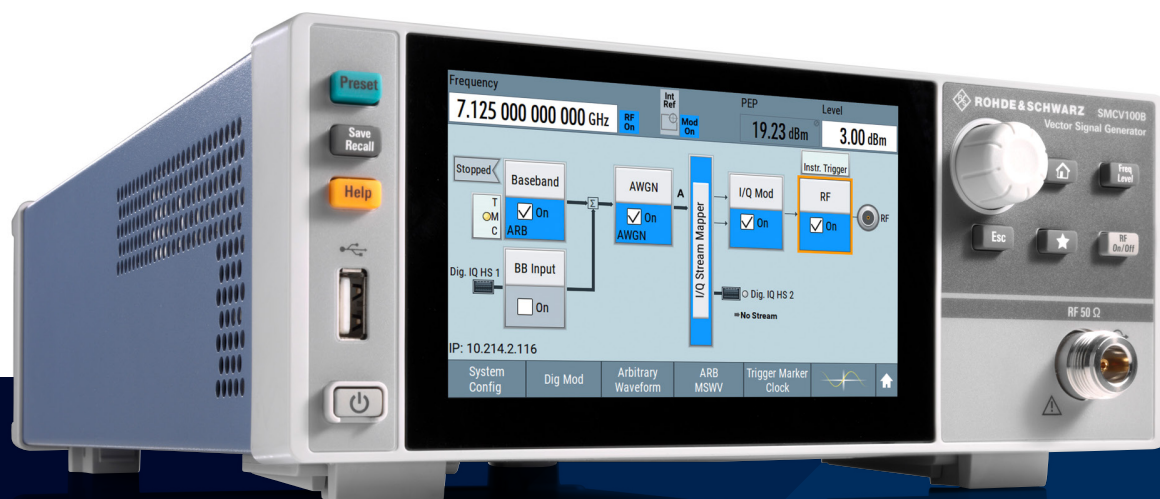


R&S® SMCV100B VECTOR SIGNAL GENERATOR



Maximum flexibility in applications
and in production



Product Brochure
Version 01.00

ROHDE & SCHWARZ

Make ideas real



AT A GLANCE

The R&S®SMCV100B vector signal generator is the first multistandard platform for automotive, broadcast, navigation and wireless applications. This makes the R&S®SMCV100B unique for use in many applications, from the lab to production and wherever different technologies meet.

The R&S®SMCV100B vector signal generator features a new direct RF DAC concept for RF signal generation. This concept enables I/Q modulation and upconversion in the digital domain, which eliminates the I and Q imbalance errors and LO leakage associated with traditional analog I/Q modulators.

The R&S®SMCV100B options concept is fully software defined. No hardware options are required to obtain full instrument functionality. This software concept applies to upgrading the RF frequency, memory, I/Q modulation bandwidth and all other R&S®SMCV100B options for other applications.

Thanks to its flexible and customizable design, the instrument is ready to meet future requirements. Options can easily be added via software keycodes, allowing users to quickly upgrade functions and add bandwidth, output power and even frequency range.

The intuitive, touchscreen based operating concept makes the R&S®SMCV100B very ergonomic and practical to use.

Key facts

- First multistandard platform for broadcast, navigation, cellular and wireless applications
- Fully software defined vector signal generator with software based option concept
- Modern RF signal generation concept with direct digital RF upconversion up to 2.5 GHz
- High output power up to +25 dBm
- Modulation bandwidth up to 240 MHz
- Convenient operation on 5" touchscreen



BENEFITS

First multistandard platform
► page 4

User friendly in every detail
► page 6

Maximum flexibility in production
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R&S®LegacyPro: refresh your technology
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APPLICATIONS

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Waveform streaming from internal SSD for EMC testing and validation
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OPERATION

State-of-the-art user interface
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Rear panel connections
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FIRST MULTISTANDARD PLATFORM

For automotive, broadcast, navigation and wireless applications

Modern RF signal generation with direct digital RF upconversion concept

The R&S®SMCV100B vector signal generator features a new direct RF DAC concept for RF signal generation. This concept enables I/Q modulation and upconversion in the digital domain which eliminates I and Q imbalance errors and LO leakage as known from traditional analog I/Q modulators.

The direct RF DAC concept is used up to a frequency of 2.5 GHz. For RF frequencies > 2.5 GHz, an analog mixing concept is used to bring the signal to the desired output frequency.

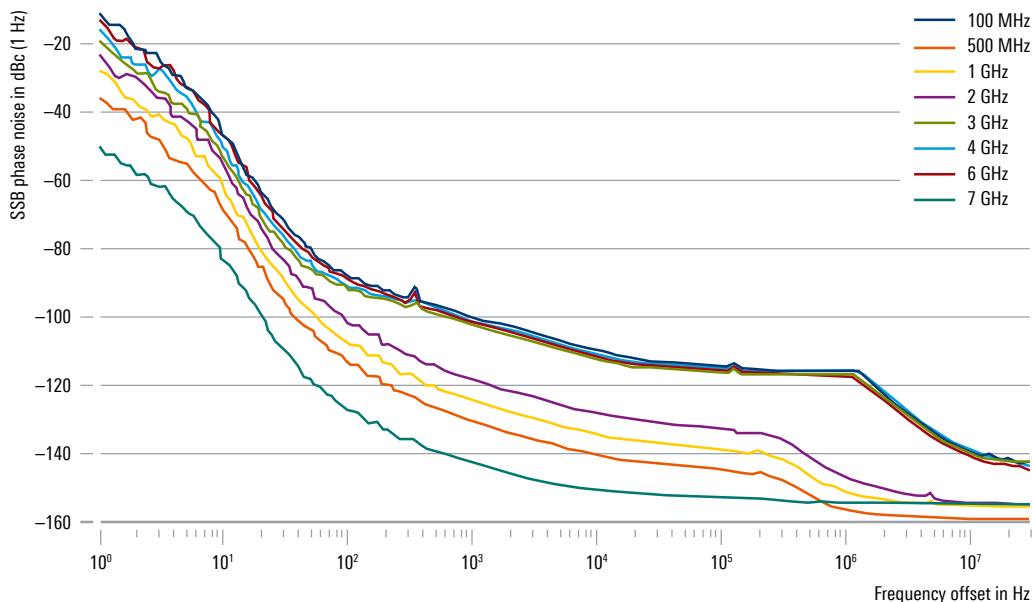
Powerful internal baseband generator

The R&S®SMCV100B provides powerful hardware for internal baseband signal generation. The R&S®SMCV100B either generates signals in real time in FPGAs or it uses the ARB generator to directly generate I/Q signals for digital communications standards. The R&S®WinIQSIM2™ signal simulation software can also be used to generate I/Q signals.

Real-time signal generation in FPGAs is especially used for broadcast standards. This technological approach enables continuous and very long uninterrupted signal generation with different data content (audio, video, data, PRBS) for decoding. Such long sequences are required for testing the performance or EMC of tuners.

Measured SSB phase noise for different carrier frequencies

With the R&S®SMCVB-K709 low phase noise option



Internal I/Q streaming capabilities

The playing time of arbitrary waveform generators depends on the available hardware memory size and on signal parameters such as the signal bandwidth. This combination usually limits the playing time of conventional ARB generators to a few seconds, which is a problem for measurement applications that require a longer signal duration.

For such applications, the R&S®SMCV100B offers the option of playing back I/Q waveforms from the internal solid state hard disk (64 Gbyte SSD). The maximum RF bandwidth is 56 MHz. A playing time of almost 4 minutes can be achieved with a 60 Gbyte sequence stored on the SSD. For signals with a lower RF bandwidth, the playing time is extended accordingly. A 100 kHz wide FM signal, for example, can be played over a period of several days.

If it is necessary to play even longer I/Q signals, it is possible (via the digital I/Q interface) to use the R&S®SMCV100B in combination with other Rohde & Schwarz instruments such as the R&S®IQW wideband I/Q data recorder.

R&S®WinIQSIM2™ waveform generation

Modulated signals for different standards can be generated with the R&S®WinIQSIM2™ simulation software. The simulation software supports wireless standards such as 5G and LTE and the generation of noncellular signals such as Wi-Fi (IEEE 802.11xx) and many others.

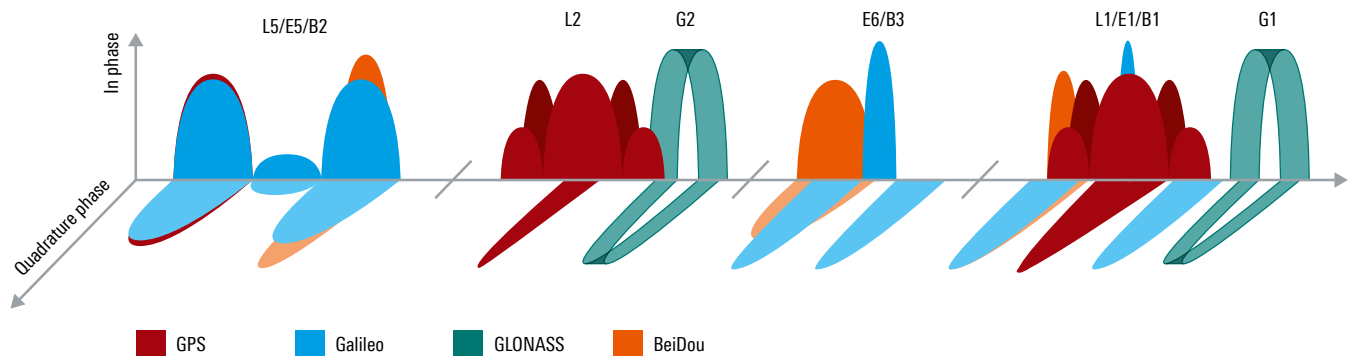
Navigation standards for functional Go/NoGo tests

With the R&S®WinIQSIM2™ simulation software, the R&S®SMCV100B supports the GPS, GLONASS, Galileo, and BeiDou navigation standards for functional Go/NoGo tests.

Signal content for each navigation standard can be generated with a single navigation satellite. The output of this satellite signal makes it possible to quickly perform a simple functional Go/NoGo test of the navigation receiver. For a functional test with a position fix, predefined waveforms of limited length can be played. This makes the R&S®SMCV100B ideal for production applications.

GNSS signals supported by R&S®WinIQSIM2™

Power spectral density of the most important GNSS signals



Remark: Galileo E6/B3 on roadmap for future release.

USER FRIENDLY IN EVERY DETAIL

The intuitive operating concept makes the R&S®SMCV100B very ergonomic and practical to use. Thanks to its design for flexible customization, the instrument is ready to fulfill future requirements.

Half a rack size, great performance, smart block diagram operating concept

With its ½ 19" form factor and clearly structured user interface, the R&S®SMCV100B offers optimum operating convenience, a state-of-the-art signal generation concept and great RF performance in a minimum of space. The space saving concept allows installation of a second R&S®SMCV100B or other ½ 19" instrument, such as an R&S®NGM202 power supply, in just one 2 HU mounting frame.

5" touch display in a 2 HU instrument

The high-resolution 5" touch display and clearly structured block diagram user interface enable simple and intuitive operation at all times. The user instantly sees the signal flow in the R&S®SMCV100B as well as the states of the instrument inputs and outputs. An integrated graphic function displays the generated signal in real time.

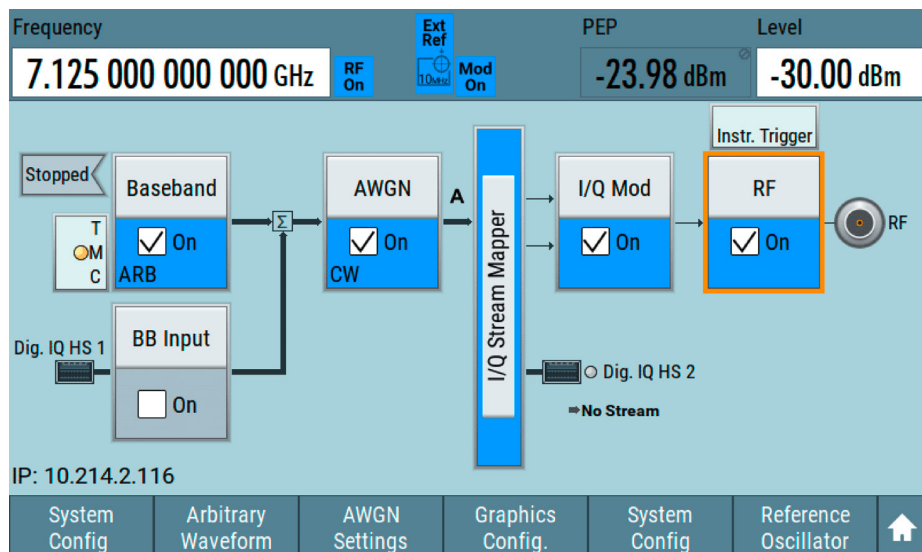
SCPI macro recorder

The R&S®SMCV100B supports fast and error-free creation of remote control programs. The integrated SCPI macro recorder with its built-in code generator allows users to automatically record all manually performed settings and create a directly executable MATLAB® script.

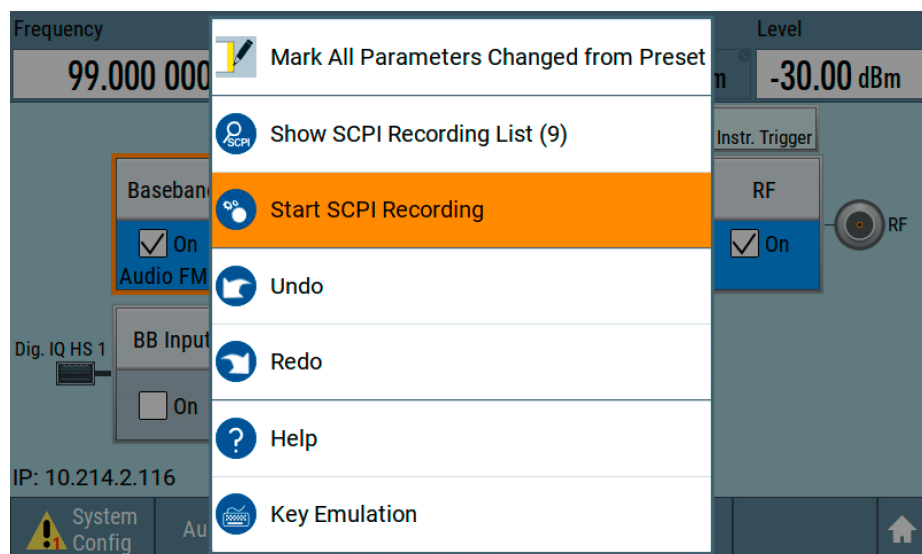
This minimizes the time and development resources needed to develop test automation.

R&S®HZN96 19" rack adapter with R&S®SMCV100B and R&S®NGM202

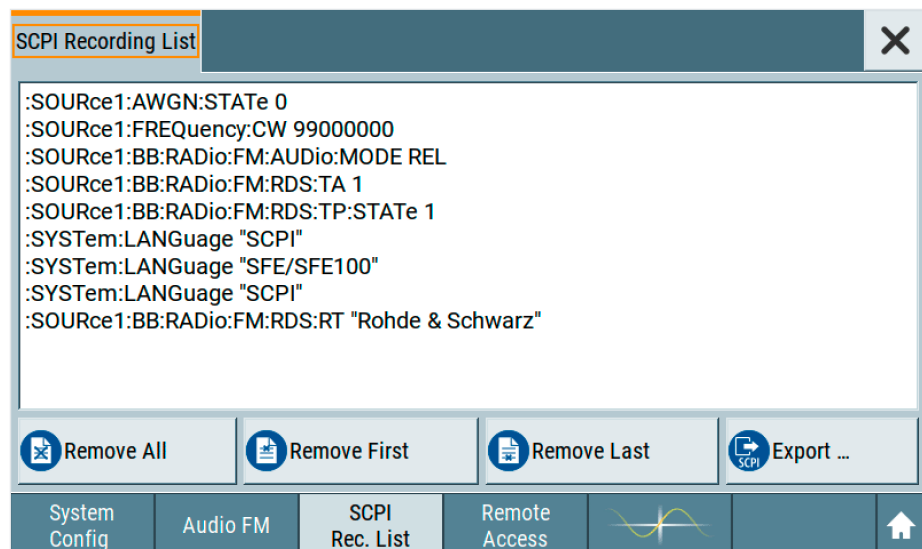




R&S®SMCV100B graphical user interface with block diagram



The R&S®SMCV100B generator's built-in SCPI macro recorder and code generator support fast and easy generation of SCPI program sequences



SCPI recording list

MAXIMUM FLEXIBILITY IN PRODUCTION

From functional end-of-line testing to application-specific device software testing

The flexible R&S®SMCV100B easily handles a wide variety of test applications – from a simple functional Go/NoGo test to an end-of-line test on the physical layer or a software test on the application layer with user test data or user-specific data content, such as RDS, TMC and EON data. The various technologies available in the R&S®SMCV100B, such as the arbitrary waveform generator and the real-time encoder for broadcast standards, are used as needed for the specific test scenario.

Fully software defined vector signal generator for easy upgrading at user site

Software options fully cover changing requirements for the signals to be generated. The R&S®SMCV100B can generate signals for virtually all common communications, broadcast and navigation standards as well as user-specific signals. Users simply use keycodes to easily activate all these options on their R&S®SMCV100B.

Standardization of production lines with a single vector signal generator

Thanks to its many frequency ranges, modulation bandwidths, standards and ARB functions, the R&S®SMCV100B is the ideal standard signal generator for production. Software options allow users to adapt the R&S®SMCV100B basic functionality to changing

requirements and products on production lines, making it the right vector signal generator even for EMS contract manufacturers with limited batch sizes. Standardization based on a flexibly configurable vector signal generator offers the additional advantages of less downtime due to failures and servicing on production lines.

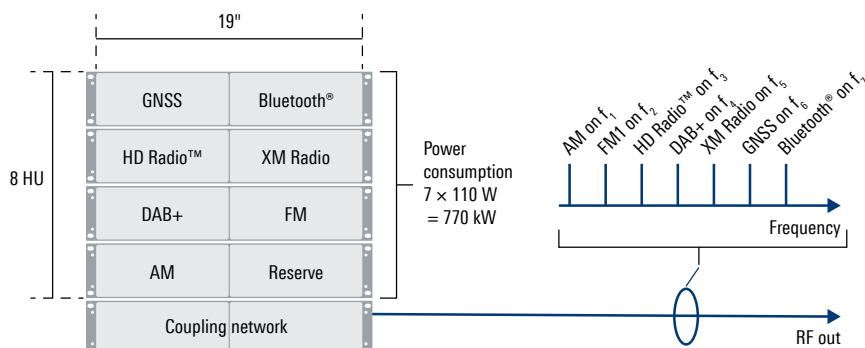
Temporary and transferable software licenses

All R&S®SMCV100B software options can also be licensed for a limited time period (e.g. 1 month or 6 months) to accommodate users who do not permanently need certain functions. This allows users to reconfigure the functionality of the R&S®SMCV100B platform as needed on a project-specific basis. It also means the R&S®SMCV100B offers maximum flexibility for production lines.

Minimize the downtime of production lines

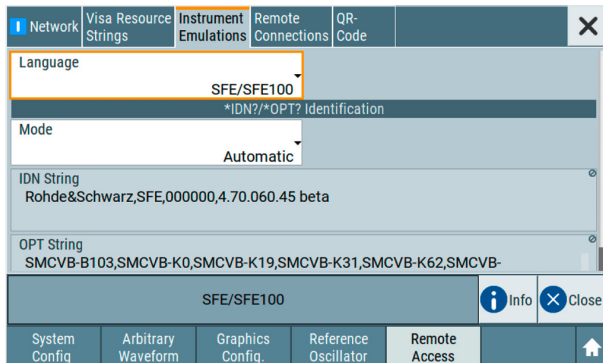
The configuration flexibility of the R&S®SMCV100B enables the instrument platform to be used in production lines with different products. The R&S®SMCV100B minimizes downtime on a production line standardized since a replacement R&S®SMCV100B can be quickly configured to provide the necessary functionality. The generator's basic functionality is activated on the replacement generator by using available keycodes or transferable licenses. This capability also minimizes downtime for instrument servicing or calibration.

Space and power saving 19" rack with R&S®SMCV100B in central transmitter room



R&S®LegacyPRO: REFRESH YOUR TECHNOLOGY

Enjoy plug and play replacement of your outdated signal generator with the R&S®LegacyPro program and the R&S®SFE100.

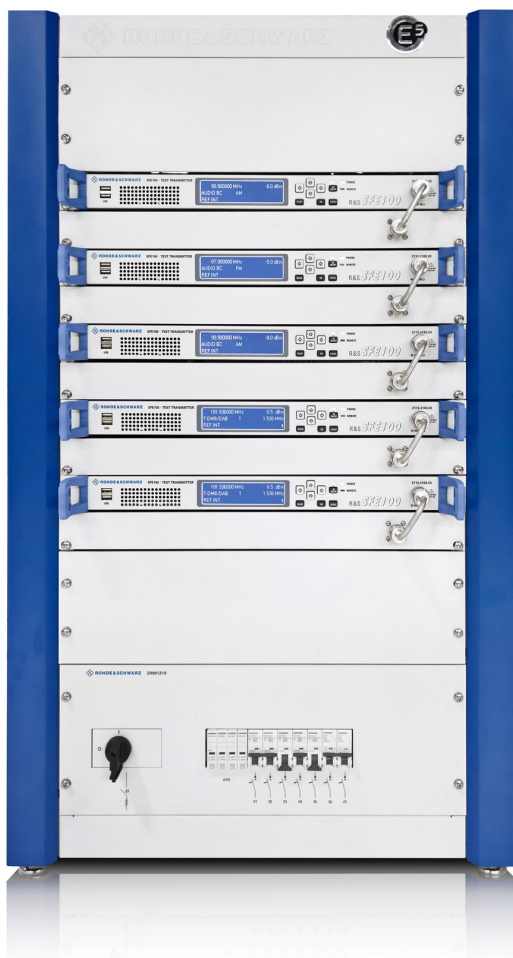


R&S®SMCV100B instrument setup for R&S®SFE100 emulation and replacement

Remote compatibility and emulation of the R&S®SFE100

The challenge associated with existing test systems is servicing the test equipment and eventually replacing it with new, more powerful equipment. The R&S®SMCV100B can be integrated into existing test environments with minimal effort, and the existing remote control and automation software does not have to be changed.

Thanks to its R&S®SFE100 emulation mode, the R&S®SMCV100B offers an easy way to replace instruments in existing test systems by simply pulling them out and plugging in a replacement. This solution minimizes the risk and effort involved.



End-of-line test: rack with four operational R&S®SFE100 test transmitters and one spare unit



APPLICATIONS

The many supported standards and its functionality make the R&S®SMCV100B ideal for a large number of applications.



RESEARCH AND EDUCATION

Use in labs at universities, schools, etc.



WIDE BASE MARKET

Use as general purpose instrument in labs



WIRELESS MARKET

Signal generator for producing signals for communications standards such as 5G, LTE, IoT and even Wi-Fi in line with the different versions of IEEE 802.11, Bluetooth® and other standards



BROADCAST CONSUMER EQUIPMENT INDUSTRY

Production and testing of broadcast receivers, set-top boxes, TV receivers, etc.



AUTOMOTIVE INDUSTRY

Production, end-of-line testing of car radios, entertainment and navigation systems and many other products



ELECTRONICS MANUFACTURING SERVICES

Production of different products with constantly varying user requirements regarding modulation types, system bandwidths, etc.



FUNCTIONAL AND END-OF-LINE TESTING

Of infotainment systems and multifunctional antennas

Production requires maximum flexibility and extremely fast response times for generating signals of different standards. With its platform concept, the R&S®SMCV100B precisely meets these requirements and also offers investment protection for future test system expansions. The R&S®SMCV100B is the perfect solution for optimizing existing test systems. The many signal sources previously used for different standards can now be replaced by just one vector signal generator, the R&S®SMCV100B.

The ideal functional and end-of-line tester

- ▶ Space saving single-box solution
- ▶ Simplification and standardization of different test systems based on the R&S®SMCV100B platform
- ▶ Sequential generation of the different signals required
- ▶ Functional tests with audio and video content
- ▶ Software activation of new functions and configuration modifications

Examples for testing DUTs in line with used standards and regional requirements

	EU	USA/Canada	Asia
Audio broadcast	AM/FM RDS	AM/FM RDBS	AM/FM RDS DARC
	DAB/DAB+	HD Radio	T-DMB
		XM Radio	ISDB-Tsb
Navigation	GPS	GPS	GPS
	GLONASS		GLONASS
	Galileo		
Noncellular	Bluetooth®	Bluetooth®	Bluetooth®
	IEEE 802.11 xx	IEEE 802.11 xx	IEEE 802.11 xx

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CENTRAL RF SIGNAL GENERATION AND CABLE DISTRIBUTION

Due to the high RF output power, the signals generated by the R&S®SMCV100B can also be fed into cable distribution networks.

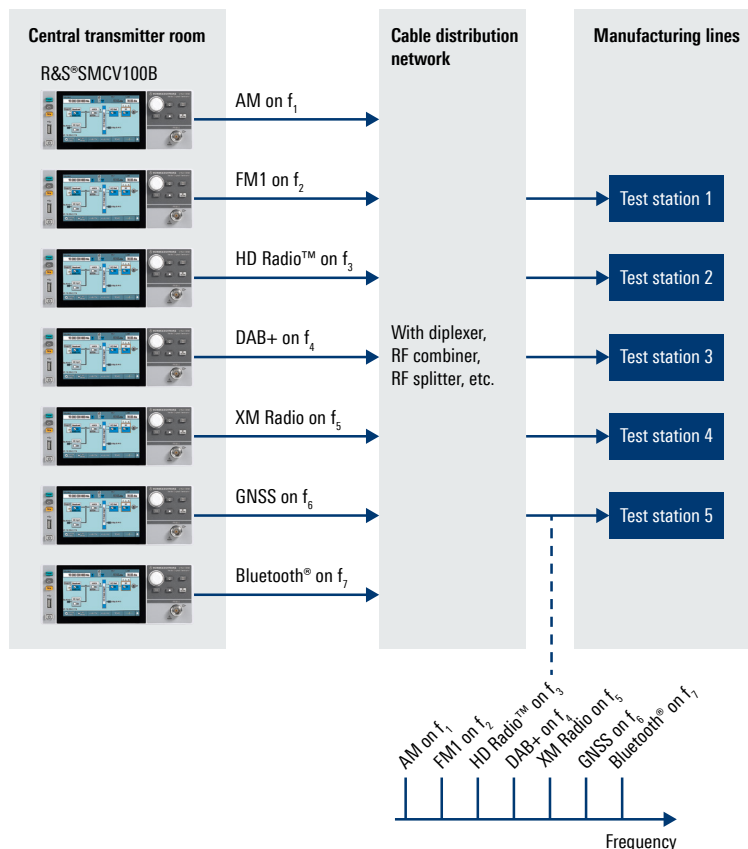
In this scenario, several R&S®SMCV100B instruments generate the same or different signals at different frequencies. The R&S®SMCV100B signal generators are typically all located in one room, the central transmitter room.

From this room, the R&S®SMCV100B signal generators feed the generated RF signals at different frequencies into a common distribution network. The signals are combined in a single cable and can be distributed to several production lines and test stations.

The receiver under test receives all signals fed into the cable at its RF input and can perform the test with the intended signal by simply switching to the respective receiving frequency.

The permanently available signal at each test station is a distinct advantage since the individual production lines do not have to be synchronized and production is therefore not subject to time dependencies.

Central transmitter room application with R&S®SMCV100B and manufacturing line distribution



BASIC GNSS RECEIVER TESTING

The R&S®SMCV100B GNSS solutions cover all production testing requirements for GNSS receivers.

Using GNSS waveforms for basic receiver tests

Many Rohde & Schwarz signal generators can be used to play back GNSS waveforms. This approach is ideal for setting up a basic and cost-efficient single-channel test environment for GNSS receiver manufacturing and for performing basic sensitivity tests. GNSS waveforms can be created using the R&S®WinIQSIM2™ simulation software and are also available for the R&S®SMCV100B.

For more information, see
www.rohde-schwarz.com/product/winiqsim2

GNSS production tester

The R&S®SMCV100B GNSS simulation capabilities address specific needs for GNSS chipset testing and speed-optimized production testing of GNSS receivers. During such tests, the basic GNSS signal reception and the connection between the antenna and GNSS chipset need to be verified. Two types of tests are typically used for this purpose.

Go/NoGo tests on the physical layer

The GNSS receiver is stimulated with a navigation standard signal. Since the simulated signal represents just one satellite in the navigation standard, the receiver cannot carry out positioning. This is a pure Go/NoGo test that can be used to test different aspects of the overall system, for instance the cabling between the GNSS receiving antenna and the navigation receiver.

The R&S®WinIQSIM2™ simulation software is used for this simple test. It generates a single GPS, GLONASS, BeiDou or Galileo satellite signal. The base configuration of a 3 GHz R&S®SMCV100B with 64 Msample ARB is sufficient for this test.

Functional tests with positioning fix

The GNSS receiver needs simulated signals from at least four navigation satellites in order to fix a position based on the information transmitted in the signals. The GNSS receiver has to be synchronized with the signals before it can process the position data and fix the position. The different GNSS standards require different waveform lengths to perform a position fix. The R&S®SMCV100B with the R&S®SMCVB-K511 option with 512 Msample can handle such position-fix sequences for each of these standards.

For long position-fix sequences, the R&S®SMCV100B is used with the R&S®SMCVB-K505 waveform streaming option together with predefined waveforms. Each waveform contains a defined navigation scenario with a fixed, unchangeable position. Proprietary I/Q sequences can still be used and played out. The I/Q sequences played out with the waveform streaming option are modulated and transmitted on the selected navigation standard's frequency.

EXAMPLES OF ARB MEMORY DEPTHS NEEDED FOR GNSS WAVEFORMS

Galileo E1 has the largest memory requirements with about 25 Msample for a playing time of one second and an oversampling factor of two. A 64 Msample ARB would result in a maximum playing time of 2.5 seconds.

GPS L1 has a much simpler signal structure and only needs a 2 Msample memory depth for a playing time of one second. A 64 Msample ARB can broadcast a GPS L1-signal for 32 seconds without interruption. This R&S®SMCV100B configuration is ideal for functional tests such as signal tracking and sensitivity tests that only need short playing times.

WAVEFORM STREAMING FROM INTERNAL SSD FOR EMC TESTING AND VALIDATION

With its waveform streaming functionality, the R&S®SMCV100B also supports users working with EMC test applications.

When performing EMC measurements on receivers, it is essential to feed an uninterrupted wanted signal to the DUT to detect possible effects of an interferer. Unlike the real-time coder approach, which can generate an uninterruptible signal, ARB generator approaches are mostly based on a limited memory from which the signals are output.

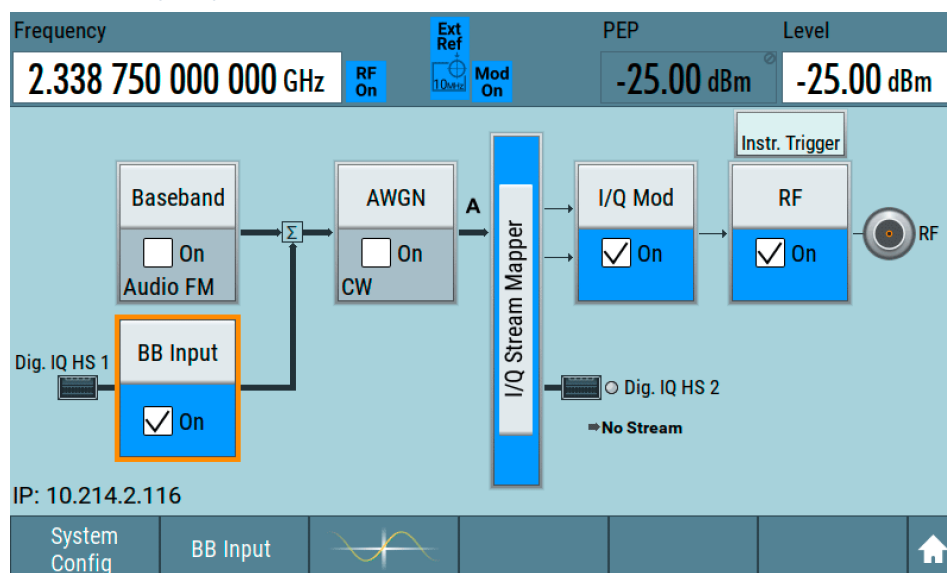
Depending on the signal properties, an uninterrupted signal can usually only be provided for a short playing time.

The R&S®SMCV100B waveform streaming functionality can stream long I/Q waveform sequences from the internal SSD, from an external hard disk via the USB 3.0 interface or from an I/Q playback device (e.g. an R&S®IQW) via the digital I/Q interface. The stream is output at the R&S®SMCV100B RF output.

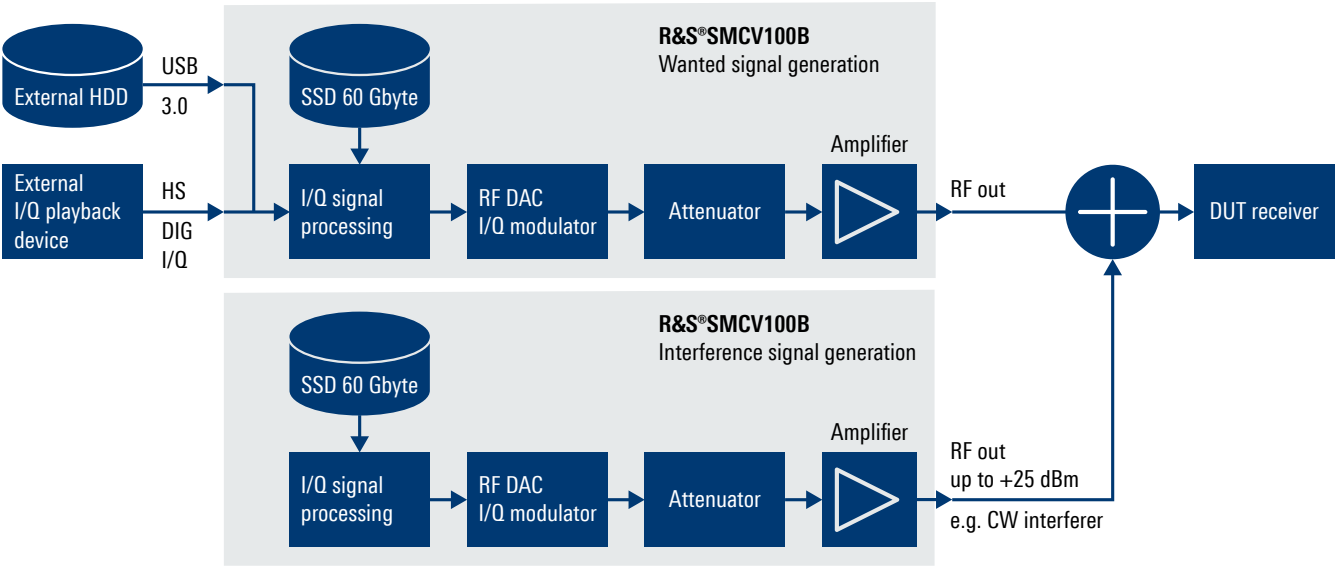
Use of the Linux operating system means there are no restrictions on the maximum manageable file size in the R&S®SMCV100B. The USB 3.0 interface supports playback from external storage media.

The R&S®SMCV100B can be used to generate both the wanted signal and the interferer.

Waveform streaming via digital I/Q interface on an XM radio frequency



Receiver blocking test scenario using the R&S®SMCV100B to generate wanted signals and interferers

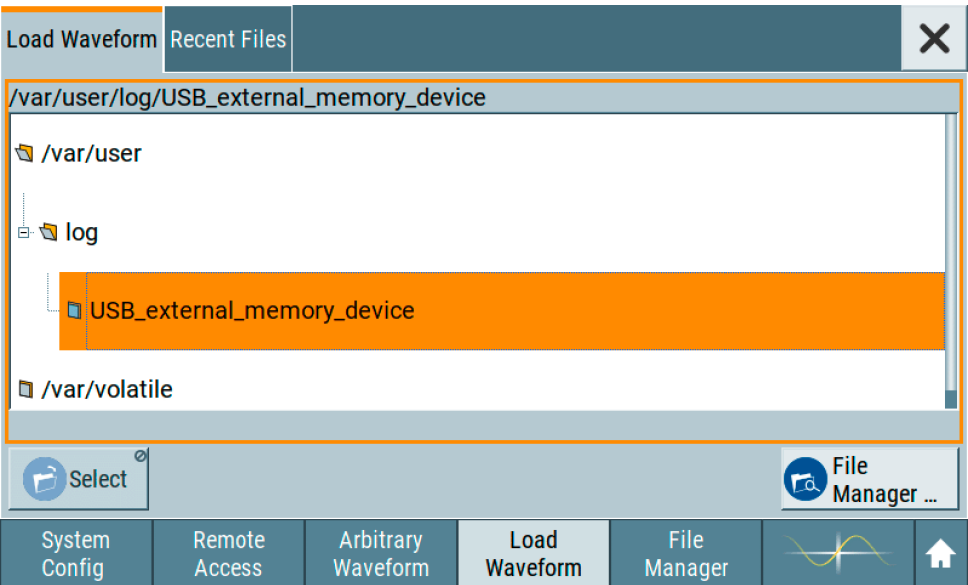


Calculation examples for I/Q waveform streaming with the R&S®SMCV100B

Playback time of internal SSD and external storage medium

Waveform streaming source	I/Q signal bandwidth	Streaming duration
Internal SSD (60 Gbyte)	56 MHz (70 Msymbol/s)	approx. 3.83 min
	100 kHz (125 ksymbol/s)	approx. 35.8 h
External memory device (example 1 Tbyte)	56 MHz (70 Msymbol/s)	approx. 1.09 h
	100 kHz (125 ksymbol/s)	approx. 25.5 days

Waveform streaming via USB 3.0 interface from external memory device



STATE-OF-THE-ART USER INTERFACE

High-resolution touchscreen
With easy-to-use graphical user
interface and block diagram concept

Context-sensitive help
With complete user documentation

Quick access
Softkey access to user menus

Favorite key
For simplified and fast operation
via customizable user menu

Quick access
With RF on/off hardkey

RF out connector (N female)
With 2 W reverse power protection

Graphical signal monitoring
At practically every point in the signal flow



REAR PANEL CONNECTIONS

Digital visual interface (DVI-D)
External monitor interface

Ethernet (LAN)
For remote access and remote control

USB 3.0 interfaces
PC data and streaming interfaces
for waveform streaming

QSFP+ slots with 10BASE-T
For electrical interfaces
(prepared for optical interfaces)

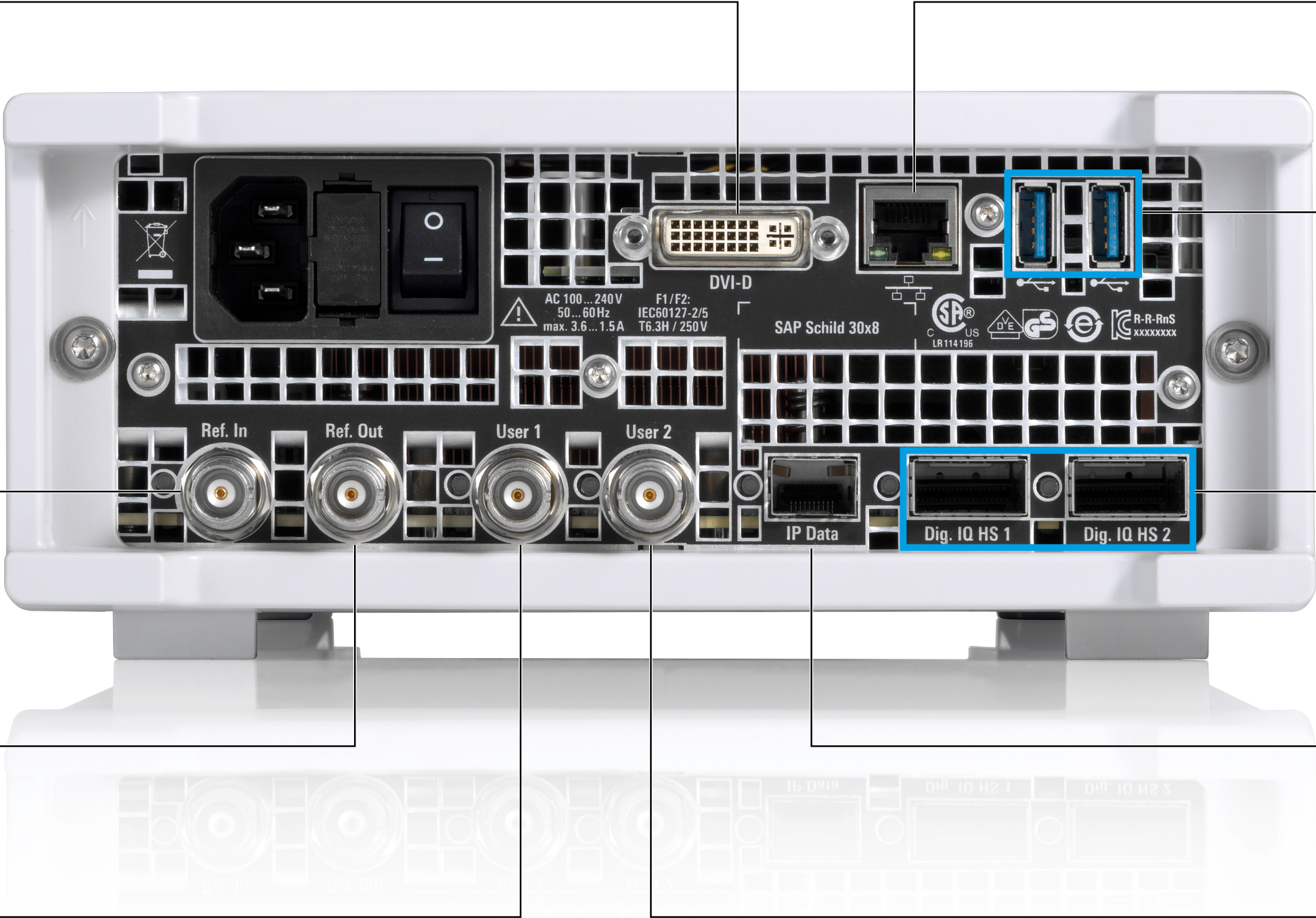
IP streaming interface
For external IP streaming to
broadcast real-time coders

Multifunctional interface
► Input for 1 PPS
► Output for markers

Reference input
For external clock source

Reference output
For synchronizing external instruments

Multifunctional interface
► Input for ASI, ETI, TS, trigger, SPDIF
► Output for markers



Service that adds value

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

Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

www.rohde-schwarz.com

Sustainable product design

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

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

Rohde & Schwarz training

www.training.rohde-schwarz.com

Rohde & Schwarz customer support

www.rohde-schwarz.com/support



R&S® SMCV100B VECTOR SIGNAL GENERATOR

Specifications



Data Sheet
Version 03.00

ROHDE & SCHWARZ

Make ideas real



Version 03.00, July 2020

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Definitions

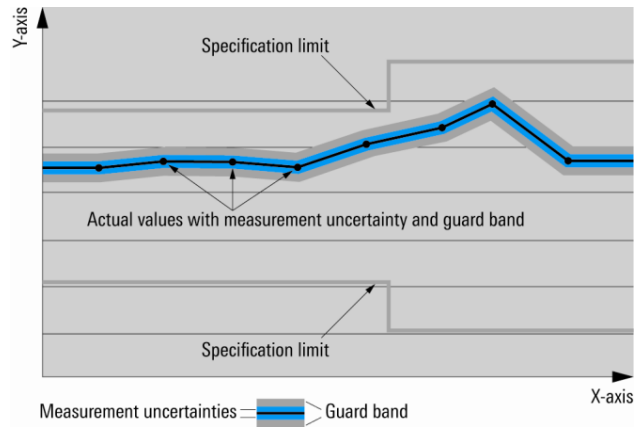
General

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 indicated as follows: "parameter: value".

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

Version 03.00, July 2020

RF characteristics

Frequency

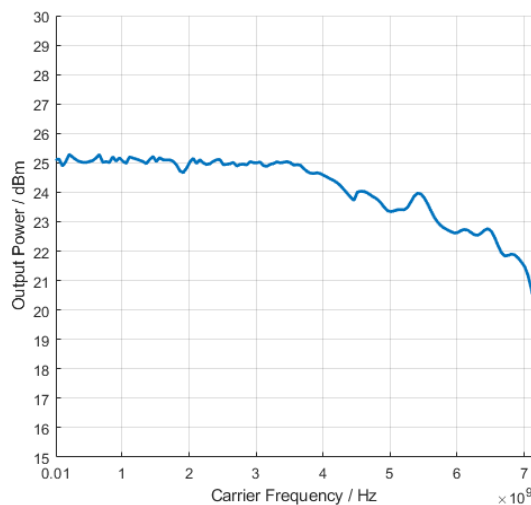
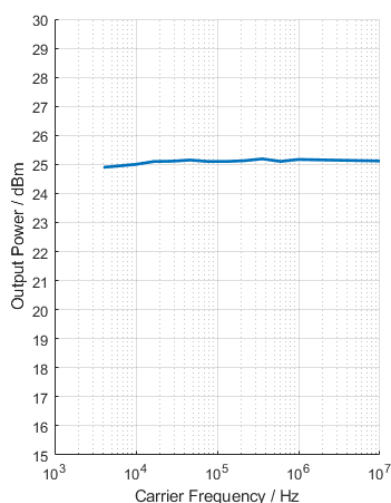
Range	with R&S®SMCVB-B103 option (mandatory)	4 kHz to 3 GHz
	with R&S®SMCVB-B103 and R&S®SMCVB-KB106 options	4 kHz to 6 GHz
	with R&S®SMCVB-B103, R&S®SMCVB-KB106 and R&S®SMCVB-KB107 options	4 kHz to 7.125 GHz
Resolution of setting		0.001 Hz
Resolution of synthesis	$f = 1 \text{ GHz}$	2.665 μHz (nom.)
Settling time	to within $< 1 \times 10^{-7}$ for $f > 200 \text{ MHz}$ or $< 20 \text{ Hz}$ for $f \leq 200 \text{ MHz}$ with GUI update stopped, I/Q optimization mode: fast, measured from command at instrument to frequency settled within specified range, with Ethernet (fast socket) remote control, level setting characteristic: auto	$< 5 \text{ ms}$
Range and resolution of phase offset setting		-999.99° to $+999.99^\circ$, 0.01° resolution

Reference frequency

Frequency error	at time of calibration in production	$< 1 \times 10^{-7}$
Aging	after 30 days of uninterrupted operation	$\leq 1 \times 10^{-6}/\text{year}$
Temperature effect	in temperature range from $+5^\circ\text{C}$ to $+45^\circ\text{C}$	$\pm 1.0 \times 10^{-6}$
Source		internal, external
External reference frequency modes	standard	10 MHz
Reference frequency input		
Connector type	REF IN on rear panel	BNC female
Input frequency		10 MHz
Minimum frequency locking range		$\pm 25 \times 10^{-6}$ (meas.)
Input level range		0 dBm to +16 dBm (meas.)
Input impedance		50 Ω (nom.)
Reference frequency output		
Connector type	REF OUT on rear panel	BNC female
Output frequency	square wave	
	source mode: internal	10 MHz
	source mode: external	10 MHz
Output level		+7 dBm to +13 dBm, +10 dBm (meas.)
Source impedance		50 Ω (nom.)

Level

Setting range		
R&S®SMCVB-B103/-KB106/-KB107	standard	
	4 kHz ≤ f < 100 kHz	−120 dBm to +16 dBm
	100 kHz ≤ f < 6 GHz	−145 dBm to +16 dBm
	6 GHz ≤ f ≤ 7.125 GHz	−145 dBm to +16 dBm
	with R&S®SMCVB-K31 option	
	4 kHz ≤ f < 100 kHz	−120 dBm to +25 dBm
	100 kHz ≤ f ≤ 6 GHz	−145 dBm to +25 dBm
	6 GHz ≤ f ≤ 7.125 GHz	−145 dBm to +25 dBm
Setting resolution		0.01 dB
Specified level range	peak envelope power (PEP)	
R&S®SMCVB-B103/-KB106/-KB107	standard	
	4 kHz < f ≤ 10 MHz	−110 dBm to +15 dBm
	10 MHz < f ≤ 6 GHz ¹	−120 dBm to +15 dBm
	6 GHz < f ≤ 7.125 GHz	−120 dBm to +15 dBm
	with R&S®SMCVB-K31 option	
	4 kHz < f ≤ 10 MHz	−110 dBm to +20 dBm
	10 MHz < f ≤ 6 GHz ¹	−120 dBm to +20 dBm
	6 GHz < f ≤ 7.125 GHz	−120 dBm to +18 dBm
Level accuracy	level setting characteristic: auto, temperature range from +18 °C to +33 °C	
	level > −80 dBm	
	4 kHz < f < 200 kHz	< 1.8 dB
	200 kHz ≤ f ≤ 10 MHz	< 0.7 dB
	10 MHz < f ≤ 2.5 GHz ¹	< 0.5 dB
	f > 2.5 GHz ¹	< 0.7 dB
	level ≤ −80 dBm	
	4 kHz < f < 200 kHz	< 1.8 dB
	200 kHz ≤ f ≤ 10 MHz	< 1.2 dB, < 1.0 dB (typ.)
	10 MHz < f ≤ 2.5 GHz ¹	< 0.8 dB
	f > 2.5 GHz ¹	< 1.1 dB
Settling time	to < 0.1 dB deviation from final value, with GUI update stopped, temperature range from +18 °C to +33 °C, f > 10 MHz, level setting characteristic: auto, I/Q optimization mode: fast measured from command at instrument to frequency settled within specified range, with Ethernet (fast socket) remote control	
		< 5 ms
Interruption-free level range	level setting characteristic: uninterrupted level setting	> 20 dB



Measured maximum output power versus frequency with R&S®SMCVB-K31 option

¹ For multiples of f = 0.5 GHz, specified level range is limited to −100 dBm due to a discrete spurious.

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Reverse power

Reverse power	maximum permissible RF power in output frequency range of RF path, from 50 Ω source In case of too high reverse power, the RF output is switched off.	
	1 MHz < f \leq 7.125 GHz	2 W
Maximum permissible DC voltage		35 V (nom.)

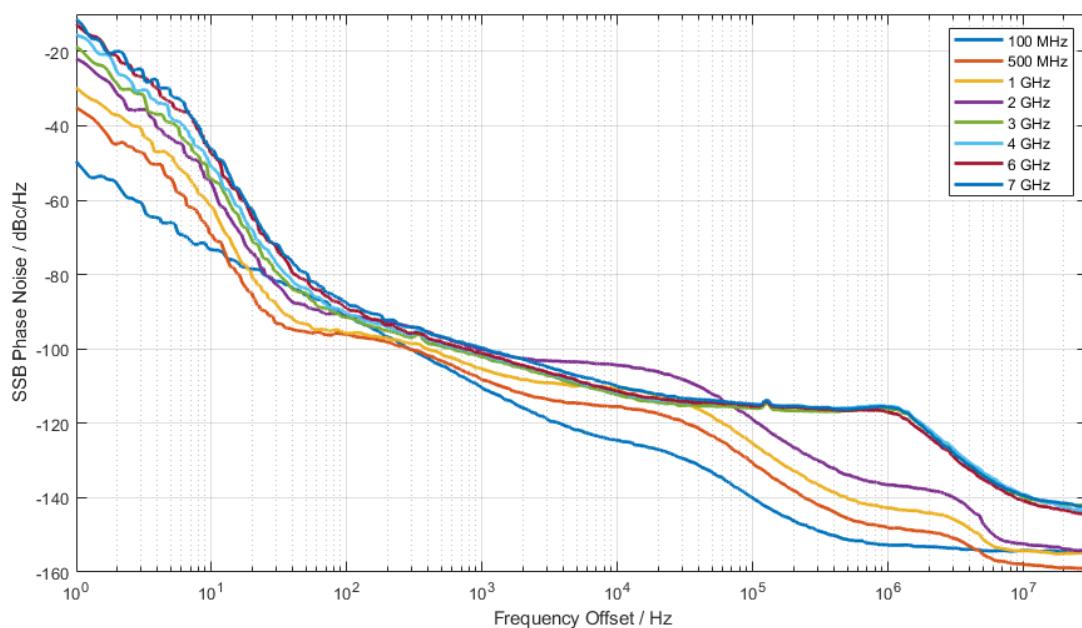
VSWR

Output impedance VSWR in 50 Ω system	level setting characteristic: auto, f > 200 kHz	
	P _{OUT} \leq 5 dBm	< 2.0
	P _{OUT} > 5 dBm	< 2.5
	200 kHz < f \leq 4.5 GHz	< 2.0
	4.5 GHz < f \leq 6 GHz	< 2.5

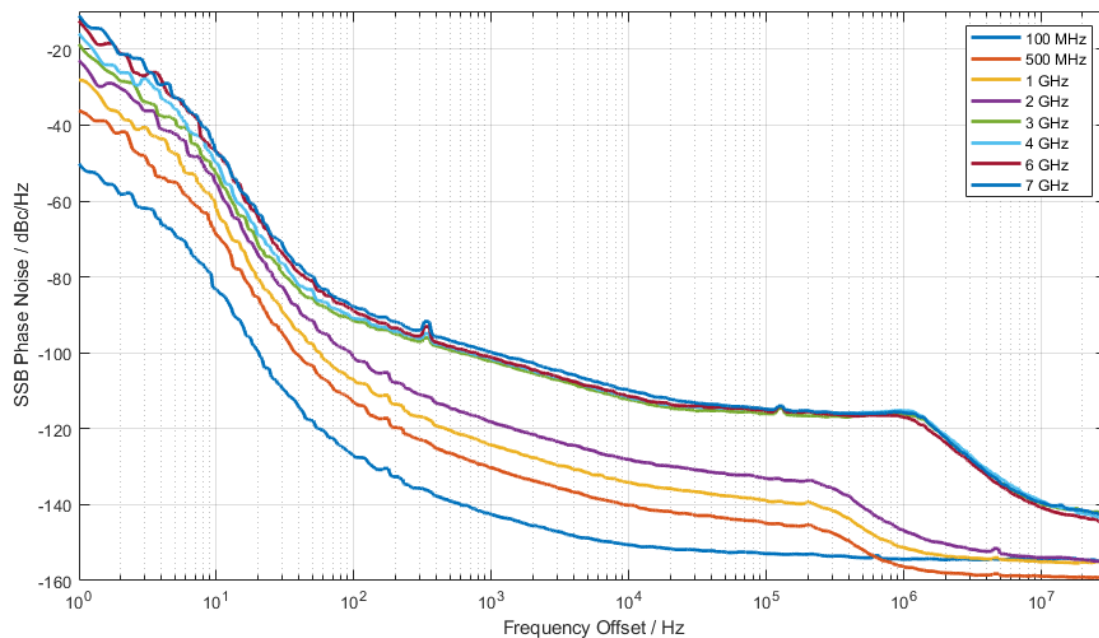
Spectral purity

Harmonics	CW, I/Q mode (full-scale internal single carrier signal), level \leq 13 dBm	
	1 MHz < f \leq 7.125 GHz	< -30 dBc
Nonharmonics	CW, level > +10 dBm, > 10 kHz offset from carrier and outside the modulation spectrum, reference frequency internal	
	f \leq 2.5 GHz	< -55 dBc, -60 dBc (typ.)
	2.5 GHz < f \leq 7.125 GHz	< -55 dBc, -70 dBc (typ.)
Wideband noise	CW, level = +10 dBm, carrier offset = 30 MHz, measurement bandwidth 1 Hz	
	20 MHz \leq f \leq 100 MHz	< -139 dBc
	100 MHz < f \leq 2.5 GHz	< -142 dBc
	2.5 GHz < f \leq 7.125 GHz	< -133 dBc
SSB phase noise	carrier offset = 20 kHz, measurement bandwidth 1 Hz, level = +10 dBm	
	f = 100 MHz	< -110 dBc
	f = 1 GHz	< -100 dBc
	f = 2 GHz	< -100 dBc
	f = 2.5 GHz	< -100 dBc
	2.5 GHz < f \leq 7.125 GHz	< -95 dBc
SSB phase noise with R&S®SMCVB-K709 option	carrier offset = 20 kHz, measurement bandwidth 1 Hz, level = +10 dBm	
	f = 100 MHz	< -145 dBc
	f = 1 GHz	< -125 dBc
	f = 2 GHz	< -119 dBc
	f = 2.5 GHz	< -117 dBc
	2.5 GHz < f \leq 7.125 GHz	< -107 dBc
Residual FM	CW, RMS values at f = 1 GHz ²	
	300 Hz to 3 kHz, weighted (ITU-T)	< 2 Hz, 0.15 Hz (typ.)
	20 Hz to 23 kHz	< 4 Hz, 1.9 Hz (typ.)
Residual AM	CW, f > 10 MHz, RMS value (20 Hz to 20 kHz), level = 12 dBm	
	4 kHz \leq f \leq 100 MHz	< 0.08 %
	100 MHz < f \leq 7.125 GHz	< 0.05 %

² With internal reference frequency. May be improved using external reference.



Measured SSB phase noise for different carrier frequencies, standard instrument



Measured SSB phase noise for different carrier frequencies, with R&S®SMCVB-K709 option

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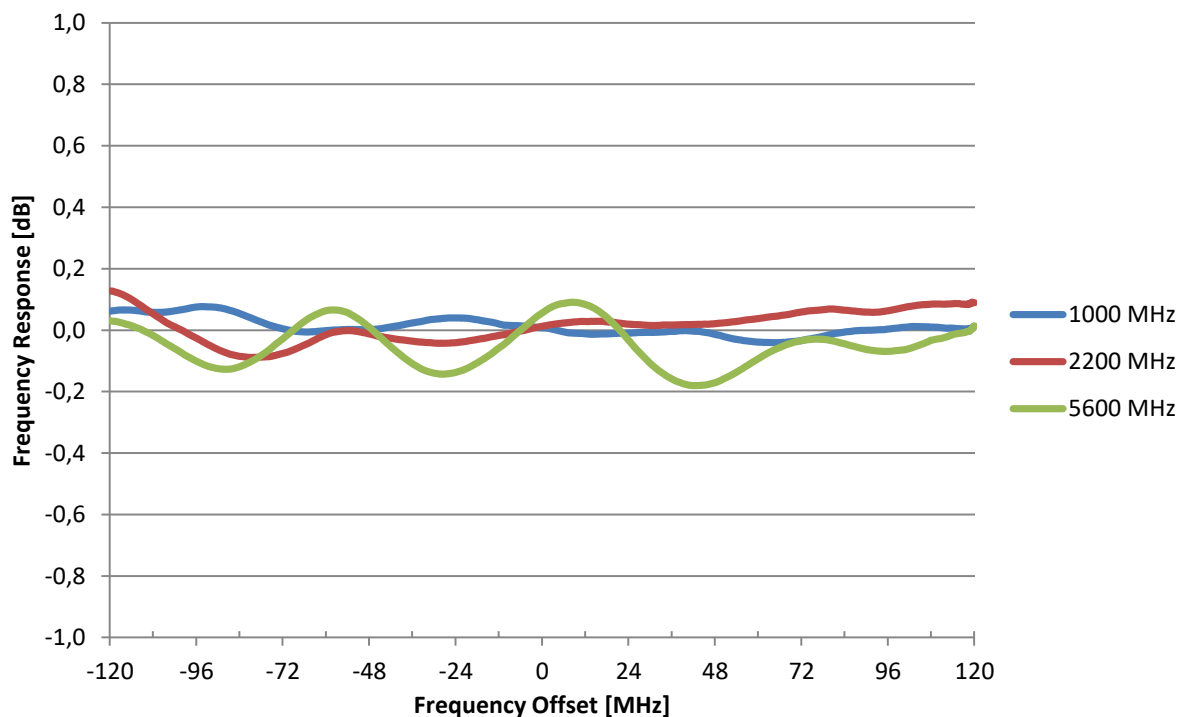
Frequency and level sweep

Operating mode		digital sweep in discrete steps
Sweep parameters		RF frequency, RF level
Trigger modes	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 (user 1 or user 2 at rear), rotary knob, touch panel, remote control
Sweep range		fully specified frequency and level range
	interruption-free level sweep with level setting characteristic: uninterrupted level setting	0.01 dB to 20 dB
Sweep shape		sawtooth, triangle
Step size setting resolution	frequency sweep linear	0.001 Hz
	frequency sweep logarithmic	0.01 %
	level sweep	0.01 dB
Dwell time setting range		5 ms to 100 s
Dwell time setting resolution		0.1 ms

I/Q modulation

I/Q modulation performance

Operating modes		internal baseband I/Q
RF modulation bandwidth	The maximum signal bandwidth depends on the baseband option configuration, see I/Q baseband generator.	
	8 kHz < f ≤ 240 MHz	±50 % of carrier frequency
	f > 240 MHz	±120 MHz
RF frequency response in specified RF modulation bandwidth	standard, up to 120 MHz RF modulation bandwidth	< 3.5 dB, < 2.5 dB (meas.)
	with R&S®SMCVB-K547 option, optimization mode: high quality, up to 240 MHz RF modulation bandwidth	< 1.2 dB, < 0.3 dB (meas.)
Carrier leakage	mode: internal baseband I/Q, referenced to full-scale input	< -60 dBc, < 80 dBc (meas.)
Suppression of image sideband for entire instrument in modulation bandwidth	up to 240 MHz RF modulation bandwidth	> 75 dB (meas.)



Measured RF modulation frequency response at different carrier frequencies

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Baseband characteristics

Internal baseband characteristics

Aliasing filter	with amplitude, group delay and sin(x)/x correction	
Bandwidth, rolloff to −0.1 dB		250 MHz (nom.)
I/Q impairments (digital baseband)	These impairments are set in the digital baseband section of the R&S®SMCV100B. They act on the I/Q signal sent to the I/Q modulator/RF section, as well as on the I/Q signals at the digital I/Q outputs (of the respective path).	
Carrier leakage		
Setting range		−10 % to +10 %
Resolution		0.01 %
I ≠ Q (imbalance)		
Setting range		−1 dB to +1 dB
Resolution		0.01 dB
Quadrature offset		
Setting range		−10° to +10°
Resolution		0.01°

Digital baseband input/output (R&S®SMCVB-K19 option)

The R&S®SMCVB-K19 option makes digital I/Q signals available on the rear panel of the instrument if set to output mode. External digital I/Q signals can be fed in to the baseband section at the same connector if set to input mode. The digital I/Q input/output can be used for the lossless connection of the R&S®SMCV100B to the digital I/Q input/output of other Rohde & Schwarz instruments (e.g. R&S®SMW200A vector signal generator). One R&S®SMCVB-K19 option can be installed.

Output parameters

Interface		
Standard		Dig I/Q HS, in line with R&S®Digital I/Q interface 40G ³ (DIG I/Q 40G), I/Q data and control signals
Level		LVDS
Connector		QSFP+/QSFP 28
I/Q sample rate	max. sample rate depends on connected receiving device	
	standard	400 Hz to 75 MHz
	with R&S®SMCVB-K521 option	400 Hz to 150 MHz
	with R&S®SMCVB-K522 option	400 Hz to 200 MHz
	with R&S®SMCVB-K523 option	400 Hz to 300 MHz
Resolution		0.001 Hz
Frequency uncertainty		$< (1 \times 10^{-12} + \text{relative deviation of reference frequency}) \times \text{sample rate (nom.)}$
I/Q data		
Resolution		up to 16 bit
Logic format		two's complement
Physical signal level		
Setting range		0 to -60 dBFS
Setting resolution		0.01 dBFS
Bandwidth (RF)		$0.8 \times \text{sample rate}$
Control signals	markers	2

³ R&S®Digital I/Q interface 40G PAD-R is a Rohde & Schwarz internal company guideline for the transmission of digital I/Q data. It is supported by a wide range of signal generators, signal analyzers and radiocommunications testers.

Input parameters

Interface		
Standard		Dig I/Q HS, in line with R&S®Digital I/Q interface 40G ⁴ (DIG I/Q 40G), I/Q data and control signals
Input level	peak level	
Setting range		–60 dB to +3 dB, referenced to full scale
Setting resolution		0.01 dB
Crest factor		
Setting range		0 dB to +30 dB
Setting resolution		0.01 dB
Adjust level function	automatically determines peak level and crest factor of input signal	
Level		LVDS
Connector		QSFP+/QSFP 28
I/Q sample rate		
Source	The sample rate will be used based on information provided by the transmitting device.	digital I/Q HS
Sample rate	max. sample rate depends on connected transmitting device	
	standard	400 Hz to 75 MHz
	with R&S®SMCVB-K521 option	400 Hz to 150 MHz
	with R&S®SMCVB-K522 option	400 Hz to 200 MHz
	with R&S®SMCVB-K523 option	400 Hz to 300 MHz
Resolution		0.001 Hz
Frequency uncertainty		$< (1 \times 10^{-12} + \text{relative deviation of reference frequency}) \times \text{sample rate (nom.)}$
I/Q data		
Resolution		16 bit
Logic format		two's complement
Bandwidth (RF)		$0.8 \times \text{sample rate}$
Control signals	markers	2

⁴ R&S®Digital I/Q Interface 40G PAD-R is a Rohde & Schwarz internal company guideline for the transmission of digital I/Q data. It is supported by a wide range of signal generators, signal analyzers and radiocommunications testers.

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I/Q baseband generator – arbitrary waveform mode

Waveform length	standard	1 sample to 64 Msample in 1 sample steps
	with R&S®SMCVB-K511 option	1 sample to 512 Msample in 1 sample steps
	with R&S®SMCVB-K512 option	1 sample to 1 Gsample in 1 sample steps
Sample rate	standard	400 Hz to 75 MHz
	with R&S®SMCVB-K521 option	400 Hz to 150 MHz
	with R&S®SMCVB-K522 option	400 Hz to 200 MHz
	with R&S®SMCVB-K523 option	400 Hz to 300 MHz
Sample rate (HDD streaming)	standard	400 Hz to 75 MHz ⁵
Sample resolution	equivalent to D/A converter	16 bit
Sample clock source		internal
Sample frequency error	internal clock	$< 4 \times 10^{-11}$ Hz + relative deviation of reference frequency \times sample rate (nom.)
Bandwidth (RF)	using the maximum sample rate, rolloff to –0.1 dB	60 MHz
	using a reduced sample rate, rolloff to –0.1 dB	$0.833 \times$ sample rate
Bandwidth (RF), with R&S®SMCVB-K521 option	using the maximum sample rate, rolloff to –0.1 dB	120 MHz
	using a reduced sample rate, rolloff to –0.1 dB	$0.833 \times$ sample rate
Bandwidth (RF), with R&S®SMCVB-K522 option	using the maximum sample rate, rolloff to –0.1 dB	160 MHz
	using a reduced sample rate, rolloff to –0.1 dB	$0.833 \times$ sample rate
Bandwidth (RF), with R&S®SMCVB-K523 option	using the maximum sample rate, rolloff to –0.1 dB	240 MHz
	using a reduced sample rate, rolloff to –0.1 dB	$0.833 \times$ sample rate
Frequency offset setting range	standard	–30 MHz to 30 MHz
	with R&S®SMCVB-K521 option	–60 MHz to 60 MHz
	with R&S®SMCVB-K522 option	–80 MHz to 80 MHz
	with R&S®SMCVB-K523 option	–120 MHz to 120 MHz
Frequency offset setting resolution		0.01 Hz
Frequency offset error		$< 3 \times 10^{-6}$ Hz + relative deviation of reference frequency \times frequency offset (nom.)
Triggering	A trigger event restarts I/Q generation. The I/Q signal is then synchronous with the trigger (with a specific timing jitter).	
Trigger source	event triggered via GUI or remote command	internal
	event triggered by external trigger signal	external
Trigger modes	The signal is generated continuously.	auto ⁶
	The signal is generated continuously. A trigger event causes a restart.	retrig
	The signal is started only when a trigger event occurs. Subsequent trigger events are ignored.	armed auto ⁶
	The signal is started only when a trigger event occurs. Every subsequent trigger event causes a restart.	armed retrig
	The signal is started only when a trigger event occurs. Signal is generated once.	single
External trigger input		selectable from user 1, 2
Connector type	user 1, 2	BNC female
Input level		0 V to 3 V (nom.)
Threshold		settable between 0.1 V and 2.0 V
Input impedance	selectable	1 k Ω or 50 Ω (nom.)
Trigger jitter		± 1.67 ns

⁵ With R&S®SMCVB-K505 option.⁶ Supported in HDD streaming mode.

External trigger delay		
Setting range		0 sample to 2.147×10^9 sample
Setting resolution		3.3 ns
External trigger inhibit		
Setting range		0 sample to (21.47s × sample rate) sample
Setting resolution		3.3 ns
External trigger pulse width		> 7.5 ns
Marker signals		
Number of marker signals		3
Operating modes		unchanged, restart ⁷ , pulse, pattern, ratio
Marker outputs		selectable from user 1, 2
Connector type	user 1, 2	BNC female
Level		LVTTTL
Marker delay		
Setting range		0 sample to (waveform length – 1) sample
Setting resolution		1 sample
Marker duration		
Minimum value	sample rate ≤ 300 Msample/s	1 sample
Multisegment waveform mode		
Number of segments		1 to 1024
Changeover modes		GUI, remote control, external trigger
Extended trigger modes		same segment, next segment, next segment seamless, sequencer
Seamless changeover		output up to end of current segment, followed by changeover to next segment
Sequencer play list length		1024 (max.)
Sequencer segment repetitions		1048575 (max.)
Multicarrier waveform mode		
Number of carriers		512 (max.)
Total RF bandwidth	standard	60 MHz (max.)
	with R&S®SMCVB-K521 option	120 MHz (max.)
	with R&S®SMCVB-K522 option	160 MHz (max.)
	with R&S®SMCVB-K523 option	240 MHz (max.)
Carrier spacing		
Setting range		depends on number of carriers and signal RF bandwidth
Setting resolution		0.01 Hz
Crest factor modes		maximize, minimize, off
Signal period modes		longest file, shortest file, user (max. 1 s)
Single carrier gain		
Setting range		–80 dB to 0 dB
Setting resolution		0.01 dB
Single carrier start phase		
Setting range		0° to 360°
Setting resolution		0.01°
Single carrier delay		
Setting range		0 s to 1 s
Setting resolution		1 ns

⁷ Supported in HDD streaming mode.

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Baseband enhancements

Custom digital modulation (R&S®SMCVB-K199 option)

Types of modulation		
ASK		
Modulation index		0 % to 100 %
Resolution		0.1 %
FSK		
Deviation		1 Hz to $15 \times f_{\text{sym}}$
Maximum	standard	30 MHz
	with R&S®SMCVB-K521 option	60 MHz
	with R&S®SMCVB-K522 option	80 MHz
	with R&S®SMCVB-K523 option	120 MHz
Resolution		0.5 Hz
Variable FSK		
Deviation		$-15 \times f_{\text{sym}}$ to $+15 \times f_{\text{sym}}$
Maximum	standard	± 30 MHz
	with R&S®SMCVB-K521 option	± 60 MHz
	with R&S®SMCVB-K522 option	± 80 MHz
	with R&S®SMCVB-K523 option	± 120 MHz
Resolution		0.5 Hz
PSK		
		BPSK, QPSK, QPSK 45° offset, QPSK EDGE, AQPSK, OQPSK, $\pi/4$ -QPSK, $\pi/2$ -DBPSK, $\pi/4$ -DQPSK, $\pi/8$ -D8PSK, 8PSK, 8PSK EDGE, 16APSK, 32APSK
QAM		
		16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 1024QAM, 2048QAM, $\pi/4$ -16QAM, $-\pi/4$ -32QAM (for EDGE+)
Symbol rate		
Operating mode		internal
Setting range	standard	
	ASK, PSK and QAM	100 Hz to 50 MHz
	FSK	100 Hz to 50 MHz
	with R&S®SMCVB-K521 option	
	ASK, PSK and QAM	100 Hz to 100 MHz
	FSK	100 Hz to 100 MHz
	with R&S®SMCVB-K522 option	
	ASK, PSK and QAM	100 Hz to 120 MHz
	FSK	100 Hz to 120 MHz
	with R&S®SMCVB-K523 option	
	ASK, PSK and QAM	100 Hz to 150 MHz
	FSK	100 Hz to 150 MHz
Resolution		0.001 Hz
Frequency uncertainty (internal)		$< 4 \times 10^{-11}$ Hz + relative deviation of reference frequency \times sample rate (nom.)
Baseband filter		
Filter types	any filter can be used with any type of modulation	
		cosine, root cosine, Gaussian, cdmaOne, cdmaOne + equalizer, cdmaOne 705 kHz, cdmaOne 705 kHz + equalizer, CDMA2000® 3x, APCO25 C4FM, EDGE narrow pulse, EDGE wide pulse rectangular, split phase, EUTRA/LTE
Filter parameter		
Setting range	cosine, root cosine (filter parameter α)	0.05 to 1.00
	Gaussian (filter parameter $B \times T$)	0.15 to 2.50
	split phase (filter parameter $B \times T$)	0.15 to 2.50
Setting resolution		0.01
Coding		
	Not all coding methods can be used with every type of modulation.	off, differential, diff. + Gray, Gray, GSM, NADC, PDC, PHS, TETRA, APCO25 (PSK), APCO25 (8PSK), PWT, TETS, INMARSAT, VDL, EDGE, APCO25 (FSK), ICO, CDMA2000®, WCDMA

Data sources		PRBS: 9, 11, 15, 16, 20, 21, 23, All 0, All 1, pattern (length: 1 bit to 64 bit), data lists
Data lists		
Output memory	standard	8 bit to 2 Gbit
	with R&S®SMCVB-K511 option	8 bit to 16 Gbit
	with R&S®SMCVB-K512 option	8 bit to 32 Gbit
Nonvolatile memory		internal mSATA module
Predefined settings	modulation, filter, symbol rate and coding in line with standard	
Standards		APCO, Bluetooth®, CW in baseband, DECT, ETC, GSM, GSM EDGE, NADC, PDC, PHS, TETRA, WCDMA 3GPP, TD-SCDMA, CDMA2000® Forward, CDMA2000® Reverse, Worldspace
Frequency offset	With the aid of the frequency offset, the center frequency of the wanted baseband signal can be shifted. The restrictions caused by the modulation bandwidth still apply.	
Frequency offset setting range	standard	–30 MHz to +30 MHz
	with R&S®SMCVB-K521 option	–60 MHz to +60 MHz
	with R&S®SMCVB-K522 option	–80 MHz to +80 MHz
	with R&S®SMCVB-K523 option	–120 MHz to +120 MHz
Frequency offset setting resolution		0.01 Hz
Frequency offset error		$< 3 \times 10^{-6}$ Hz+ relative deviation of reference frequency \times frequency offset (nom.)
Triggering		
Trigger source	event triggered via GUI or remote command	internal
	event triggered by external trigger signal	external
Trigger modes	The signal is generated continuously.	auto
	The signal is generated continuously; a trigger event causes a restart.	retrig
	The signal is started only when a trigger event occurs; subsequent trigger events are ignored.	armed auto
	The signal is started only when a trigger event occurs; every subsequent trigger event causes a restart.	armed retrig
	The signal is started only when a trigger event occurs; signal is generated once.	single
External trigger input		selectable from user 1, 2
Connector type	user 1, 2	BNC female
Input level		0 V to 3 V (nom.)
Threshold		settable between 0.1 V and 2.0 V
Input impedance	selectable	1 k Ω or 50 Ω (nom.)
Trigger jitter		± 2.67 ns
External trigger delay		
Setting range		0 symbol to 1466 s \times symbol rate
Setting resolution		0.01 symbol \pm 5.33 ns
External trigger inhibit		
Setting range		0 symbol to 3.22×10^9 symbol
Setting resolution		1 symbol
External trigger pulse width		> 7.5 ns
Marker signals		
Number of marker signals		3
Operating modes		control list, pulse, pattern, ratio
Marker outputs		selectable from user 1, 2
Connector type	user 1, 2	BNC female
Level		LVTTL
Marker delay		
Setting range		0 symbol to $(2^{24} - 1)$ symbol
Setting resolution		1 symbol
Marker duration		
Minimum value		1 symbol

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Basic AM/FM/φM (via baseband, R&S®SMCVB-K197 option)

Amplitude modulation		
Modulation source	internal modulation generator	internal
AM depth		
Setting range		0 % to 100 %
Setting resolution		0.1 %
AM depth (m) error	$f_{\text{mod}} = 1 \text{ kHz}$	< 1 % (meas.)
AM distortion	$f_{\text{mod}} = 1 \text{ kHz}$	< -60 dB (meas.)
Incidental φM at AM	$m = 30 \%$, $f_{\text{mod}} = 1 \text{ kHz}$, $\pm \text{peak}/2$	< 0.02 rad (meas.)
Frequency modulation		
Modulation source	internal modulation generator	internal
Maximum deviation		4 MHz
Resolution of setting		0.01 Hz
FM deviation error	$f_{\text{mod}} = 2 \text{ kHz}$, deviation $\leq 1 \text{ MHz}$	
	modulation source: internal	< (1 % of setting) (meas.)
FM distortion	$f_{\text{mod}} = 2 \text{ kHz}$, deviation = 1 MHz	< -80 dB (meas.)
Synchronous AM with FM	40 kHz deviation, $f_{\text{mod}} = 1 \text{ kHz}$, $f > 10 \text{ MHz}$	< -80 dB (meas.)
Carrier frequency offset	$f_{\text{mod}} = 2 \text{ kHz}$	< 23×10^{-6} of set deviation
Phase modulation		
Modulation source	internal modulation generator	internal
Maximum deviation		$N \times 6 \text{ rad}$
Resolution of setting		1 μrad
φM deviation error	$f_{\text{mod}} = 1 \text{ kHz}$	
	modulation source: internal	< (2 % of setting + 0.003 rad)
φM distortion	$f_{\text{mod}} = 10 \text{ kHz}$, half of max. deviation	< -80 dB
Internal modulation generator		
Signal types		sine
Frequency setting range		0.1 Hz to 100 kHz
Frequency setting resolution		0.01 Hz
Frequency error		< (0.001 Hz + relative deviation of reference frequency × modulation frequency)

Pulse modulation (via baseband, R&S®SMCVB-K198 option)

Modulation source	pulse generator	internal
On/off ratio		> 80 dB (meas.)
Rise/fall time	10 % to 90 % of RF amplitude	
	transition type: fast	< 15 ns, < 5 ns (meas.)
	transition type: smoothed	< 200 ns (meas.)
Minimum pulse width	50 %/50 % of RF amplitude, transition type: fast	200 ns (meas.)
Pulse repetition frequency		0 Hz to 10 MHz
Pulse overshoot		< 10 % (meas.)
Pulse generator		
Pulse modes		single pulse, double pulse
Pulse period		
Setting range		100 ns to 100 s
Setting resolution		5 ns
Pulse width	pulse widths of double pulses can be set independently	
Setting range		50 ns to 100 s
Setting resolution		5 ns
Pulse delay		
Setting range		50 ns to 100 s
Setting resolution		5 ns
Double-pulse delay		
Setting range		50 ns to 100 s
Setting resolution		5 ns

Additive white Gaussian noise (AWGN, R&S®SMCVB-K62 option)

Addition of an AWGN signal of settable bandwidth and settable C/N ratio or E_b/N_0 to a wanted signal. If the noise generator is used, a frequency offset cannot be added to the wanted signal.

Noise		
Distribution density		Gaussian, statistical, separate for I and Q
Crest factor		> 15 dB
Periodicity		> 3×10^{10} s
C/N, E_b/N_0		
Setting range	depending on the set RF level; the PEP of the sum signal (wanted signal + noise) must not exceed the maximum possible PEP of the RF path	–50 dB to +65 dB
Setting resolution		0.01 dB
Uncertainty	for system bandwidth = symbol rate, symbol rate < 4 MHz, –24 dB < C/N < 30 dB and crest factor < 12 dB	< 0.1 dB (meas.)
System bandwidth	bandwidth for determining noise power	
Setting range	standard	1 kHz to 60 MHz
	with R&S®SMCVB-K521 option	1 kHz to 120 MHz
	with R&S®SMCVB-K522 option	1 kHz to 160 MHz
	with R&S®SMCVB-K523 option	1 kHz to 240 MHz
Setting resolution		100 Hz

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Digital modulation systems

The specified data applies together with the parameters of the respective standard. The entire frequency range, the filter parameters and the symbol rates can be set by the user.

Internal digital standards

Digital standards that run on the internal baseband generator. The R&S®SMCVB-K519 option must be installed. The options are described in the Broadcast Standards for R&S®SMCV100B Vector Signal Generators data sheet (PD 3608.3990.22).

Broadcast standards	Option
AM/FM/RDS	R&S®SMCVB-K155
DAB/T-DMB	R&S®SMCVB-K156
DRM	R&S®SMCVB-K160
ATSC/ATSC-MH	R&S®SMCVB-K161
ATSC 3.0	R&S®SMCVB-K162
DVB-T	R&S®SMCVB-K163
DVB-T2	R&S®SMCVB-K164
ISDB-T/T _{sb}	R&S®SMCVB-K165
DTMB	R&S®SMCVB-K166
DVB-S/DVB-S2	R&S®SMCVB-K167
DVB-S2X	R&S®SMCVB-K168, R&S®SMCVB-K167 required

Digital standards with R&S®WinIQSIM2™

R&S®WinIQSIM2™ requires an external PC.

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

Cellular standards	Option
5G New Radio	R&S®SMCVB-K444
Verizon 5GTF signals	R&S®SMCVB-K418
EUTRA/LTE	R&S®SMCVB-K255
EUTRA/LTE Release 9 and enhanced features	R&S®SMCVB-K284, R&S®SMCVB-K255 required
EUTRA/LTE Release 10/LTE-advanced	R&S®SMCVB-K285, R&S®SMCVB-K255 required
LTE Release 11 and enhanced features	R&S®SMCVB-K412, R&S®SMCVB-K255 required
EUTRA/LTE Release 12	R&S®SMCVB-K413, R&S®SMCVB-K255 required
LTE Release 13/14/15	R&S®SMCVB-K419, R&S®SMCVB-K255 required
Cellular IoT	R&S®SMCVB-K415
Cellular IoT enhancements	R&S®SMCVB-K443, R&S®SMCVB-K415 required
3GPP FDD	R&S®SMCVB-K242
3GPP FDD/HSPA/HSPA+, enhanced BS/MS tests	R&S®SMCVB-K283, R&S®SMCVB-K242 required
GSM/EDGE	R&S®SMCVB-K240
EDGE Evolution	R&S®SMCVB-K241, R&S®SMCVB-K240 required
CDMA2000®	R&S®SMCVB-K246
1xEV-DO	R&S®SMCVB-K247
1xEV-DO Rev. B	R&S®SMCVB-K287, R&S®SMCVB-K247 required
TD-SCDMA (3GPP TDD LCR)	R&S®SMCVB-K250
TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA	R&S®SMCVB-K251, R&S®SMCVB-K250 required

Wireless connectivity standards	Option
IEEE 802.11 a/b/g/n	R&S®SMCVB-K254
IEEE 802.11 ac	R&S®SMCVB-K286, R&S®SMCVB-K254 required
IEEE 802.11 ax	R&S®SMCVB-K442, R&S®SMCVB-K254 required
Bluetooth® EDR/low energy	R&S®SMCVB-K260
Bluetooth® 5.0	R&S®SMCVB-K417, R&S®SMCVB-K260 required
LoRa®	R&S®SMCVB-K431

Navigation standards	Option
GPS 1 satellite	R&S®SMCVB-K244
Galileo 1 satellite	R&S®SMCVB-K266
GLONASS 1 satellite	R&S®SMCVB-K294
IRNSS 1 satellite	R&S®SMCVB-K297
BeiDou 1 satellite	R&S®SMCVB-K407

Broadcast standards	Option
DVB-H/DVB-T	R&S®SMCVB-K252
DAB/T-DMB	R&S®SMCVB-K253

Other standards and modulation systems	Option
OFDM signal generation	R&S®SMCVB-K414
Multicarrier CW signal generation	R&S®SMCVB-K261
Additional white Gaussian noise (AWGN)	R&S®SMCVB-K262
NFC A/B/F	R&S®SMCVB-K289

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Signal performance for digital standards and modulation systems

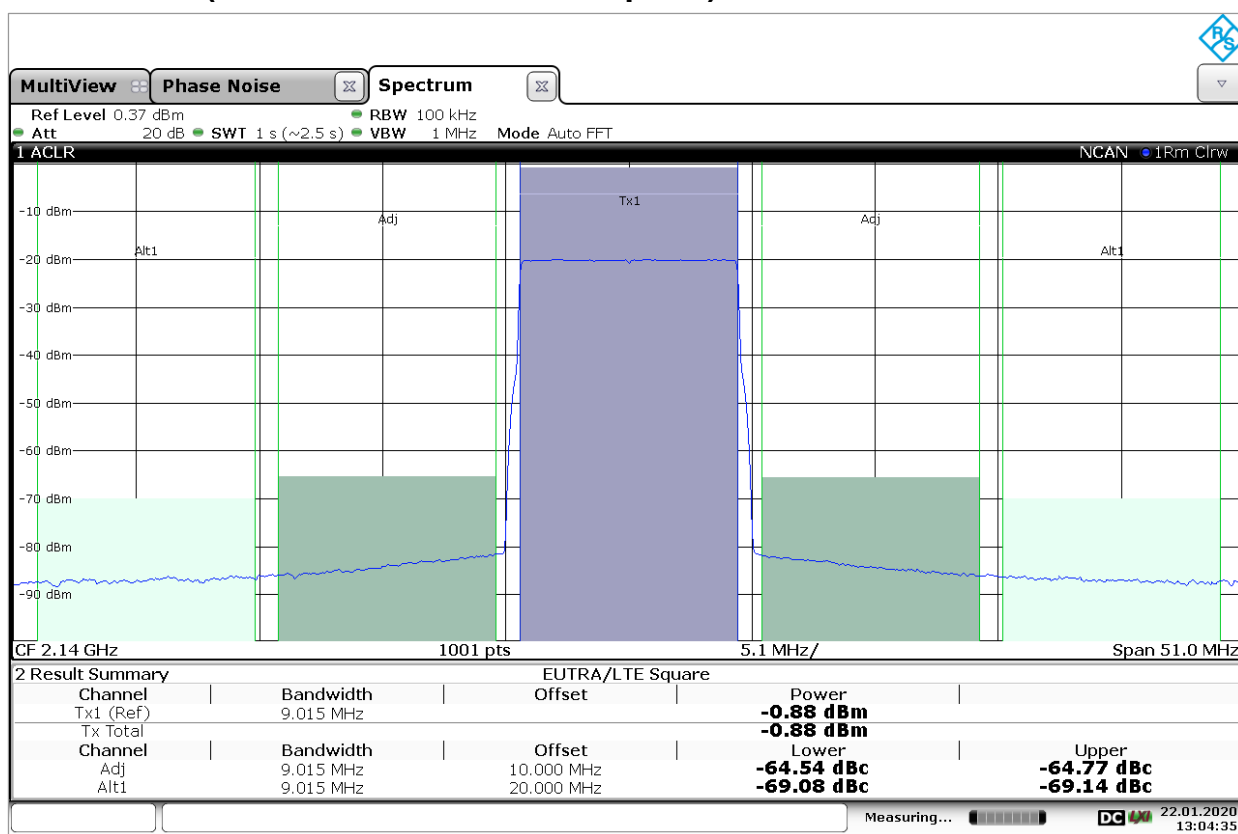
3GPP FDD (with R&S®SMCVB-K242 option)

Error vector magnitude	1 DPCH, RMS, frequency = 1800 MHz to 2200 MHz	< 0.8 %, 0.3 % (meas.)
Adjacent channel leakage ratio (ACLR)	test model 1, 64 DPCH, frequency = 1800 MHz to 2200 MHz, average channel power ≤ 0 dBm, optimization mode = fast, temperature range from +18 °C to +33 °C	
	5 MHz offset	< -63 dBc, -65 dBc (typ.)
	10 MHz offset	< -67 dBc, -70 dBc (typ.)



Measured ACPR for 3GPP test model 1, 64 DPCH

EUTRA/LTE (with R&S®SMCVB-K255 option)



Measured EVM performance versus channel power for a 10 MHz LTE E-TM 3.1 signal, carrier frequency 2.14 GHz

Custom digital modulation (with R&S®SMCVB-K199 option)

Deviation error with 2FSK, 4FSK	deviation 0.2 to 0.7 × symbol rate	
	Gaussian filter with $B \times T = 0.2$ to 0.7, $f = 1$ GHz	
	symbol rate up to 2 MHz	0.4 % (meas.)
Phase error with MSK	symbol rate up to 10 MHz	1.2 % (meas.)
	Gaussian filter with $B \times T = 0.2$ to 0.7, $f = 1$ GHz	
	bit rate up to 10 MHz	0.3° (meas.)
EVM with QPSK, OQPSK, $\pi/4$ -DQPSK, 8PSK, 16QAM, 32QAM, 64QAM	cosine, root cosine filter with $\alpha = 0.2$ to 0.7, $f = 1$ GHz	
	symbol rate up to 5 MHz	0.5 % RMS (meas.)
	symbol rate up to 20 MHz	2.0 % RMS (meas.)

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Remote control

Interfaces/systems	standard	Ethernet/LAN 10/100/1000BASE-T
		USB 2.0 (according to VISA USB-TMC)
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.</p>	Rohde & Schwarz <ul style="list-style-type: none"> • R&S®SFE • R&S®SFE100
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

Connectors

Front panel connectors

RF 50 Ω	RF output	N female
USB	<ul style="list-style-type: none"> • USB 2.0 (high speed) connector for external USB devices • mouse and keyboard for enhanced operation • R&S®NRPx power sensors (with R&S®NRP-Z4 or R&S®NRP-ZKU adapter cable) for external power measurements and level adjustment of instrument • memory stick for software update and data exchange 	
	connector type	USB type A

Rear panel connectors

Ref. In	reference frequency input	BNC female
Ref. Out	reference frequency output	BNC female
User 1, User 2	user-configurable inputs or outputs, e.g. as trigger input or marker output	BNC female
Dig. IQ HS 1, Dig. IQ HS 2	high speed digital input or output, connectivity in line with R&S®Digital I/Q interface	QSFP+/QSFP 28
IP Data	for future use	SFP+
USB (2 connectors)	<ul style="list-style-type: none"> • USB 3.0 (high speed) connector for external USB devices • mouse and keyboard for enhanced operation • R&S®NRPx power sensors (with R&S®NRP-Z4 or R&S®NRP-ZKU adapter cable) for external power measurements and level adjustment of instrument • memory stick for software update and data exchange 	
	connector type	USB type A
LAN	provides remote control functionality and other services, see section Remote control	RJ-45
DVI-D	external monitor	

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General data

Environmental conditions		
Temperature	operating temperature range	+5 °C to +45 °C
	storage temperature range	–20 °C to +70 °C
Damp heat		+25 °C/+40 °C, 90 % rel. humidity, cyclic, in line with EN 60068-2-30
Altitude	operating	up to 4600 m
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-810G, method 516.4, proc. I
Power rating		
Rated voltage		100 V to 240 V AC (± 10 %)
Rated frequency		50 Hz to 60 Hz (± 5 %)
Rated current		3.6 A to 1.5 A
Rated power		360 W (110 W measured – no USB load connected, fans full speed)
	standby	< 2 W
Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2014/30/EC	applied harmonized standards: <ul style="list-style-type: none"> • EN 61326-1 (industrial environment) • EN 61326-2-1 • EN 55011 (class B)
	Korea: KC registration	KC registration number R-R-RnS-GSMCV1HBG
Electrical safety	EU: in line with Low Voltage Directive 2014/30/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, number of certificate 40050925
	CSA – Canadian Standards Association	cCSA _{US} mark certificate 80021036
Restriction of the use of hazardous substances in electrical and electronic equipment	EU: in line with RoHS Directive 2011/65/EC	applied harmonized standard: EN 50581
Acoustic noise emission	sound power level, +23 °C ambient temperature	53 dB(A) (meas.), in line with DIN EN ISO 3744:2010
Calibration interval	recommended for highest accuracy	12 months
	for general test and measurement applications	24 months
Dimensions	W × H × D	222 mm × 97 mm × 366 mm (8.74 in × 3.82 in × 14.41 in) (½ 19", 2 HU)
Weight		4.7 kg (10.36 lb)
Display		5" color display with capacitive touch functionality
Non-volatile memory	standard	mSATA, 64 Gbyte

Ordering information

R&S®SMCVB-Bxxx = hardware option

R&S®SMCVB-Kxxx/KBxxx = software/keycode option

Designation	Type	Order No.
Vector signal generator ⁸ including baseband generator with ARB (64 Msample, 60 MHz RF bandwidth), power cable and quick start guide	R&S®SMCV100B	1432.7000.02
Options		
Frequency options		
4 kHz to 3 GHz	R&S®SMCVB-B103	1433.2002.02
Frequency extension to 6 GHz	R&S®SMCVB-KB106	1433.2202.02
Frequency extension to 7.125 GHz	R&S®SMCVB-KB107	1433.2402.02
RF options		
High output power	R&S®SMCVB-K31	1434.4115.02
Low phase noise	R&S®SMCVB-K709	1434.3590.02
Baseband options		
ARB waveform streaming	R&S®SMCVB-K505	1434.5328.02
ARB memory extension to 512 Msample	R&S®SMCVB-K511	1434.3519.02
ARB memory extension to 1 Gsample	R&S®SMCVB-K512	1434.3531.02
Baseband extension to 120 MHz RF bandwidth	R&S®SMCVB-K521	1434.3554.02
Baseband extension to 160 MHz RF bandwidth	R&S®SMCVB-K522	1434.3577.02
Baseband extension to 240 MHz RF bandwidth	R&S®SMCVB-K523	1434.4050.02
Baseband enhancements		
Digital baseband interface	R&S®SMCVB-K19	1434.4073.02
Additive white Gaussian noise (AWGN)	R&S®SMCVB-K62	1434.3654.02
Basic AM/FM/PM	R&S®SMCVB-K197	1434.3619.02
Pulse modulation	R&S®SMCVB-K198	1434.3631.02
Custom digital modulation	R&S®SMCVB-K199	1434.3990.02
Enable broadcast standards	R&S®SMCVB-K519	1434.3690.02
Improved modulation frequency response	R&S®SMCVB-K547	1434.4138.02
Crest factor reduction	R&S®SMCVB-K548	1434.5640.02
Broadcast standards		
AM/FM/RDS	R&S®SMCVB-K155	1434.3719.02
DAB/T-DMB	R&S®SMCVB-K156	1434.3731.02
DRM	R&S®SMCVB-K160	1434.3819.02
ATSC/ATSC-MH	R&S®SMCVB-K161	1434.3831.02
ATSC 3.0	R&S®SMCVB-K162	1434.3854.02
DVB-T	R&S®SMCVB-K163	1434.3877.02
DVB-T2	R&S®SMCVB-K164	1434.3890.02
ISDB-T/T _{sb}	R&S®SMCVB-K165	1434.3919.02
DTMB	R&S®SMCVB-K166	1434.3931.02
DVB-S/DVB-S2	R&S®SMCVB-K167	1434.3954.02
DVB-S2x	R&S®SMCVB-K168	1434.3977.02
Digital standards using R&S®WinIQSIM2™ ⁹		
GSM/EDGE	R&S®SMCVB-K240	1434.4150.02
EDGE Evolution	R&S®SMCVB-K241	1434.4173.02
3GPP FDD	R&S®SMCVB-K242	1434.4196.02
GPS	R&S®SMCVB-K244	1434.4215.02
CDMA2000®	R&S®SMCVB-K246	1434.4238.02
1xEV-DO Rev A	R&S®SMCVB-K247	1434.4250.02
TD-SCDMA	R&S®SMCVB-K250	1434.4273.02
TD-SCDMA, enhanced BS/MS tests	R&S®SMCVB-K251	1434.4296.02
DVB-H	R&S®SMCVB-K252	1434.4315.02
DAB/T-DMB	R&S®SMCVB-K253	1434.4338.02
802.11a/b/g/n	R&S®SMCVB-K254	1434.4350.02
EUTRA/LTE	R&S®SMCVB-K255	1434.4373.02
Bluetooth® EDR	R&S®SMCVB-K260	1434.4396.02
Multicarrier CW signal generation	R&S®SMCVB-K261	1434.4415.02
Additive white Gaussian noise (AWGN)	R&S®SMCVB-K262	1434.4438.02
Galileo	R&S®SMCVB-K266	1434.4450.02
3GPP FDD HSPA/HSPA+, enhanced BS/MS tests	R&S®SMCVB-K283	1434.4473.02

⁸ The base unit can only be ordered with an R&S®SMCVB-B103 frequency option.

⁹ R&S®WinIQSIM2™ requires an external PC.

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Designation	Type	Order No.
EUTRA/LTE Release 9 and enhanced features	R&S®SMCVB-K284	1434.4496.02
EUTRA/LTE Release 10 (LTE-Advanced)	R&S®SMCVB-K285	1434.4415.02
IEEE 802.11ac	R&S®SMCVB-K286	1434.4538.02
1xEV-DO Rev. B	R&S®SMCVB-K287	1434.4550.02
NFC A/B/F	R&S®SMCVB-K289	1434.4573.02
GLONASS 1 satellite	R&S®SMCVB-K294	1434.4596.02
IRNSS 1 satellite	R&S®SMCVB-K297	1434.5734.02
Modernized GPS	R&S®SMCVB-K298	1434.4615.02
BeiDou	R&S®SMCVB-K407	1434.4638.02
LTE Release 11 and enhanced features	R&S®SMCVB-K412	1434.4650.02
EUTRA/LTE Release 12	R&S®SMCVB-K413	1434.4673.02
OFDM signal generation	R&S®SMCVB-K414	1434.4696.02
Cellular IoT	R&S®SMCVB-K415	1434.4738.02
DVB-S2/DVB-S2X	R&S®SMCVB-K416	1434.4715.02
Bluetooth® 5.x	R&S®SMCVB-K417	1434.4750.02
Verizon 5GTF signals	R&S®SMCVB-K418	1434.4773.02
LTE Release 13 and 14	R&S®SMCVB-K419	1434.4796.02
LoRa®	R&S®SMCVB-K431	1434.4815.02
Modernized BeiDou	R&S®SMCVB-K432	1434.5740.02
IEEE 802.11ax	R&S®SMCVB-K442	1434.4838.02
Cellular IoT Release 14	R&S®SMCVB-K443	1434.4850.02
5G NR	R&S®SMCVB-K444	1434.4873.02
Cellular IoT Release 15	R&S®SMCVB-K446	1434.5705.02
Waveform libraries (available for download at customer web)		
DAB/T-DMB waveforms	R&S®SMCVB-KV10	1434.5340.02
DRM waveforms	R&S®SMCVB-KV11	1434.5370.02
DRM+ waveforms	R&S®SMCVB-KV12	1434.5405.02
HD radio waveforms	R&S®SMCVB-KV13	1434.5434.02
XM radio waveforms	R&S®SMCVB-KV14	1434.5463.02
DVB-T2 waveforms	R&S®SMCVB-KV15	1434.5492.02
ATSC 3.0 waveforms	R&S®SMCVB-KV16	1434.5528.02
Digital TV interferer waveforms	R&S®SMCVB-KV17	1434.5557.02
Cable interferer waveforms	R&S®SMCVB-KV18	1434.5586.02
Satellite interferer waveforms	R&S®SMCVB-KV19	1434.5611.02
Transport stream libraries for broadcast standards (available for download at customer web)		
DAB/T-DMB stream library	R&S®SMCVB-KS10	1434.4896.02
DAB+ stream library	R&S®SMCVB-KS11	1434.4938.02
ISDB-T stream library	R&S®SMCVB-KS12	1434.4973.02
ATSC/ATSC and mobile DTV stream library	R&S®SMCVB-KS13	1434.5011.02
DVB-T2 MI stream library	R&S®SMCVB-KS14	1434.5057.02
EMC stream library	R&S®SMCVB-KS15	1434.5092.02
DRM stream library	R&S®SMCVB-KS16	1434.5134.02
Basic stream library	R&S®SMCVB-KS17	1434.5170.02
Extended SDTV stream library	R&S®SMCVB-KS18	1434.5211.02
Extended HDTV stream library	R&S®SMCVB-KS19	1434.5257.02
HEVC stream library	R&S®SMCVB-KS20	1434.5292.02
Recommended extras		
19" rack adapter	R&S®HZN96	3638.7813.02
Documentation of calibration values	R&S®DCV-2	0240.2193.18
R&S®SMCV100B accredited calibration	R&S®ACASMCV100B	3598.5600.03

Warranty		
Base unit		3 years
All other items ¹⁰		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 to four years (WE1 to WE4)

Repairs carried out during the contract term are free of charge ¹¹. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

Extended warranty with calibration (CW1 to CW4)

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 ¹¹ 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 ¹¹ and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

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¹⁰ For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

¹¹ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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