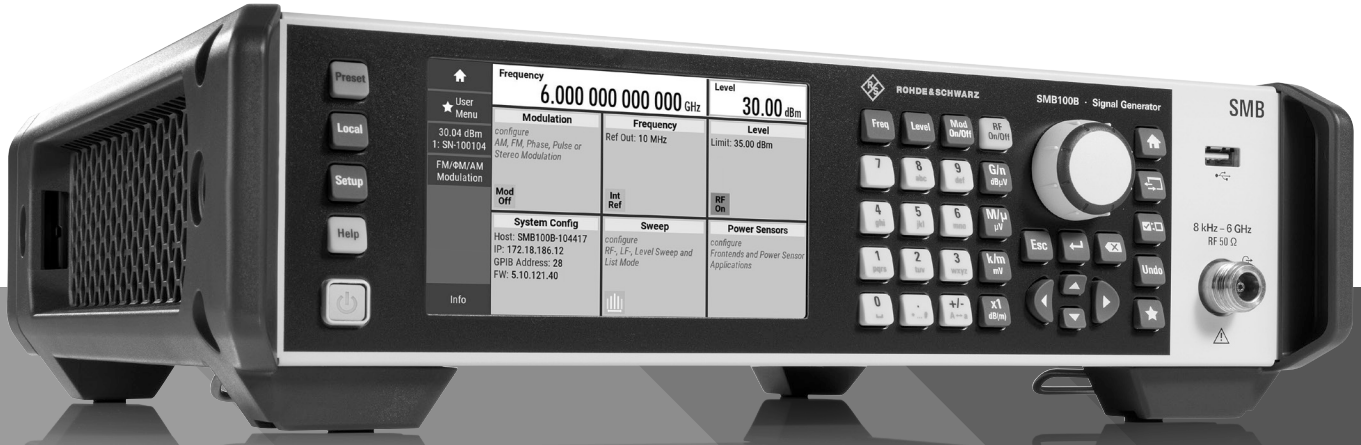
R&S®SMB100B
RF SIGNAL GENERATOR

Specifications



Specifications
Version 09.00

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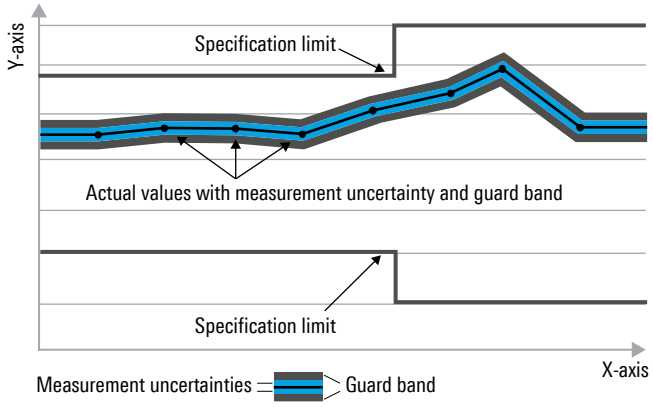
CONTENTS

Definitions

General
Product data applies under the following conditions:

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

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



Non-traceable specifications with limits (n. trc.)
Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

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”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

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 < 1×10^{-7} for f > 200 MHz or < 20 Hz for f ≤ 200 MHz, with GUI update stopped	
	after IEC/IEEE bus delimiter, without LAN connection, with R&S®SMBB-B86 option, level setting characteristic: auto	< 1.5 ms
Range and resolution of phase offset setting		–36000° to +36000°, 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	< 1×10^{-7}
	with R&S®SMBB-B1 or R&S®SMBB-B1H option	< 1×10^{-8}
Aging	after 30 days of uninterrupted operation	
	standard	≤ 1×10^{-6}/year
	with R&S®SMBB-B1 option	≤ 1×10^{-9}/day, ≤ 1×10^{-7}/year
	with R&S®SMBB-B1H option	≤ 5×10^{-10}/day, ≤ 3×10^{-8}/year
Temperature effect	in temperature range from 0 °C to +55 °C	
	standard	±2×10^{-6}
	with R&S®SMBB-B1 option	±1×10^{-7}
	with R&S®SMBB-B1H option	±1×10^{-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 from 5 MHz to 13 MHz and from 95 MHz to 100 MHz.

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	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 [2]	•	•	•
	1 GHz output frequency	–	–	•

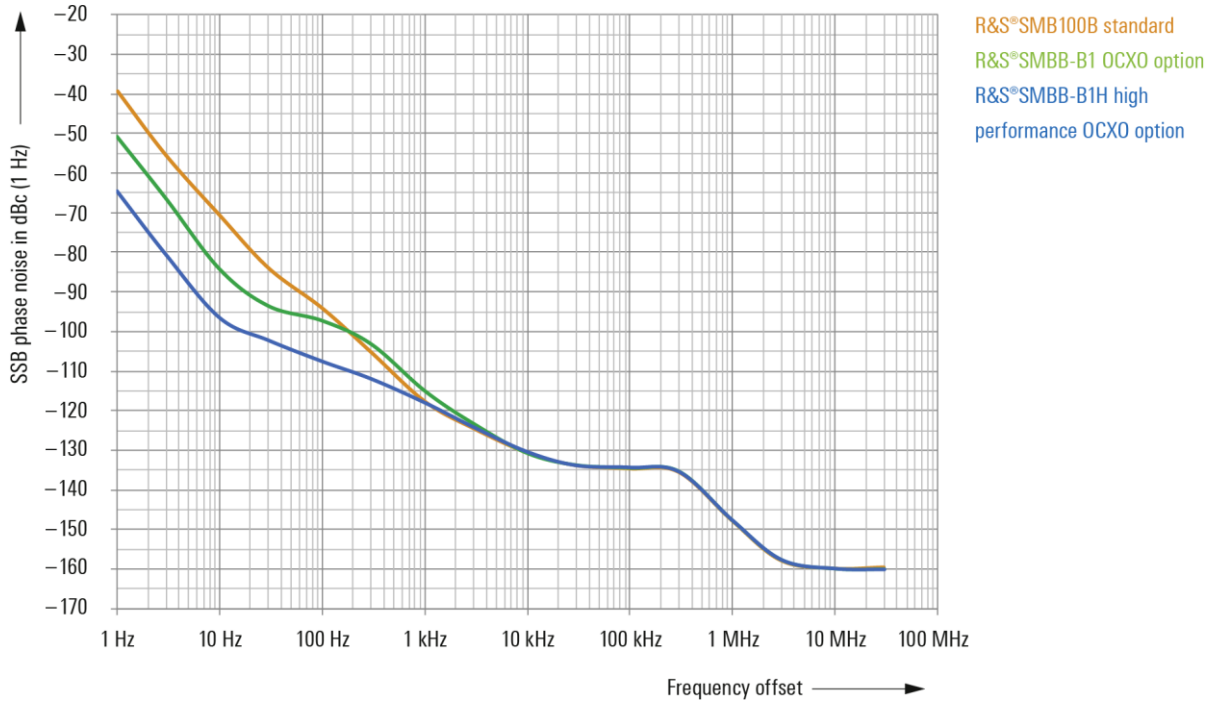
R&S®SMBB-K704 option, flexible reference input from 1 MHz to 100 MHz

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

R&S®SMBB-B3 option, 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 at 1 GHz (measured), with the R&S®SMBB-B1 option (OXCO) and with the R&S®SMBB-B1H option (high performance OCXO)

[2] Not available with all external input reference frequencies.

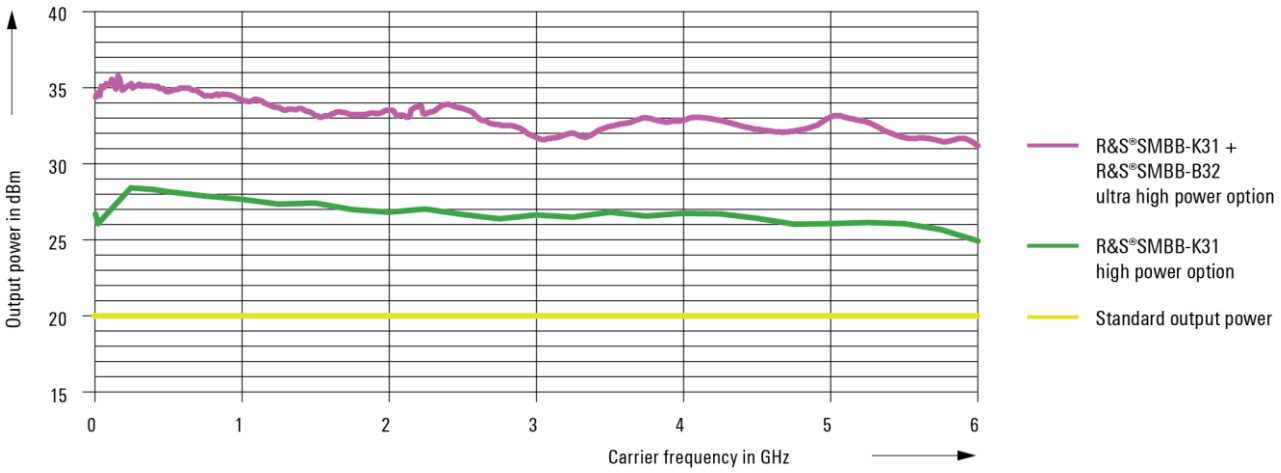
Level settings [3]

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 options	
	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

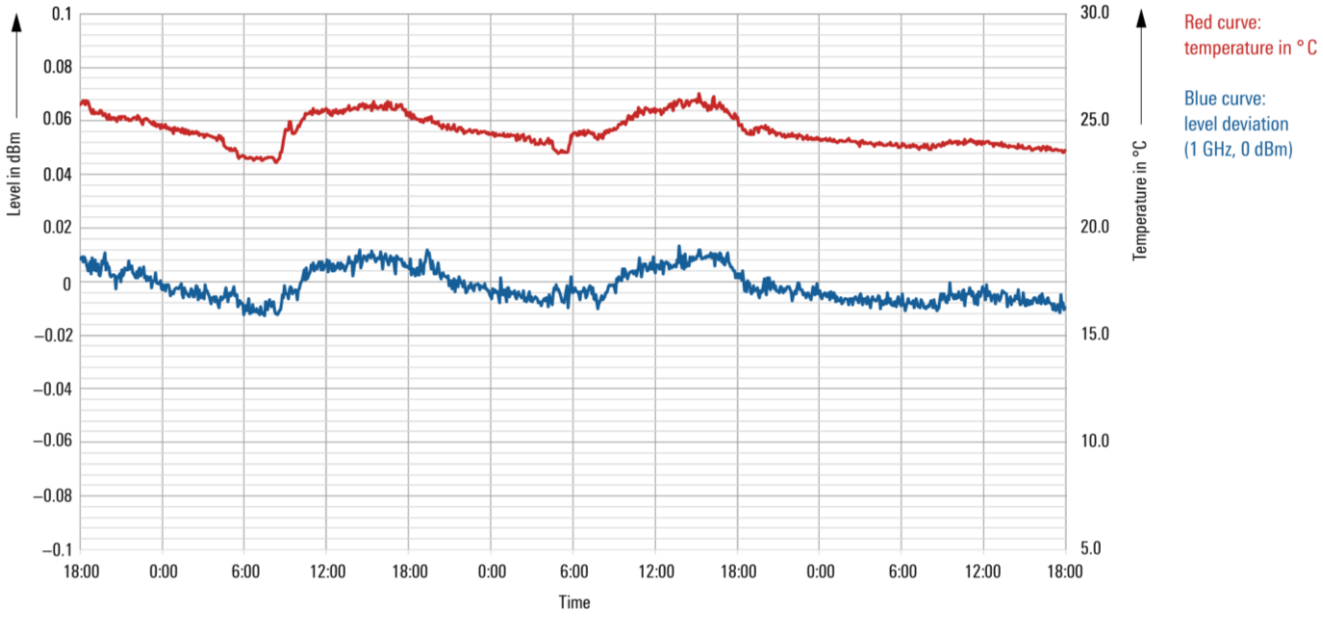
Level performance

Specified level range, peak envelope power (PEP)		
R&S®SMBB-B101/-B103/-B106	standard	
	8 kHz ≤ f ≤ 100 kHz	–90 dBm to +5 dBm
	100 kHz < f ≤ 200 kHz	–110 dBm to +5 dBm
	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	
	8 kHz ≤ f ≤ 100 kHz	–90 dBm to +5 dBm
	100 kHz < f ≤ 200 kHz	–110 dBm to +5 dBm
	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	
	8 kHz ≤ f ≤ 100 kHz	–90 dBm to +17 dBm
	100 kHz < f ≤ 200 kHz	–110 dBm to +21 dBm
	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	
	8 kHz ≤ f ≤ 200 kHz	< 1.2 dB
	200 kHz < f ≤ 3 GHz	< 0.5 dB
	f > 3 GHz	< 0.7 dB
	level ≤ –90 dBm	
	100 kHz ≤ f ≤ 200 kHz	< 1.5 dB
	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

[3] Maximum output power can be limited via “Level Limit” menu.



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, without LAN connection, with R&S®SMBB-B86 option	< 1.4 ms

Reverse power

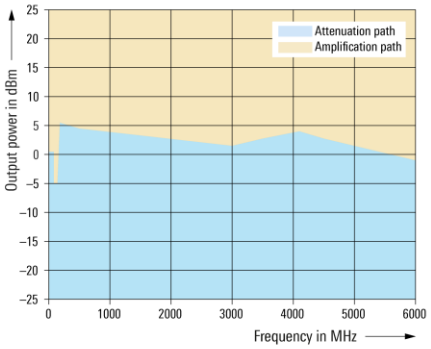
The R&S®SMB100B includes a reverse power protection as standard. The reverse power protection switches off the RF output signal if reverse power exceeds the limit.

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.)

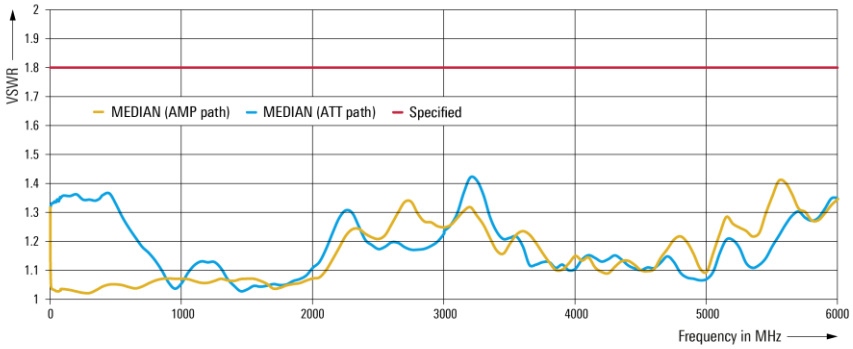
VSWR

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

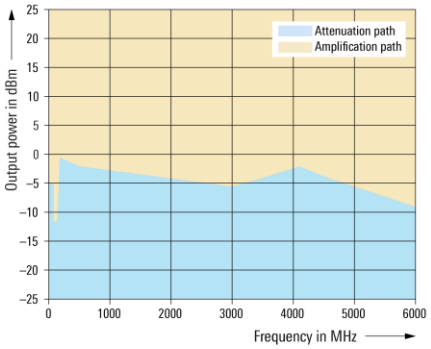
Step attenuator transition power level (without R&S®SMBB-B32 option)



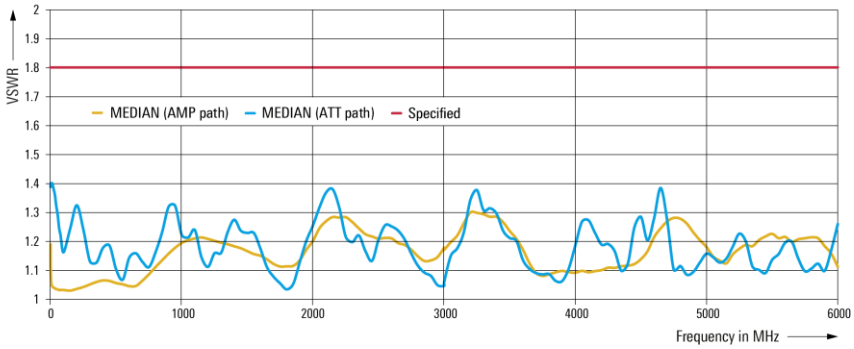
VSWR versus frequency (without R&S®SMBB-B32 option)



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



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



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

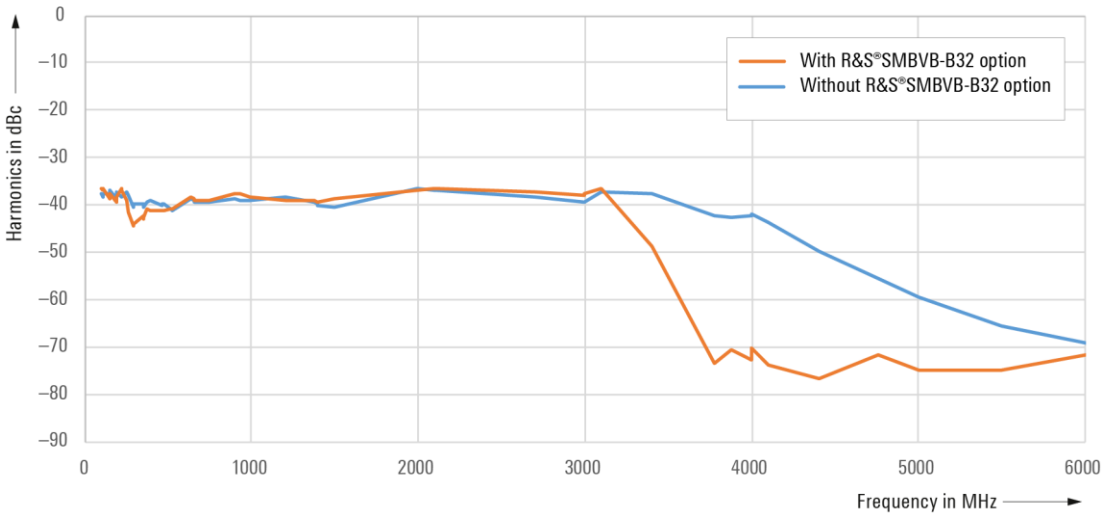
Level sweep

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

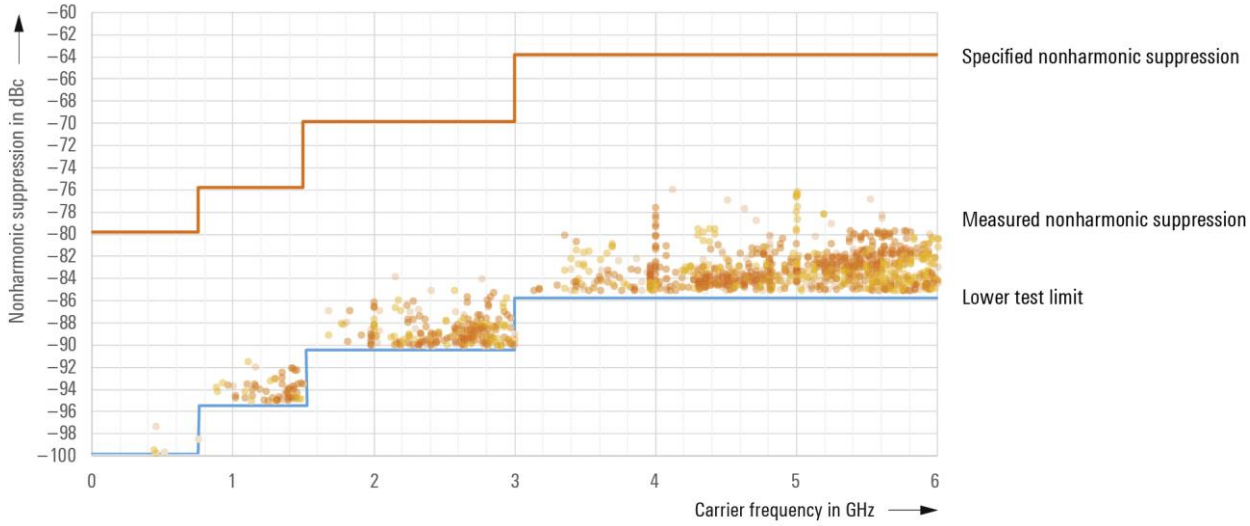
Spectral purity

Harmonics		
R&S®SMBB-B101/-B103/-B106	1 MHz < f ≤ 6 GHz; level ≤ 13 dBm [4]	< –30 dBc
Nonharmonics	CW, level > +10 dBm or maximum specified output power, whichever is lower; 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	CW, level > +10 dBm or maximum specified output power, whichever is lower	
	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, –150 dBc (typ.)
	f = 1 GHz	< –126 dBc, –132 dBc (typ.)
	f = 2 GHz	< –120 dBc, –126 dBc (typ.)
	f = 3 GHz	< –116 dBc, –123 dBc (typ.)
	f = 4 GHz	< –114 dBc, –120 dBc (typ.)
	f = 6 GHz	< –110 dBc, –117 dBc (typ.)
RMS jitter	standard, CW	
	f = 155 MHz, bandwidth = 100 Hz to 1.5 MHz	49 fs (meas.)
	f = 622 MHz, bandwidth = 1 kHz to 5 MHz	12 fs (meas.)
	f = 1 GHz, bandwidth = 1 Hz to 10 MHz	11 ps (meas.)
	f = 2.488 GHz, bandwidth = 5 kHz to 20 MHz	26 fs (meas.)
	with R&S®SMBB-B1 option, CW	
	f = 155 MHz, bandwidth = 100 Hz to 1.5 MHz	40 fs (meas.)
	f = 622 MHz, bandwidth = 1 kHz to 5 MHz	12 fs (meas.)
	f = 1 GHz, bandwidth = 1 Hz to 10 MHz	225 fs (meas.)
	f = 2.488 GHz, bandwidth = 5 kHz to 20 MHz	26 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	13 fs (meas.)
	f = 1 GHz, bandwidth = 1 Hz to 10 MHz	109 fs (meas.)
	f = 2.488 GHz, bandwidth = 5 kHz to 20 MHz	26 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 %

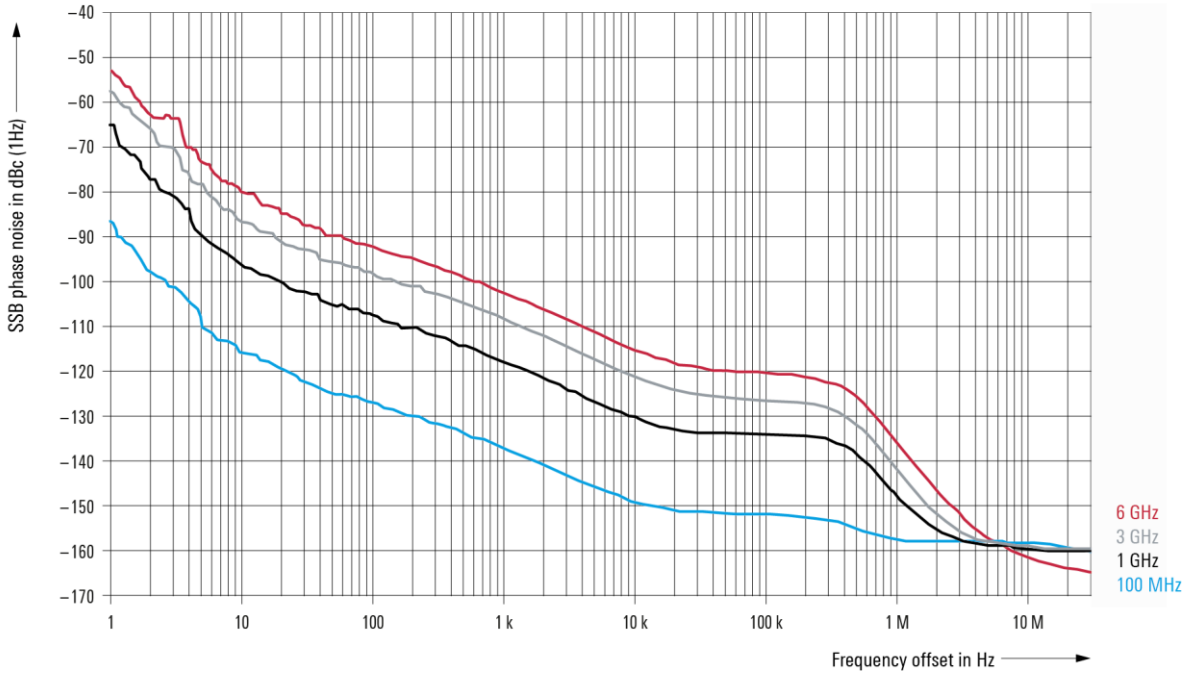
[4] Or maximum specified output power, whichever is lower.



Measured harmonics, second 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
Maximum number of steps		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	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.

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

Specifications apply for f ≥ 100 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_{mod} = 1 kHz and m < 80 %	
	f ≤ 80 MHz	< (1 % of setting + 1 %)
	f > 80 MHz	< (3 % of setting + 1 %)
AM distortion	f_{mod} = 1 kHz	
	m = 30 %	
	f ≤ 80 MHz	< 0.25 %
	f > 80 MHz	< 1.5 %
	m = 80 %	
	f ≤ 80 MHz	< 0.5 %
	f > 80 MHz	< 3 %
Modulation frequency response	m = 60 %, DC coupling: 0 Hz to 50 kHz, AC coupling: 10 Hz to 50 kHz	< 3 dB
Incidental φM at AM	m = 30 %, f_{mod} = 1 kHz, ± peak/2	< 0.2 rad

Frequency bands for frequency and phase modulation

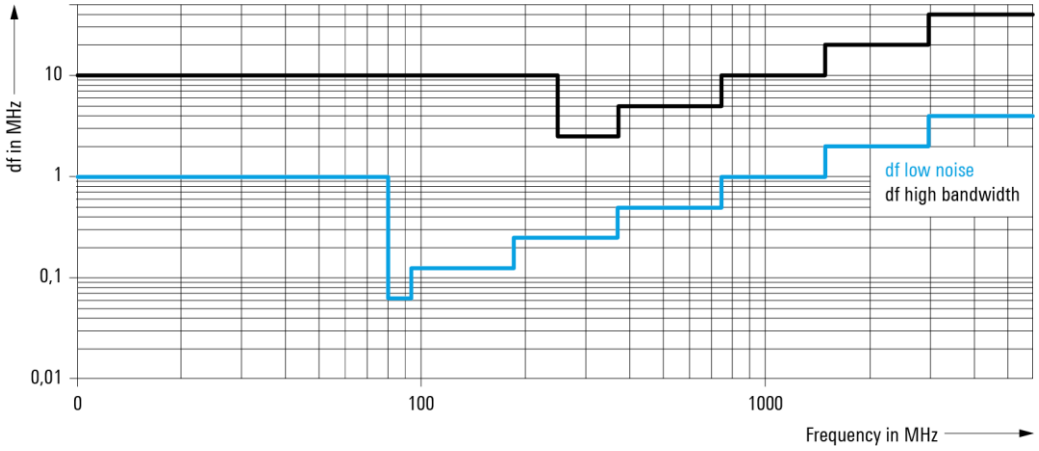
Multiplier N is used to define FM and φM specifications within this document.

Multiplier N for different frequency ranges	FM mode: low noise; φM mode: low noise	
	f ≤ 80 MHz	1
	80 MHz < f ≤ 93.75 MHz	1/16
	93.75 MHz < f ≤ 187.5 MHz	1/8
	187.5 MHz < f ≤ 375 MHz	1/4
	375 MHz < f ≤ 750 MHz	1/2
	750 MHz < f ≤ 1.5 GHz	1
	1.5 MHz < f ≤ 3 GHz	2
	3 GHz < f ≤ 6 GHz	4
	FM mode: high bandwidth; φM mode: high bandwidth, high deviation	
	f ≤ 250 MHz (mixer mode)	1
	250 MHz < f ≤ 375 MHz	1/4
	375 MHz < f ≤ 750 MHz	1/2
	750 MHz < f ≤ 1.5 GHz	1
	1.5 MHz < f ≤ 3 GHz	2
	3 GHz < f ≤ 6 GHz	4

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

Specifications apply for f > 200 kHz.

Modulation source		internal, external, internal + external
External coupling		AC, DC
FM modes		low noise, high bandwidth
Maximum deviation	FM mode: high bandwidth	N × 10 MHz
	FM mode: low noise	N × 1 MHz
Resolution of setting		< 0.02 % of set deviation or N × 0.1 Hz, whichever is greater, min. 0.01 Hz
FM deviation error	f_{mod} = 2 kHz, deviation ≤ N × 1 MHz	
	internal	< (2 % of setting + 20 Hz)
	external	< (3 % of setting + 20 Hz)
FM distortion	f_{mod} = 2 kHz, deviation = N × 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_{mod} = 1 kHz, f > 10 MHz	< 0.2 %
Carrier frequency offset with FM DC	after FM offset adjustment	< 0.2 % of set deviation

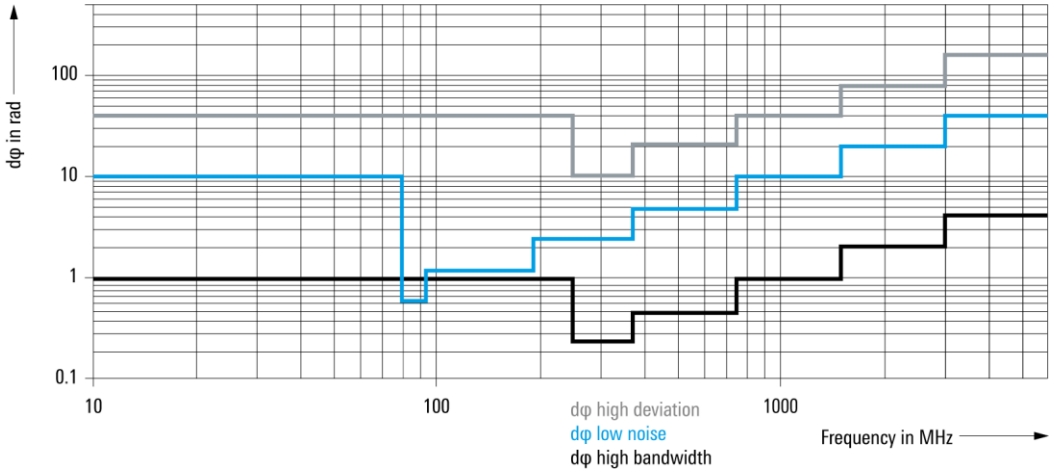


Maximum deviation (frequency modulation).

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

Specifications apply for f > 200 kHz.

Modulation source		internal, external, internal + external
External coupling		AC, DC
φM modes		high deviation, high bandwidth, low noise
Maximum deviation	φM mode: high bandwidth	N × 1 rad
	φM mode: high deviation	N × 40 rad
	φM mode: low noise	N × 10 rad
Resolution of setting	φM modes: high deviation, low noise	< 0.02 % of set deviation or N × 20 µrad, whichever is greater, min. 1 µrad
	φM mode: high bandwidth	< 0.1 % of set deviation, min. N × 20 µrad
φM deviation error	f_{mod} = 1 kHz, deviation ≤ half of max. deviation	
	internal	< (2 % of setting + 0.003 rad)
	external	< (3 % of setting + 0.003 rad)
φM distortion	f_{mod} = 10 kHz, half of max. deviation	< 0.2 %
Modulation frequency response	φM 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
	φM 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
	φM 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

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, φM
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 Ω	< 0.5 dB
	up to 10 MHz, R_O = 50 Ω	< 1.5 dB
Distortion	f < 100 kHz, at R_L > 50 Ω, 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.)
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

Remote control

Interfaces/systems	standard	Ethernet/LAN 10/100/1000BASE-T
	with R&S®SMBB-B86 option	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	These command sets can be selected in order to emulate another instrument. A subset of common commands is supported. 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.	**Hewlett Packard** • 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 **Agilent/Keysight Technologies** • E4421, E4422, E4428 • E8257, E8663 • N5161, N5181, N5183A **Aeroflex (IFR/Marconi)** • 2023, 2024 • 2030, 2031, 2032 • 2040, 2041, 2042 **Anritsu** • 68017, 68037 **Panasonic** • VP-8303A **Racal Dana** • 3102, 9087 **Rohde & Schwarz** • 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		• 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

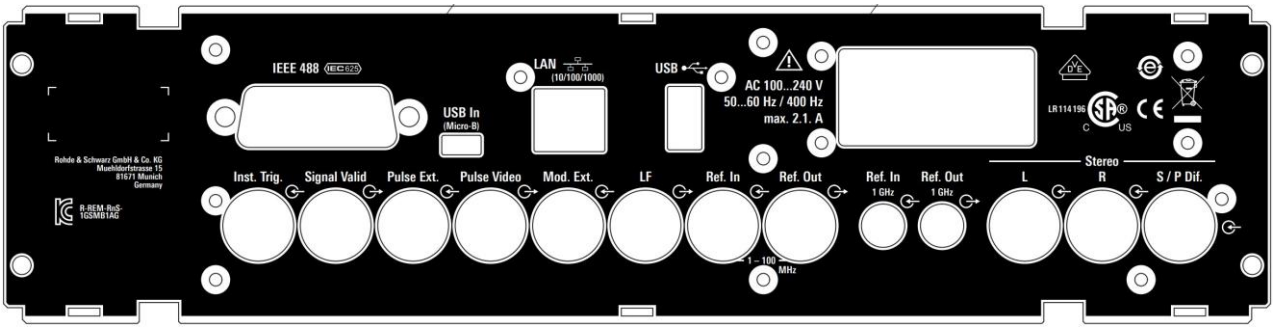
[5] Requires recommended extra R&S®TS-USB1.

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: • 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



R&S®SMB100B rear panel, schematic view of the connectors

REF 1 GHz IN	1 GHz reference frequency input, only available with R&S®SMBB-B3 option	SMA female
REF 1 GHz OUT	1 GHz reference frequency output, only available with R&S®SMBB-B3 option	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, only available with R&S®SMBB-B5 option	BNC female
R	stereo signal input for R signal, only available with R&S®SMBB-B5 option	BNC female
S/P DIF	stereo signal input for digital stereo signal, only available with R&S®SMBB-B5 option	BNC female
USB IN	USB 2.0 (high speed), remote control of instrument (USB-TMC), only available with R&S®SMBB-B86 option	USB type B
USB	USB 3.0 (SuperSpeed) connector for external USB devices: • 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, only available with R&S®SMBB-B86 option	24-pin Amphenol series 57 female

General data

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)
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
Power rating		
Rated voltage		100 V to 240 V (± 10 %)
Rated frequency		50 Hz to 60 Hz (± 5 %), 400 Hz (± 5 %)
Rated current		max. 2.1 A, 1.2 A at 100 V to 0.6 A at 240 V (meas.)
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	VDE mark 40046635
	CSA – Canadian Standards Association	CSA_{UL} mark 70133349
Acoustic noise emission	sound power level, ambient temperature, equipped with R&S®SMBB-B32	44 dB(A) (meas.), in line with DIN EN 3744:2011-02
Dimensions and weight		
Dimensions	W × H × D	344 mm × 108 mm × 372 mm (13.6 in × 4.3 in × 14.7 in)
Weight	when fully equipped	6.8 kg (15.0 lb)
Display		5" color display, with capacitive touch functionality
Calibration interval		
Recommended calibration interval	when operated 40 h/week in the full range of the specified environmental conditions	2 years

Ordering information

Designation	Type	Order No.
Signal generator [6] including power cable and quick start guide	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 [7]	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 [8]	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 [9]	R&S®SMBB-K27	1422.6101.02
AM/FM/φM	R&S®SMBB-K720	1422.6201.02
Stereo/RDS coder [10]	R&S®SMBB-B5	1422.5605.02
Other options		
Remote control interface (GPIB and USB)	R&S®SMBB-B86	1422.5805.02
Health and utilization monitoring service (HUMS)	R&S®SMBB-K980	1422.6347.02
Recommended extras		
19" rack adapter	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®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] Requires the R&S®SMBB-K31 option.

[9] Requires the R&S®SMBB-K23 option.

[10] Requires the R&S®SMBB-K720 option.

Warranty and service

Warranty		
Base unit		1 year
All other items		1 year
Service options		
	Service plans	**On demand**
Calibration	up to five years [11]	pay per calibration
Warranty and repair	up to five years [11]	standard price repair
Find out more about our service portfolio under: www.rohde-schwarz.com/service-support/service/overview/service-overview_229461.html		

[11] For extended periods, contact your Rohde & Schwarz sales office.

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Certified Environmental Management
ISO 14001

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PD 3607.8182.22 | Version 09.00 | February 2024 (jr)
R&S®SMB100B RF Signal Generator
Data without tolerance limits is not binding | Subject to change

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