 500 MHz reference oscillator on the 100 MHz reference.



SSB phase noise of the R&S®SMB100B base unit, with the R&S®SMBB-B1 option (OCXO) and with the R&S®SMBB-B1H option (high performance OCXO).

² Not available with all external input reference frequencies.

³ Not available with all external input reference frequencies.

Level settings

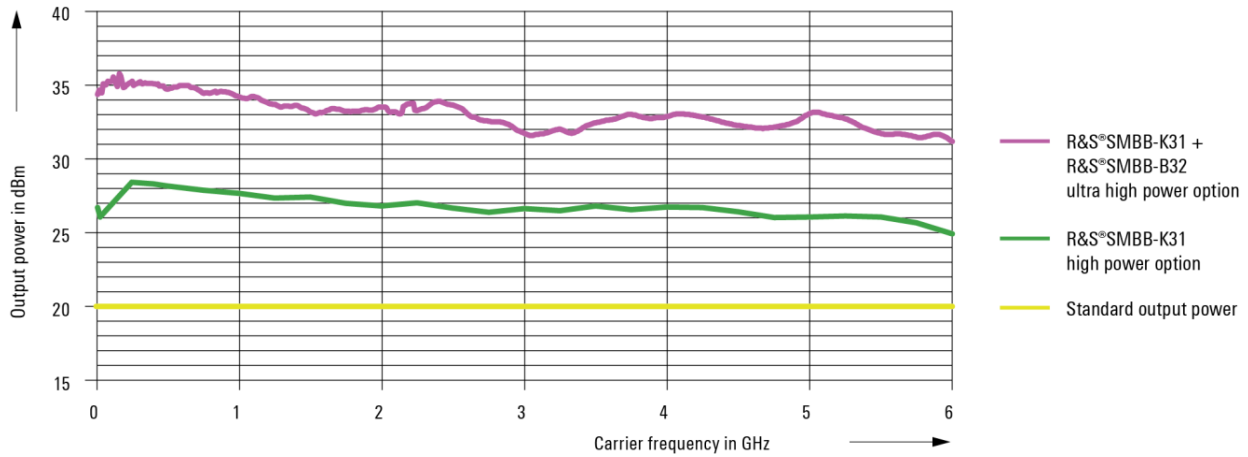
Setting range		
R&S®SMBB-B101/-B103/-B106	standard	
	8 kHz ≤ f < 100 kHz	−145 dBm to +8 dBm
	100 kHz ≤ f < 300 kHz	−145 dBm to +13 dBm
	300 kHz ≤ f < 1 MHz	−145 dBm to +18 dBm
	1 MHz ≤ f < 6 GHz	−145 dBm to +20 dBm
	with R&S®SMBB-K31 option	
	8 kHz ≤ f < 100 kHz	−145 dBm to +8 dBm
	100 kHz ≤ f < 300 kHz	−145 dBm to +13 dBm
	300 kHz ≤ f < 1 MHz	−145 dBm to +18 dBm
	1 MHz ≤ f ≤ 6 GHz	−145 dBm to +30 dBm
	with R&S®SMBB-B32 and R&S®SMBB-K31 option	
	8 kHz ≤ f < 100 kHz	−145 dBm to +23 dBm
	100 kHz ≤ f < 300 kHz	−145 dBm to +27 dBm
300 kHz ≤ f < 1 MHz	−145 dBm to +31 dBm	
1 MHz ≤ f ≤ 6 GHz	−145 dBm to +36 dBm	
Setting resolution		0.01 dB
Interruption-free level range	level setting characteristic: uninterrupted level setting	> 20 dB

Maximum output power can be limited via "Level Limit" menu.

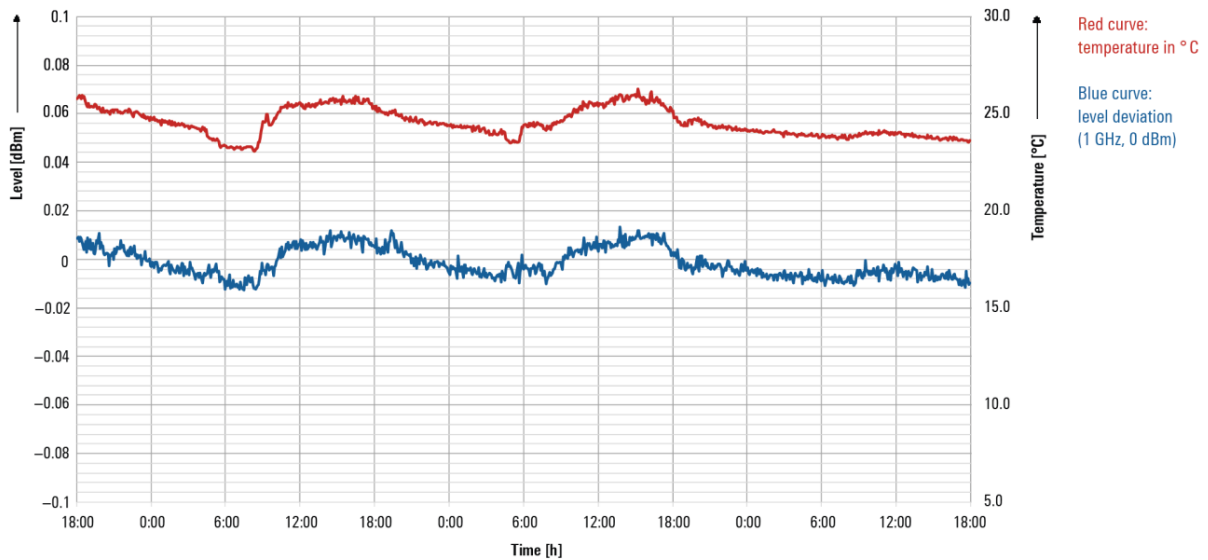
Level performance

Specified level range, peak envelope power (PEP)		
R&S®SMBB-B101/-B103/-B106	standard	
	200 kHz < f ≤ 1 MHz	−110 dBm to +13 dBm
	1 MHz < f ≤ 10 MHz	−110 dBm to +18 dBm
	10 MHz < f ≤ 6 GHz	−127 dBm to +18 dBm
	with R&S®SMBB-K31 option	
	200 kHz < f ≤ 1 MHz	−110 dBm to +13 dBm
	1 MHz < f ≤ 10 MHz	−110 dBm to +21 dBm
	10 MHz < f ≤ 4 GHz	−127 dBm to +21 dBm
	4 GHz < f ≤ 6 GHz	−127 dBm to +20 dBm
	with R&S®SMBB-B32 and R&S®SMBB-K31 option	
200 kHz < f ≤ 10 MHz	−110 dBm to +21 dBm	
10 MHz < f ≤ 6 GHz	−127 dBm to +26 dBm	
Level accuracy	level setting characteristic: auto, temperature range +18 °C to +33 °C	
R&S®SMBB-B101/-B103/-B106	level > −90 dBm	
	200 kHz < f ≤ 3 GHz	< 0.5 dB
	f > 3 GHz	< 0.7 dB
	level ≤ −90 dBm	
	200 kHz < f ≤ 10 MHz	< 1.2 dB
	10 MHz < f ≤ 3 GHz	< 0.8 dB
	f > 3 GHz	< 1.1 dB
Additional level error	ALC state "Off (Table)"	< 0.5 dB
	Pulse modulation	< 0.5 dB

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Measured output power for the base unit, with the high power option (R&S®SMBB-K31) and with the additional ultra high power option (R&S®SMBB-B32).



Measured level repeatability at different temperatures over a very long time period of three days. The graph shows the accuracy with which a 0 dBm level at 1 GHz is repeated (another level is always selected between two 0 dBm settings).

Level settling time

Settling time	to < 0.1 dB deviation from final value, with GUI update stopped, temperature range +18 °C to +33 °C, f > 10 MHz, level setting characteristic: auto	
	after IEC/IEEE bus delimiter with R&S®SMBB-B86 option	< 1 ms, (0.7 ms meas.)

Reverse power

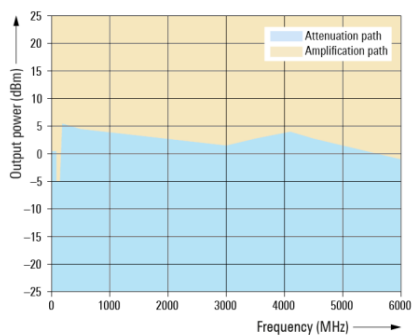
The R&S®SMB100B includes a reverse power protection as standard. The reverse power protection switches off the RF output signal if reverse power exceeds the limit.

Maximum permissible RF power in output frequency range of RF path, from 50 Ω source		
Reverse power	1 MHz < f ≤ 1 GHz	50 W
	1 GHz < f ≤ 2 GHz	25 W
	2 GHz < f ≤ 6 GHz	10 W
Maximum permissible DC voltage		50 V (nom.)

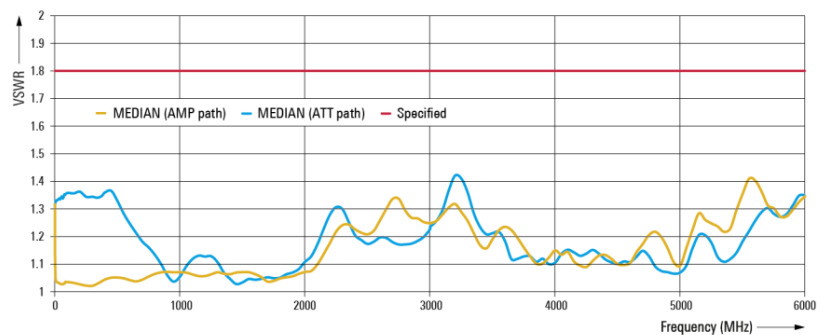
VSWR

Output impedance VSWR in 50 Ω system, level setting characteristic: auto		
R&S®SMBB-B101/-B103/-B106	f > 200 kHz	< 1.8

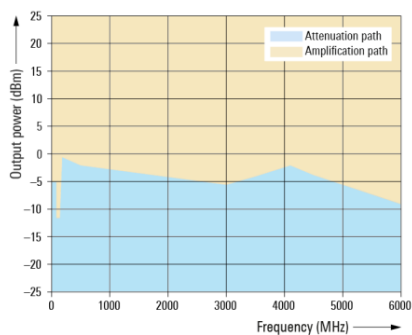
Step attenuator transition power level (without R&S®SMBB-B32 option)



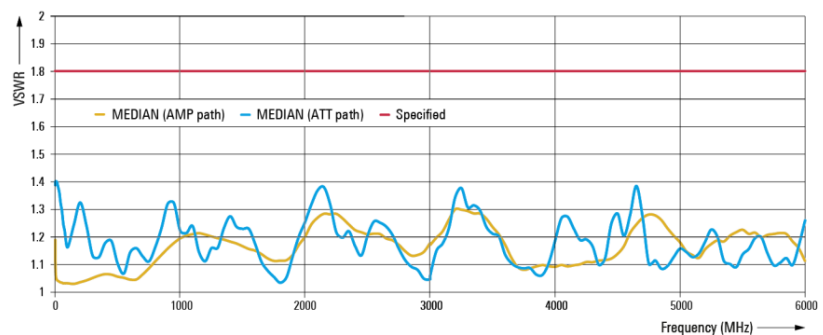
VSWR vs. frequency (without R&S®SMBB-B32 option)



Step attenuator transition power level (with R&S®SMBB-B32 option)



VSWR vs. frequency (with R&S®SMBB-B32 option)



Measured VSWR (calculated MEDIAN of several R&S®SMB100B instruments).

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Level sweep

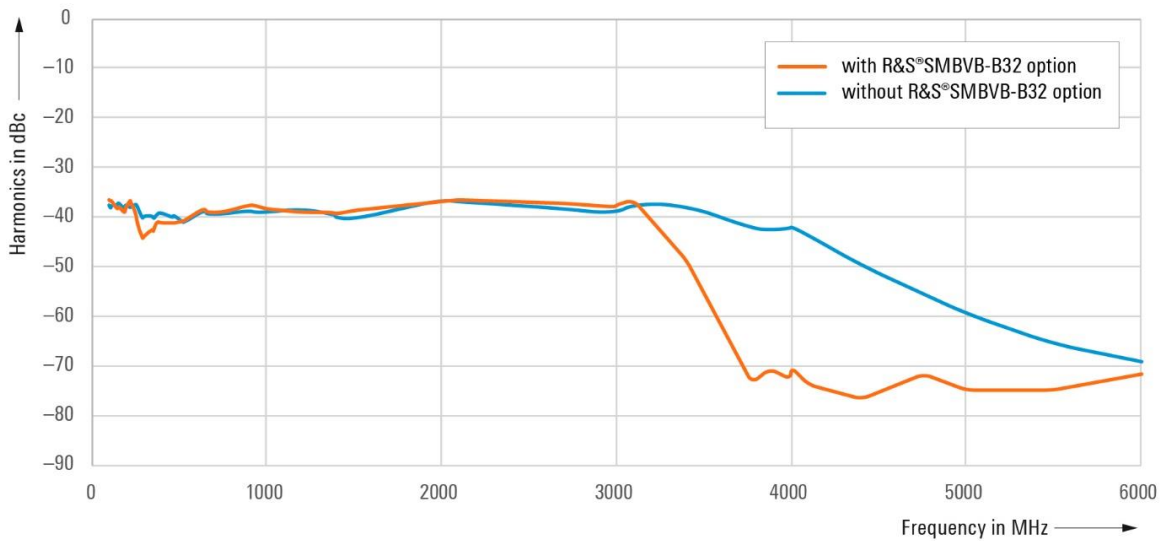
Operating mode		digital sweep in discrete steps
Trigger mode	execute sweep continuously with internal trigger source	auto
	execute one full sweep	single / extern single
	execute one step	step / extern step
	sweep start and stop controlled by external trigger signal	extern start/stop
Trigger source		external trigger signal (INST TRIG at rear), rotary knob, touch panel, remote control
Trigger slope		positive, negative
Sweep range		full specified level range
	interruption-free	20 dB segment
Sweep shape		triangle, sawtooth
Step spacing		dB linear
Step size setting resolution		0.01 dB
Dwell time setting range		5 ms to 100 s
Dwell time setting resolution		0.1 ms

Spectral purity

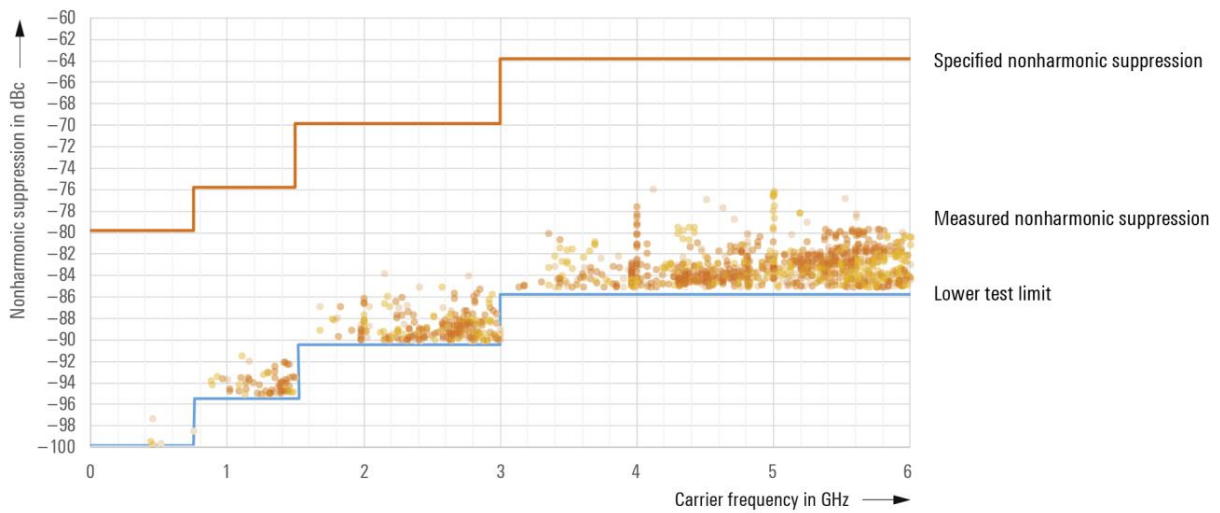
Harmonics		
R&S®SMBB-B101/-B103/-B106	1 MHz < f ≤ 6 GHz; level ≤ 13 dBm ⁴	< -30 dBc
Nonharmonics	CW, level > +10 dBm; offset > 10 kHz from carrier	
	f ≤ 750 MHz	< -80 dBc
	750 MHz < f ≤ 1500 MHz	< -76 dBc
	1500 MHz < f ≤ 3000 MHz	< -70 dBc
	3.00 GHz < f ≤ 6.00 GHz	< -64 dBc
Subharmonics	level > +10 dBm	
	f ≤ 3.00 GHz	< nonharmonic specification
	3.00 GHz < f ≤ 6.00 GHz	< -75 dBc (< -90 dBc measured)
Wideband noise	level setting characteristic: auto, level = 10 dBm, measurement bandwidth 1 Hz, CW	
	carrier offset 30 MHz	
	15 MHz < f ≤ 6 GHz	< -146 dBc, < -153 dBc (typ.)
SSB phase noise	carrier offset 20 kHz, measurement bandwidth 1 Hz, CW, level = 10 dBm	
	f = 100 MHz	< -142 dBc, -146 dBc (typ.)
	f = 1 GHz	< -126 dBc, -132 dBc (typ.)
	f = 2 GHz	< -120 dBc, -126 dBc (typ.)
	f = 3 GHz	< -116 dBc, -122 dBc (typ.)
	f = 4 GHz	< -114 dBc, -120 dBc (typ.)
	f = 6 GHz	< -110 dBc, -116 dBc (typ.)
RMS jitter	standard, CW	
	f = 155 MHz, bandwidth = 100 Hz to 1.5 MHz	63 fs (meas.)
	f = 622 MHz, bandwidth = 1 kHz to 5 MHz	37 fs (meas.)
	f = 1 GHz, bandwidth = 1 Hz to 10 MHz	2.5 ps (meas.)
	f = 2.488 GHz, bandwidth = 5 kHz to 20 MHz	33 fs (meas.)
	with R&S®SMBB-B1 option, CW	
	f = 155 MHz, bandwidth = 100 Hz to 1.5 MHz	57 ps (meas.)
	f = 622 MHz, bandwidth = 1 kHz to 5 MHz	37 ps (meas.)
	f = 1 GHz, bandwidth = 1 Hz to 10 MHz	890 fs (meas.)
	f = 2.488 GHz, bandwidth = 5 kHz to 20 MHz	33 fs (meas.)
	with R&S®SMBB-B1H option, CW	
	f = 155 MHz, bandwidth = 100 Hz to 1.5 MHz	39 fs (meas.)
	f = 622 MHz, bandwidth = 1 kHz to 5 MHz	37 fs (meas.)
	f = 1 GHz, bandwidth = 1 Hz to 10 MHz	83 fs (meas.)
	f = 2.488 GHz, bandwidth = 5 kHz to 20 MHz	33 fs (meas.)
Residual FM	RMS value at f = 1 GHz, CW	
	0.3 kHz to 3 kHz, weighted (ITU-T)	< 2 Hz, 0.22 Hz (typ.)
	0.03 kHz to 23 kHz	< 4 Hz, 1.9 Hz (typ.)
Residual AM	RMS value (0.03 kHz to 20 kHz), CW level = 12 dBm, f > 10 MHz	
	< 0.02 %	

⁴ Or maximum specified output power, whichever is lower.

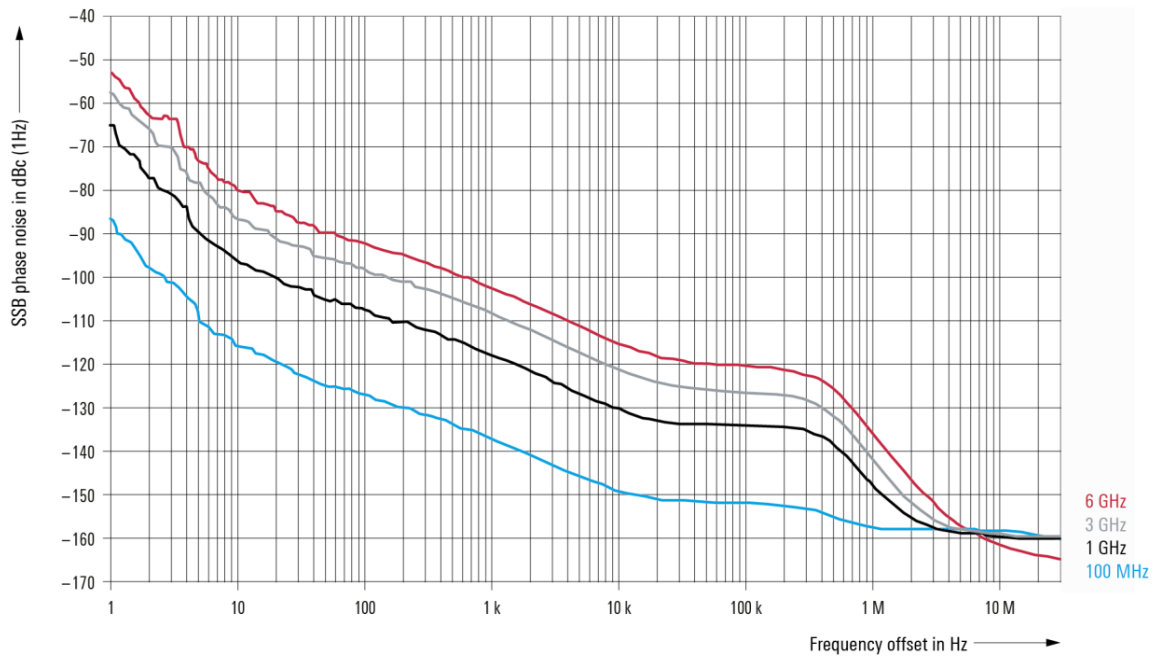
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Measured harmonics 2nd order, CW, level = +13 dBm.



Spurious emissions (carrier offset > 10 kHz) – several R&S®SMB100B instruments measured.



Measured SSB phase noise with R&S@SMBB-B1H option.

List mode

Frequency and level values can be stored in a list and triggered by an internal timer or an external trigger.

Run mode		live
Operating modes	internal trigger	auto
	internal trigger, one sweep per trigger event	single
	internal trigger, one step per trigger event	step
	external trigger, one sweep per trigger event	extern single
	external trigger, one step per trigger event	extern step
Max. number of steps (learned mode)		10000
Dwell time setting range	can be set individually for each step	1 ms to 100 s
Dwell time setting resolution		0.1 ms
Setting time	run mode: learned, after external trigger	see frequency and level data

Analog modulation

Simultaneous modulation

	Amplitude modulation	Frequency modulation	Phase modulation	Pulse modulation
Amplitude modulation		●	●	○
Frequency modulation	●		—	●
Phase modulation	●	—		●
Pulse modulation	○	●	●	

● = compatible,

— = incompatible

○ = compatible with limitations: No specification applies to level accuracy, AM distortion, AM depth error and on/off ratio with pulse/modulation.

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Amplitude modulation (R&S®SMBB-K720 option)Specifications apply for $f > 200$ kHz, level setting characteristics: auto, level (PEP) = 0 dBm.

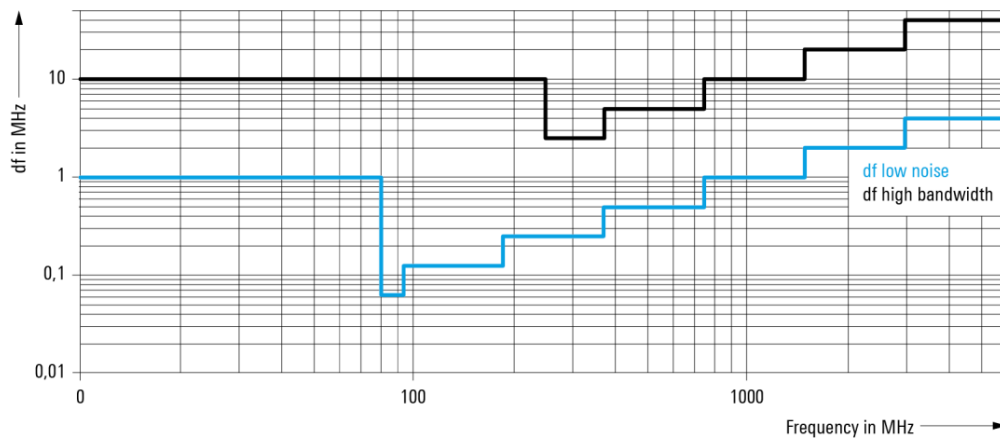
Modulation source		internal, external, internal + external	
External coupling		AC, DC	
AM depth setting range	at high levels, modulation is clipped when the maximum PEP is reached	0 % to 100 %	
Resolution of setting		0.1 %	
AM depth (m) error	$f_{\text{mod}} = 1$ kHz and $m < 80$ %		
	$f \leq 80$ MHz	< (1 % of setting + 1 %)	
	$f > 80$ MHz	< (3 % of setting + 1 %)	
AM distortion	$f_{\text{mod}} = 1$ kHz	$m = 30$ %	$m = 80$ %
	$f \leq 80$ MHz	< 0.25 %	< 0.5 %
	$f > 80$ MHz	< 1.5 %	< 3 %
Modulation frequency response	$m = 60$ %, DC coupling: 0 Hz to 50 kHz, AC coupling: 10 Hz to 50 kHz	< 3 dB	
Incidental ϕ M at AM	$m = 30$ %, $f_{\text{mod}} = 1$ kHz, \pm peak/2	< 0.2 rad	

Frequency bands for frequency and phase modulationMultiplier N is used to define FM and ϕ M specifications within this document.

Multiplier N for different frequency ranges	FM mode: Low Noise	
	ϕ M mode: Low Noise	
	$f \leq 80$ MHz	1
	$80 \text{ MHz} < f \leq 93.75 \text{ MHz}$	1/16
	$93.75 \text{ MHz} < f \leq 187.5 \text{ MHz}$	1/8
	$187.5 \text{ MHz} < f \leq 375 \text{ MHz}$	1/4
	$375 \text{ MHz} < f \leq 750 \text{ MHz}$	1/2
	$750 \text{ MHz} < f \leq 1.5 \text{ GHz}$	1
	$1.5 \text{ MHz} < f \leq 3 \text{ GHz}$	2
	$3 \text{ GHz} < f \leq 6 \text{ GHz}$	4
	FM mode: High Bandwidth	
	ϕ M mode: High Bandwidth, High Deviation	
	$f \leq 250 \text{ MHz}$ (mixer mode)	1
	$250 \text{ MHz} < f \leq 375 \text{ MHz}$	1/4
	$375 \text{ MHz} < f \leq 750 \text{ MHz}$	1/2
	$750 \text{ MHz} < f \leq 1.5 \text{ GHz}$	1
	$1.5 \text{ MHz} < f \leq 3 \text{ GHz}$	2
$3 \text{ GHz} < f \leq 6 \text{ GHz}$	4	

Frequency modulation (R&S®SMBB-K720 option)

Modulation source		internal, external, internal + external
External coupling		AC, DC
FM modes		Low Noise, High Bandwidth
Maximum deviation	FM mode: high bandwidth	$N \times 10$ MHz
	FM mode: low noise	$N \times 1$ MHz
Resolution of setting		< 0.02 % of set deviation or $N \times 0.1$ Hz, whichever is greater, min. 0.01 Hz
FM deviation error	$f_{\text{mod}} = 2$ kHz, deviation $\leq N \times 1$ MHz	
	internal	< (2 % of setting + 20 Hz)
	external	< (3 % of setting + 20 Hz)
FM distortion	$f_{\text{mod}} = 2$ kHz, deviation = $N \times 1$ MHz	< 0.2 %
Modulation frequency response	FM mode: High Bandwidth, coupling: DC/AC, input impedance: 50 Ω	
	DC coupling: 0 Hz to 7 MHz, AC coupling: 10 Hz to 7 MHz	< 3 dB
	FM mode: Low Noise, coupling: DC/AC, input impedance: 50 Ω	
	DC coupling: 0 Hz to 100 kHz, AC coupling: 10 Hz to 100 kHz	< 3 dB
Synchronous AM with FM	40 kHz deviation, $f_{\text{mod}} = 1$ kHz, $f > 10$ MHz	< 0.2 %
Carrier frequency offset with FM DC	after FM offset adjustment	< 0.2 % of set deviation

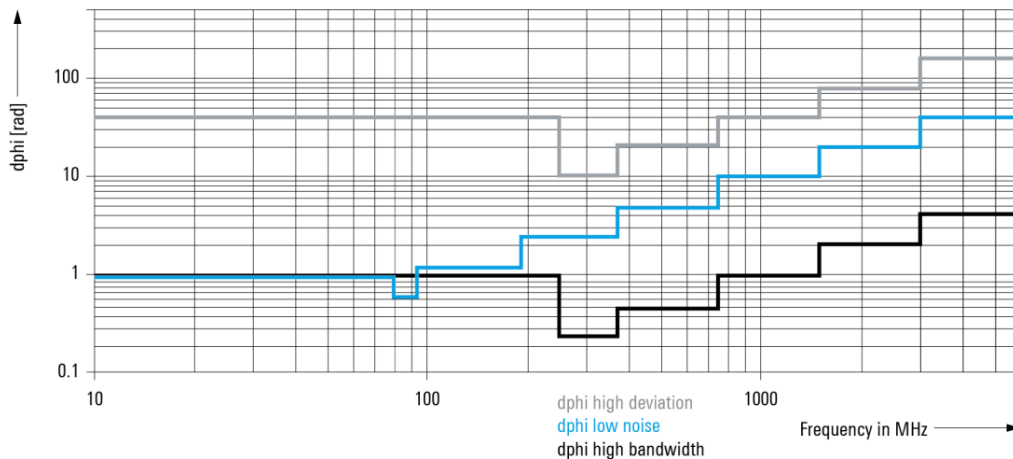


Maximum deviation (frequency modulation).

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Phase modulation (R&S®SMBB-K720 option)

Modulation source		internal, external, internal + external
External coupling		AC, DC
ϕ M modes		High Deviation, High Bandwidth, Low Noise
Maximum deviation	ϕ M mode: High Bandwidth	$N \times 1$ rad
	ϕ M mode: High Deviation	$N \times 40$ rad
	ϕ M mode: Low Noise	$N \times 10$ rad
Resolution of setting	ϕ M modes: High deviation, Low Noise	< 0.02 % of set deviation or $N \times 20 \mu\text{rad}$, whichever is greater, min. 1 μrad
	ϕ M mode: High Bandwidth	< 0.1 % of set deviation, min. $N \times 20 \mu\text{rad}$
ϕ M deviation error	$f_{\text{mod}} = 1$ kHz, deviation \leq half of max. deviation	
	internal	< (2 % of setting + 0.003 rad)
	external	< (3 % of setting + 0.003 rad)
ϕ M distortion	$f_{\text{mod}} = 10$ kHz, half of max. deviation	
	< 0.2 %	
Modulation frequency response	ϕ M mode: High Bandwidth, coupling: DC/AC, input impedance: 50 Ω	
	DC coupling: 0 Hz to 7 MHz, AC coupling: 10 Hz to 7 MHz	< 3 dB
	ϕ M mode: High Deviation, coupling: DC/AC, input impedance: 50 Ω	
	DC coupling: 0 Hz to 250 kHz, AC coupling: 10 Hz to 250 kHz	< 1 dB
	ϕ M mode: Low Noise, coupling: DC/AC, input impedance: 50 Ω	
	DC coupling: 0 Hz to 100 kHz, AC coupling: 10 Hz to 100 kHz	< 3 dB



Maximum deviation (phase modulation).

Pulse modulation (R&S®SMBB-K22 option)

Modulation source	standard	external
	with R&S®SMBB-K23 option	external, internal
On/off ratio		> 80 dB, > 92 dB (typ.)
Rise/fall time	10 % to 90 % of RF amplitude, f > 80 MHz	
	transition type: Fast	< 15 ns, < 5 ns (meas.)
	transition type: Smoothed	< 200 ns
Minimum pulse width	50 %/50 % of RF amplitude, transition type: Fast	< 20 ns
Pulse repetition frequency		0 Hz to 25 MHz
Video feedthrough	level < 10 dBm	< 10 % of RF, < 200 mV (peak-to-peak value)
Pulse overshoot		< 10 %
Pulse delay	pulse external trigger to RF transition type: Fast	90 ns (nom.)

Input for external modulation signals

Modulation input EXT for AM/FM/φM		
Connector type	MOD EXT on rear panel	BNC female
Input impedance	selectable	>100 kΩ, 600 Ω or 50 Ω (nom.)
Input sensitivity	peak value for set modulation factor or deviation	1 V (nom.)
Input damage voltage		±7 V
Modulation input PULSE EXT		
Connector type	PULSE EXT on rear panel	BNC female
Input impedance	selectable	10 kΩ or 50 Ω (nom.)
Input voltage	TTL, CMOS compatible, threshold low	0.8 V (nom.)
	TTL, CMOS compatible, threshold high	1.3 V (nom.)
Input damage voltage		± 6 V
Input polarity	selectable	normal, inverse

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Modulation sources

Internal modulation generator

Signal types		sine
Frequency setting range		0.1 Hz to 1 MHz
Frequency setting resolution		0.01 Hz
Frequency error		< (0.001 Hz + relative deviation of reference frequency × modulation frequency)

Multifunction generator (R&S®SMBB-K24 option)

Signal types	LF generator 1	sine, pulse, triangle, trapezoid
	LF generator 2	sine, pulse, triangle, trapezoid
	noise generator (noise amplitude distribution)	Gaussian, equal
Frequency setting range	sine	0.1 Hz to 10 MHz
	pulse, triangle, trapezoid	0.1 Hz to 1 MHz (displayed value)
	noise bandwidth	100 kHz to 10 MHz
Resolution of setting	sine	0.1 Hz
	pulse, triangle, trapezoid	10 ns
	noise bandwidth	100 kHz
Frequency error		< (0.001 Hz + relative deviation of reference frequency × modulation frequency)

LF frequency sweep

Operating mode		digital sweep in discrete steps
Trigger mode	execute sweep continuously with internal trigger source	auto
	execute one full sweep	single
	execute one step	step
	sweep start and stop controlled by external trigger signal	start/stop
Trigger source		external trigger signal (INST TRIG at rear), rotary knob, touch panel, remote control
Sweep range		full frequency range
Sweep shape		triangle, sawtooth
Step size	linear	full frequency range
	logarithmic	0.01 % to 100 % per step
Dwell time setting range		5 ms to 100 s
Dwell time setting resolution		0.1 ms

LF output

Monitoring of resulting modulation signal for		AM, FM, ϕ M
Source		LF generator 1, LF generator 2, noise generator, external
Output voltage	V_p at LF connector, open circuit voltage EMF	
Setting range		0 mV to 4 V
Setting resolution		1 mV
Setting error	at 1 kHz	< (1 % of reading + 1 mV)
Output impedance		50 Ω or 600 Ω (nom.)
DC offset		-4.0 V to +4.0 V
Damage voltage	Externally applied	± 7 V
Frequency response	up to 1 MHz, $R_O = 50 \Omega$	< 0.5 dB
	up to 10 MHz, $R_O = 50 \Omega$	< 1.5 dB
Distortion	f < 100 kHz, at $R_L > 50 \Omega$, level (V_{EMF}) < 1 V	< 0.1 %

Pulse generator (R&S®SMBB-K23 option)

Pulse modes		single pulse, double pulse
Trigger modes	free run, internally triggered	auto
		external trigger
		external gate
Pulse period		
Setting range		40 ns to 100 s
Setting resolution		10 ns
Pulse width	pulse widths of double pulses can be set independently	
Setting range		10 ns to 1 s
Setting resolution		10 ns
Pulse delay		
Setting range		0 ns to 100 s
Setting resolution		10 ns
Double-pulse delay		
Setting range		20 ns to 1 s
Setting resolution		10 ns
External trigger		
Delay	trigger to video output	70 ns (meas.)
Jitter		< 10 ns (nom.)

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Pulse generator output

PULSE VIDEO output	output of pulse generator signal	
Connector type	PULSE VIDEO output on rear panel	BNC female
Output level	without load	digital signal 0 V/3.3 V (nom.)

Pulse train (R&S®SMBB-K27 option)

The R&S®SMBB-K27 option extends the functionality of the pulse generator (R&S®SMBB-K23 option). With this option, pulses and sequences of pulse can be user-defined in order to generate jittered or staggered pulse scenarios widely used in radar applications.

Prerequisite: R&S®SMBB-K23 option must be installed.

Pulse modes	setting of pulse width, pulse spacing and pulse sequences	train
Trigger modes	free run, internally triggered	auto
		external trigger
Number of bursts		1 to 2047
Number of identical pulses per burst		1 to 65535
Pulse on time setting range		0 ns to 5 ms
Pulse off time setting range		5 ns to 5 ms
Pulse on and off time setting resolution		5 ns

Stereo/RDS coder (R&S®SMBB-B5 option)

The specifications apply to RF frequencies in the range from 66 MHz to 110 MHz.

Stereo modes	internal with modulation generator	L, R, R = L, R = -L
	external analog (via L and R inputs) or external digital (via S/P DIF input)	L, R, R = L, R = -L, R ≠ L
MPX frequency deviation range		0 Hz to 80 kHz
MPX frequency deviation setting resolution		10 Hz
AF frequency range	L, R signal	20 Hz to 15 kHz
AF frequency response	L, R signal (referenced to 500 Hz)	
	AF = 20 Hz to 40 Hz	< 0.3 dB
	AF = 40 Hz to 15 kHz	< 0.2 dB
Stereo crosstalk attenuation	AF = 1 kHz	> 50 dB
Distortion	67.5 kHz MPX frequency deviation, AF = 1 kHz	< 0.1 %
S/N ratio	stereo/RDS signal generator without preemphasis, receiver with deemphasis	
	ITU-R weighted (quasi-peak)	> 60 dB
	ITU-R unweighted (RMS)	> 70 dB
	A-weighted (RMS)	> 70 dB
Preemphasis	selectable	off, 50 µs, 75 µs
Pilot tone 19 kHz		
Frequency error		< 2 Hz
Deviation range		0 Hz to 10 kHz
Deviation setting resolution		10 Hz
Phase setting range		-5° to +5°
Phase setting resolution		0.1°
ARI/RDS subcarrier 57 kHz		
Frequency error		< 6 Hz
Deviation range		0 Hz to 10 kHz
Deviation setting resolution		10 Hz
ARI		
Identification modes	traffic announcement identification (DK), area identification (BK)	off, DK, BK, DK + BK
BK area identification		A to F
RDS		
Traffic program		off/on
Traffic announcement		off/on
Data set	user-selectable	1 to 5
Maximum data length		64 kbyte
Analog modulation inputs L, R		
Connector type	L and R on rear panel	BNC female
Input impedance	selectable	600 Ω or 100 kΩ (nom.)
Input sensitivity	peak value for set deviation	1 V (nom.)
Digital modulation input S/P DIF		
Connector type	S/P DIF on rear panel	BNC female
Input impedance		75 Ω (nom.)
Input voltage range	peak-to-peak voltage	400 mV to 5 V

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Remote control

Interfaces/systems	standard with R&S®SMBB-B86 option	Ethernet/LAN 10/100/1000BASE-T IEC 60625 (GPIB IEEE-488.2) USB 2.0 (according to VISA USB-TMC) Serial (RS-232) ⁵
Command set		SCPI 1999.5 or compatible command sets
Compatible command sets	<p>These command sets can be selected in order to emulate another instrument. A subset of common commands is supported.</p> <p>For each emulated instrument, the *IDN? and *OPT? strings can be configured to meet the specific requirements. This is particularly useful for the Aeroflex/IFR/Marconi instruments since the manufacturer ID changed over time and for the Hewlett-Packard/Agilent/Keysight instruments to adapt to a specific suffix and configuration.</p>	<p>Hewlett Packard</p> <ul style="list-style-type: none"> • HP 8340, HP 8341 • HP 8360 • HP 83620, HP 83622, HP 83623, HP 83624 • HP 83630, HP 83640, HP 83650 • HP 8373 • HP 83711, HP 83712 • HP 83731, HP 83732 • HP 8642, HP 8643, HP 8644, HP 8645 • HP 8647, HP 8648 • HP 8656, HP 8657 • HP 8662, HP 8664, HP 8665 • HP 8673 <p>Agilent/Keysight Technologies</p> <ul style="list-style-type: none"> • E4421, E4422, E4428 • E8257, E8663 • N5161, N5181, N5183A <p>Aeroflex (IFR/Marconi)</p> <ul style="list-style-type: none"> • 2023, 2024 • 2030, 2031, 2032 • 2040, 2041, 2042 <p>Anritsu</p> <ul style="list-style-type: none"> • 68017, 68037 <p>Panasonic</p> <ul style="list-style-type: none"> • VP-8303A <p>Racal Dana</p> <ul style="list-style-type: none"> • 3102, 9087 <p>Rohde & Schwarz</p> <ul style="list-style-type: none"> • R&S®SMB100A • R&S®SME02/03/06 • R&S®SMF100A • R&S®SMG/SMH • R&S®SMGU/SMHU • R&S®SML01/02/03 • R&S®SMP02/03/04 • R&S®SMR20/27/30/40 • R&S®SMT02/03/06 • R&S®SMY01/02
IEC/IEEE bus address		0 to 30
Ethernet/LAN protocols and services		<ul style="list-style-type: none"> • VISA VXI-11 (remote control) • Telnet/RawEthernet (remote control) • VNC (remote operation with web browser) • FTP (file transfer protocol) • SMB (mapping parts of the instrument to a host file system)
Ethernet/LAN addressing		DHCP, static; support of ZeroConf and M-DNS to facilitate direct connection to a system controller

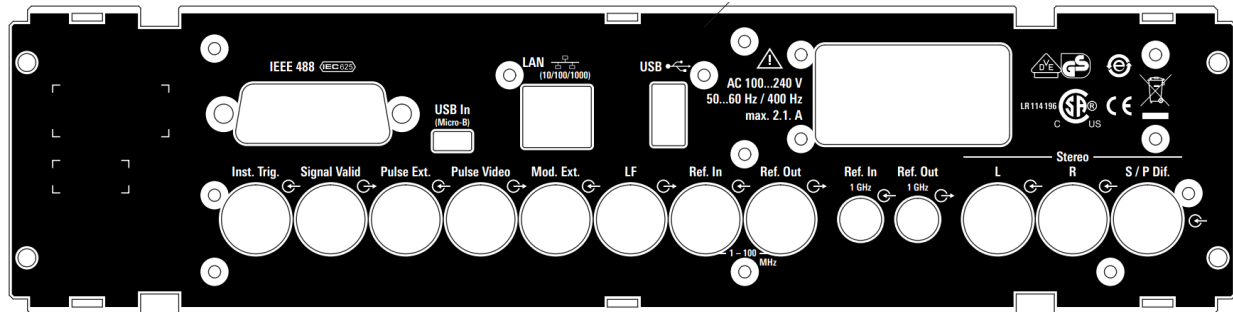
⁵ Requires recommended extra R&S®TS-USB1.

Connectors

Front panel connectors

RF 50 Ω	RF output R&S®SMBB-B101/-B103/-B106	N female
USB	USB 2.0 (high speed) connector for external USB devices, <ul style="list-style-type: none"> • Mouse and keyboard for enhanced operation • R&S®NRP-Zxx power sensors (with R&S®NRP-Z4 adapter cable) for external power measurements and level adjustment of instrument • Memory stick for software update and data exchange • USB serial adapter for RS-232 remote control 	USB type A

Rear panel connectors



REF 1 GHz IN	1 GHz reference frequency input <i>only available with R&S®SMBB-B3 option</i>	SMA female
REF 1 GHz OUT	1 GHz reference frequency output <i>only available with R&S®SMBB-B3 option</i>	SMA female
REF IN	(variable) reference frequency input	BNC female
REF OUT	reference frequency output	BNC female
LF	modulation generator output	BNC female
MOD EXT	input for external analog modulation	BNC female
PULSE EXT	input for external pulse modulation	BNC female
PULSE VIDEO	pulse generator output	BNC female
INST TRIG	trigger input, TTL 5 V compatible	BNC female
SIGNAL VALID	output for triggering external devices: high state indicates that the instrument has settled to its final value	BNC female
L	stereo signal input for L signal, <i>only available with R&S®SMBB-B5 option</i>	BNC female
R	stereo signal input for R signal, <i>only available with R&S®SMBB-B5 option</i>	BNC female
S/P DIF	stereo signal input for digital stereo signal <i>only available with R&S®SMBB-B5 option</i>	BNC female
USB IN	USB 2.0 (high speed) remote control of instrument (USB-TMC) <i>only available with R&S®SMBB-B86 option</i>	USB type B
USB	USB 3.0 (SuperSpeed) connector for external USB devices, <ul style="list-style-type: none"> • Mouse and keyboard for enhanced operation • R&S®NRP-Zxx power sensors (with R&S®NRP-Z4 adapter cable) for external power measurements and level adjustment of instrument • Memory stick for software update and data exchange • USB serial adapter for RS-232 remote control 	USB type A
LAN	provides remote control functionality and remote operation via VNC and file transfer via FTP	RJ-45
IEEE 488	remote control of instrument via GPIB <i>only available with R&S®SMBB-B86 option</i>	24-pin Amphenol series 57 female

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Power rating		
Rated voltage		100 V to 240 V ($\pm 10\%$)
Rated frequency		50 Hz to 60 Hz ($\pm 5\%$), 400 Hz ($\pm 5\%$)
Rated current		max. 2.1A (meas. 1.2 A @100 V to 0.6 A @240 V)
Rated power	when fully equipped	110 W (meas.)
Power factor correction		in line with EN 61000-3-2
Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2004/108/EC	applied harmonized standards: EN 61326-1 (industrial environment), EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3
Electrical safety	EU: in line with Low Voltage Directive 2006/95/EC	applied harmonized standard: EN 61010-1
	USA	UL 61010-1
	Canada	CAN/CSA-C22.2 No. 61010-1
International safety approvals	VDE – Association for Electrical, Electronic and Information Technologies	GS mark 40046635
	CSA – Canadian Standards Association	CSA _{UL} mark 70133349
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., 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 516.4, procedure
Environmental conditions		
Temperature	operating temperature range	0 °C to +55 °C
	storage temperature range	-40 °C to +71 °C
Damp heat		+40 °C, 90 % rel. humidity steady state in line with EN 60068-2-78
Altitude	operating, linear derating of max. ambient temperature to +45 °C starting at altitude = 3000 m	up to 4600 m (15000 ft)
	storage	up to 4600 m (15000 ft)
Dimensions and weight		
Dimensions	W x H x D	344 mm x 108 mm x 372 mm (13.6 in x 4.3 in x 14.7 in)
Weight	when fully equipped	6.8 kg (15.0 lb)
Calibration interval		
Recommended calibration interval	when operated 40 h/week in the full range of the specified environmental conditions	3 years

Ordering information

Designation	Type	Order No.
Signal Generator ⁶ including power cable and quick start guide	R&S®R&S®SMB100B	1422.1000.02
Options		
Frequency options		
8 kHz to 1 GHz	R&S®SMBB-B101	1422.5005.02
8 kHz to 3 GHz	R&S®SMBB-B103	1422.5105.02
8 kHz to 6 GHz	R&S®SMBB-B106	1422.5205.02
Reference oscillator options		
OCXO reference oscillator ⁷	R&S®SMBB-B1	1422.5305.02
OCXO reference oscillator, high performance ⁸	R&S®SMBB-B1H	1422.5405.02
100 MHz, 1 GHz ultra low noise reference input and output	R&S®SMBB-B3	1422.5505.02
Flexible reference input from 1 MHz to 100 MHz	R&S®SMBB-K704	1422.6301.02
Output power options		
High output power 1/3/6 GHz	R&S®SMBB-K31	1422.5705.02
Ultra high output power 1/3/6 GHz ⁹	R&S®SMBB-B32	1422.5740.02
Analog modulation options		
High performance pulse modulator	R&S®SMBB-K22	1422.5905.02
Pulse generator	R&S®SMBB-K23	1422.6001.02
Multifunction generator	R&S®SMBB-K24	1422.6053.02
Pulse train ¹⁰	R&S®SMBB-K27	1422.6101.02
AM / FM / φM	R&S®SMBB-K720	1422.6201.02
Stereo/RDS coder ¹¹	R&S®SMBB-B5	1422.5605.02
Other options		
Remote control interface (GPIB and USB)	R&S®SMBB-B86	1422.5805.02
Recommended extras		
19" rack adapter	R&S®ZZA-KNA23	1177.8084.00
Power sensor, 10 MHz to 18 GHz, for levels up to 15W	R&S®NRP18S-20	1424.6738.02
USB interface cable for R&S®NRPS18-20	R&S®NRP-ZKU	1419.0658.02
USB serial adapter for RS-232 remote control	R&S®TS-USB1	6124.2531.00
Documentation		
Documentation of calibration values	R&S®DCV-2	0240.2193.18
R&S®SMB100B accredited calibration	R&S®ACASMB100B	3598.1185.03

⁶ The base unit must be ordered together with an R&S®SMBB-B101, R&S®SMBB-B103 or R&S®SMBB-B106 frequency option.

⁷ Only one of the R&S®SMBB-B1 or R&S®SMBB-B1H options can be installed.

⁸ Only one of the R&S®SMBB-B1 or R&S®SMBB-B1H options can be installed.

⁹ Requires the R&S®SMBB-K31 option.

¹⁰ Requires the R&S®SMBB-K23 option.

¹¹ Requires the R&S®SMBB-K720 option.

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Warranty		
Base unit		3 years
All other items ¹²		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 accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	

Extended warranty with a term of one and two years (WE1 and WE2)

Repairs carried out during the contract term are free of charge ¹³. 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 ⁸ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

Extended warranty with accredited calibration (AW1 and AW2)

Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs ⁸ and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

For product brochure, see PD 3607.8182.12 and www.rohde-schwarz.com

¹² For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

¹³ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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- ▮ Worldwide
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- ▮ Customized and flexible
- ▮ Uncompromising quality
- ▮ Long-term dependability

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R&S®SMB100B Signal Generator
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