

R&S® SFI100A WIDEBAND IF VECTOR SIGNAL GENERATOR

Unleash unprecedented control



Product Brochure
Version 02.01

ROHDE & SCHWARZ

Make ideas real



AT A GLANCE

The R&S®SFI100A is the essential foundation for your sub-THz solution, enabling precision and innovation above expectations. Use the R&S®SFI100A wideband IF vector signal generator for comprehensive sub-THz testing and benefit from unparalleled performance and control for streamlined measurements.

The R&S®SFI100A offers a very wide RF modulation bandwidth up to 10 GHz in a compact form factor, enabling the generation of extreme wideband signals required for demanding applications such as early 6G research, millimeterwave WLAN, high capacity wireless backhaul, fixed wireless access, sensing and automotive radar.

The R&S®SFI100A offers flexibility for different test scenarios without compromising on performance or signal quality: baseband tests, IF tests and RF tests in the sub-THz frequency range in combination with the R&S®FE110ST/R&S®FE170ST external frontends.

Designed for sub-THz applications, the R&S®SFI100A is the perfect IF source to drive a device under test (DUT) or the R&S®FE110ST/R&S®FE170ST external frontends for upconversion. Thanks to the integrated operation of the R&S®FE110ST and R&S®FE170ST frontends, the

R&S®SFI100A covers the complete W and D band frequency range from 70 GHz to 175 GHz. Moreover, it ensures fully calibrated and accurate measurements out of the box without the need for time-consuming calibration routines.

In addition, the R&S®SFI100A offers wideband single-ended, differential and direct DAC analog I/Q signals for baseband tests with best signal quality up to 5 GHz and up to 2 V (V_{pp}).

The internal ARB with up to 8 Gsample memory supports playback of waveforms generated with the R&S®WinIQSIM2 simulation software or other external tools. The intuitive touch based GUI offers full monitoring along the signal path, ensuring that you are always in control.



KEY FACTS

- ▶ Up to 10 GHz RF modulation bandwidth
- ▶ ARB with up to 8 Gsample memory
- ▶ IF output from 11 GHz to 21 GHz
- ▶ Wideband single-ended, differential and direct DAC analog I/Q signals
- ▶ Perfect IF source for R&S®FE110ST and R&S®FE170ST
- ▶ Full integration of R&S®FE110ST and R&S®FE170ST
- ▶ Options for all important digital communications standards with R&S®WinIQSIM2
- ▶ Intuitive operation via touchscreen with block diagram as key element

BENEFITS

Building block of innovation

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Unleash unprecedented control

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Pioneering the future of communications

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Enhanced usability

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Fully software-defined option concept

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BUILDING BLOCK OF INNOVATION

Expand possibilities with wide modulation bandwidth

With an RF modulation bandwidth of up to 10 GHz, the R&S®SF1100A meets the bandwidth needs for demanding applications such as early 6G research in the sub-THz frequency range, millimeterwave WLAN, high capacity wireless backhaul, sensing and automotive radar.

Thanks to internal real-time frequency response correction, signals with an extremely flat response across the entire modulation bandwidth can be generated to test the true performance of the device under test.

Via keycodes, the modulation bandwidth can be upgraded from 4 GHz to 10 GHz. This ensures full control of the instrument's capabilities as test requirements evolve.

Maintain precision with clean IF signal

The R&S®SF1100A generates IF signals between 11 GHz and 21 GHz with excellent signal quality to directly test a DUT. The signal generator is optimized for use as a perfect IF source for the R&S®FE110ST/R&S®FE170ST external frontends.

The IF signals can be fed to the R&S®FE110ST or R&S®FE170ST for upconversion to an RF frequency from 70 GHz to 175 GHz without compromising on modulation bandwidth or signal quality.

The R&S®SF1100A fully controls the R&S®FE110ST/R&S®FE170ST frontends to ensure precise signal generation with the same simplicity, control and confidence in the sub-THz range.

Retain testing flexibility with analog I/Q signals

In addition to the IF and RF signals, the R&S®SF1100A can provide single-ended, differential and direct DAC analog I/Q signals for baseband tests – with excellent signal quality up to 5 GHz and up to 2 V (V_{pp}).

The full flexibility of the R&S®SF1100A allows testing of different phases and DUT designs with a single instrument, from baseband to IF and finally in the sub-THz range in combination with the R&S®FE110ST/R&S®FE170ST external frontends.



UNLEASH UNPRECEDENTED CONTROL

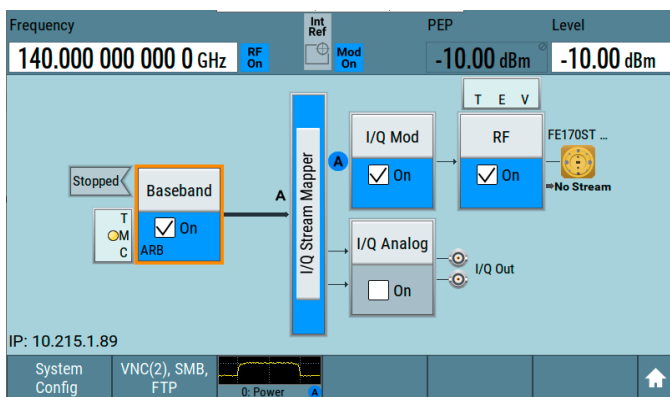
Perfect IF source for R&S®FE110ST and R&S®FE170ST

The R&S®SFI100A has been designed with sub-THz operation in mind. The RF output between 11 GHz and 21 GHz is optimized for use with the R&S®FE110ST and R&S®FE170ST external frontends, providing best in class wideband IF signals for upconversion to the W and D bands (70 GHz to 175 GHz) with excellent signal quality.

Unleash true potential – full frontend control

The R&S®SFI100A natively supports the R&S®FE110ST and R&S®FE170ST frontends in the firmware, offering full integration and control of the setup from a single interface.

Setting up a sub-THz test bed has never been easier. Simply plug the R&S®FE110ST or R&S®FE170ST frontend into the R&S®SFI100A – the signal generator takes care of the rest, saving time and effort.



The R&S®SFI100A fully controls a connected R&S®FE110ST or R&S®FE170ST external frontend, providing a single interface for the test setup.

Ensure accuracy – calibration to the measurement plane

Reducing measurement uncertainty in the sub-THz range has traditionally required extensive and time-consuming calibration routines, which typically need to be repeated for each level and frequency change.

Together with the R&S®FE110ST/R&S®FE170ST external frontends, the R&S®SFI100A wideband IF vector signal generator provides a compact, easy-to-use and fully calibrated solution for wideband signal generation all the way to the measurement plane, removing the need for time-consuming calibration routines.

Thanks to full integration and control, the R&S®SFI100A knows the characteristics of the connected R&S®FE110ST or R&S®FE170ST and automatically takes them into account to ensure calibrated signals at the frontend measurement plane. This capability can be seamlessly extended to cables and connected smart accessories such as bandpass filters and power amplifiers. Finally, it reduces measurement uncertainty and enhances the fidelity of the measurement, even in the sub-THz frequency range.

The compact and fully integrated solution takes the complexity out of conventional multi-instrument sub-THz setups (AWGs, upconverters, LO sources, control PCs), providing convenience, accuracy, measurement confidence and ease of use as a single box instrument.

Full control of frontends

The R&S®SFI100A provides clean IF signals for the R&S®FE110ST and R&S®FE170ST external frontends. Full integration of the frontends in the R&S®SFI100A firmware streamlines the setup and offers full control all the way to the measurement plane, ensuring unparalleled accuracy for wideband measurements even in the sub-THz frequency range.



PIONEERING THE FUTURE OF COMMUNICATIONS

A complete solution for early 6G research

The R&S®SFI100A provides extensive flexibility to explore the various possibilities that could be offered with a new 6G standard. This flexibility is a key requirement for a test setup for early research phases of 6G. Both baseband and IF tests can be addressed with the R&S®SFI100A. By connecting an appropriate R&S®FE110ST or R&S®FE170ST external frontend, different sub-THz frequencies can be explored. The R&S®SFI100A can be easily upgraded via software keycodes to match evolving needs, making it the perfect companion for the 6G journey.

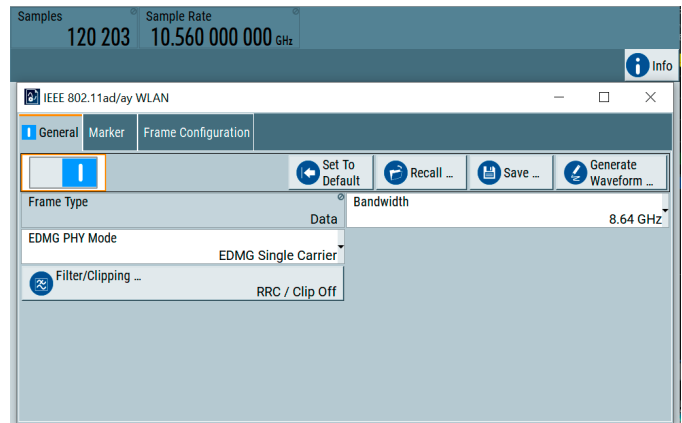
Unparalleled performance and flexibility

The R&S®SFI100A brings unparalleled performance for wideband modulation signal quality, providing the peace of mind needed to test designs at both IF and in the sub-THz frequency range.

Thanks to real-time frequency response correction, the R&S®SFI100A generates modulated signals with extremely flat frequency response over the entire modulation bandwidth.

Support for all important digital standards

The R&S®SFI100A supports playback of custom digital modulation, OFDM, multicarrier CW (MCCW), IEEE 802.11ay and 5G NR waveforms generated with the R&S®WinIQSIM2 simulation software. In addition, waveforms generated with third-party software tools can be easily loaded and played back on the instrument.

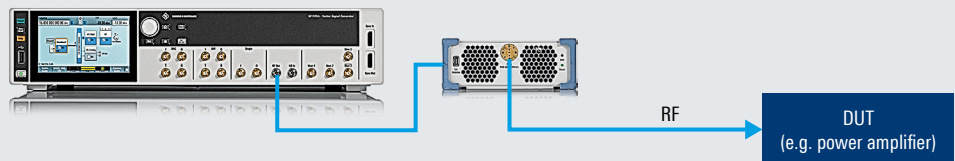


The R&S®SFI100A can play back waveforms generated with the R&S®WinIQSIM2 simulation software or third-party software tools.

Extensive flexibility for your 6G journey

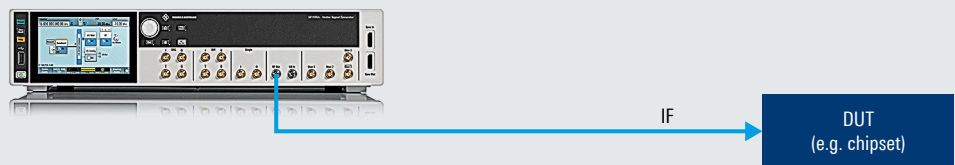
RF test in sub-THz range

70 GHz to 110 GHz with R&S®FE110ST
110 GHz to 175 GHz with R&S®FE170ST
220 GHz to 330 GHz with R&S®FC330ST



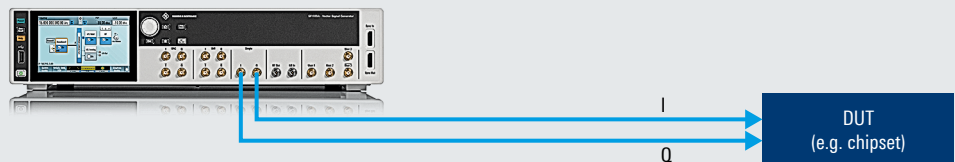
IF test

11 GHz to 21 GHz

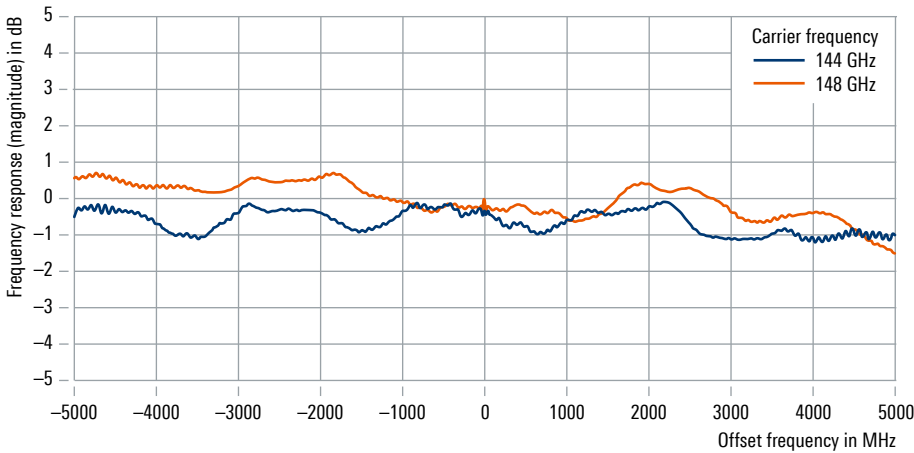


Baseband test

Differential or single-ended,
up to 5 GHz and up to 2 V_{pp}

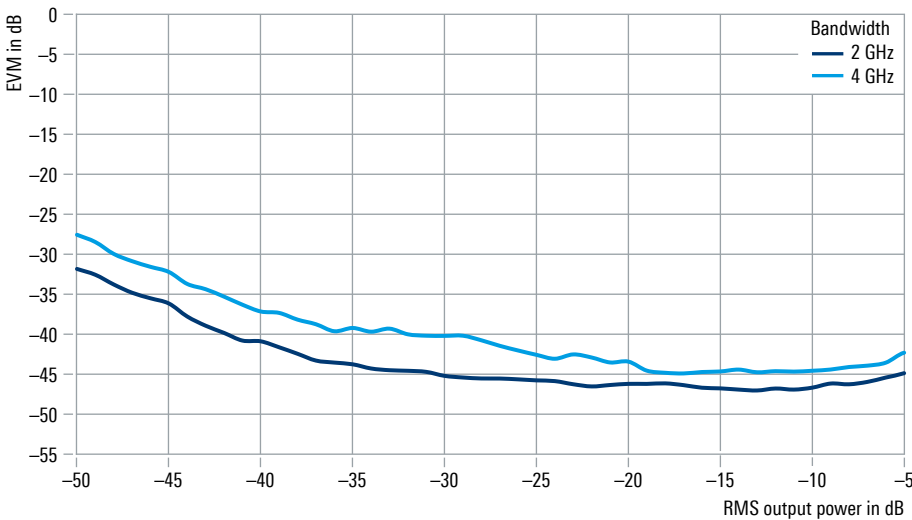


Frequency response



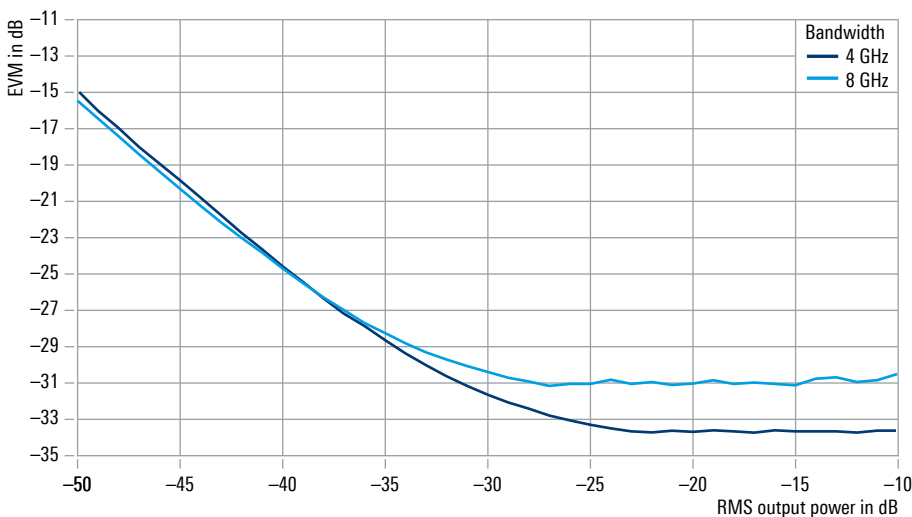
The R&S®SF1100A generates extremely flat amplitude and phase frequency response of modulated signals over the entire bandwidth, making it possible to test the true performance of a DUT.

Error vector magnitude (EVM) for a 2 GHz and 4 GHz OFDM signal at 14 GHz carrier frequency with I/Q noise cancellation



The R&S®SF1100A generates signals with excellent modulation quality to test DUTs at IF. For example, an outstanding EVM less than -46 dB (0.5%) can be achieved over a wide output power range even for a 2 GHz wide OFDM signal with 960 kHz subcarrier spacing and QPSK modulation at 14 GHz IF frequency.

Error vector magnitude (EVM) for a 4 GHz and 8 GHz wide IEEE 802.11ay signal at 144 GHz carrier frequency



The modulation quality remains excellent also when the R&S®SF1100A is used in combination with an R&S®FExxxST frontend. Even at a frequency of 144 GHz, an outstanding EVM of less than -34 dB (2%) can be achieved for a 4 GHz wide IEEE802.11ay signal over a wide output power range. The excellent performance remains even when modulation bandwidth increases to 8 GHz, still achieving less than -31 dB (3%) in the sweet spot. This outstanding performance ensures that you are testing the real performance of the DUT.

ENHANCED USABILITY

Thanks to the compact 2 HU form factor, the R&S®SFI100A fits on every desk or workbench. The combination with the R&S®FE110ST/R&S®FE170ST external frontends sets new standards for a compact and flexible test setup in the sub-THz frequency range. Never before has a setup for wideband modulated signal generation in the sub-THz frequency range been so compact and easy to use.

Ergonomic design for maximum operating convenience

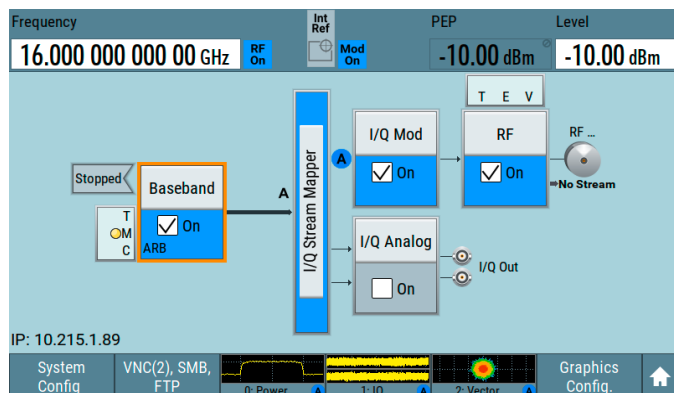
A high-resolution touchscreen and an easy-to-use graphical user interface (GUI) make for ergonomic operation. A block diagram provides a clear overview at all times. At a glance, the user sees the signal flow and the status of all inputs and outputs.

All menu feature tabs for fast access to signal parameters. The context-sensitive online help provides information about every parameter, such as setting range, detailed circuit description and SCPI commands. Various functions facilitate everyday work, e.g. each parameter can be individually reset to its specific preset status.

The built-in graphics function of the R&S®SFI100A allows the generated signals to be displayed in real time in multiple simultaneous windows. The user can select the type of display (I and Q versus time, frequency spectrum, vector diagram, etc.) and the point in the signal flow where the measurement will be performed.

User interface of the R&S®SFI100A

The header shows the frequency, level and important instrument statuses. The footer provides quick access to open menus. The generated signals and the measurement results of any connected R&S®NRP power sensors can be displayed as well.



Automation made easy

The R&S®SFI100A can be controlled via all common remote interfaces. The user benefits from a number of help functions when programming an automatic test sequence control. The SCPI commands for every setting parameter can be displayed directly. All modifications of the instrument's preset status can be highlighted graphically. This makes it easy to identify all parameters that are important for remote control.

The R&S®SFI100A also has a built-in SCPI macro recorder with code generator. It records all manual operating steps to generate a file with a remote command sequence. Code templates are provided for directly generating executable code for MATLAB®, LabWindows/CVI and Python. User-specific templates can also be used. As a result, the R&S®SFI100A minimizes the time required for test automation and saves development resources.

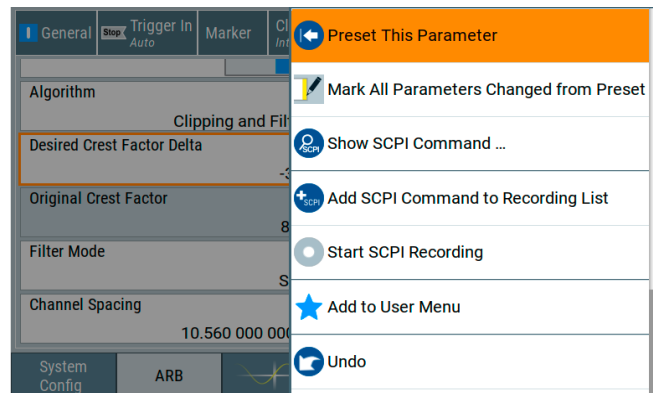
Speedy work with a fast instrument

The Linux based operating system of the R&S®SFI100A helps ensure short boot times. The high-performance onboard computer speeds up work even when settings require comprehensive signal calculation.

Support for R&S®NRP power sensors and closed-loop power control

The R&S®SFI100A supports the R&S®NRP power sensors over the USB interface. It provides a convenient way to read out power measurements and to perform closed-loop power control at any point in the measurement setup. No external PC or additional instruments are required.

The context-sensitive help menu provides a quick way to get useful additional information. The built-in SCPI macro recorder and code generator support fast, convenient generation of SCPI program sequences.



FULLY SOFTWARE-DEFINED OPTION CONCEPT

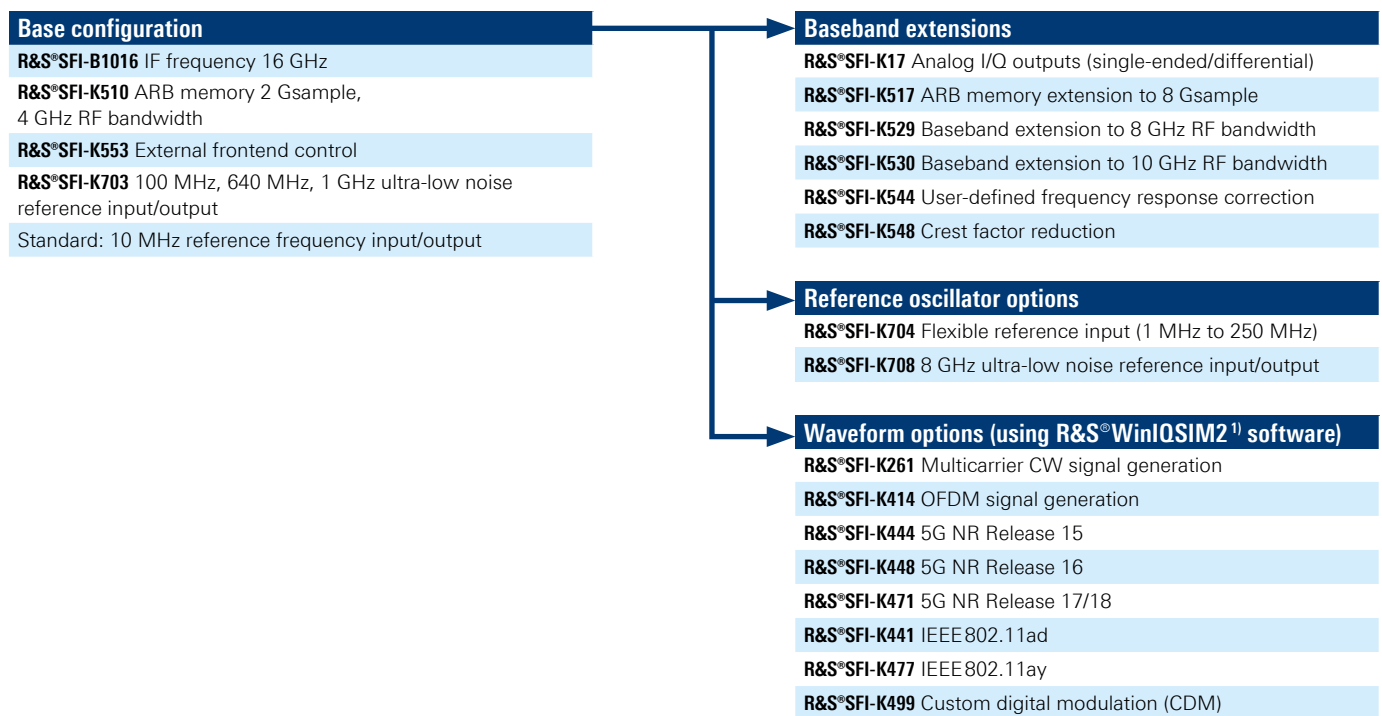
The R&S®SFI100A comes fully calibrated and ready to explore its full hardware capabilities. As test requirements evolve, additional capabilities such as wider bandwidth, extra ARB memory or high-precision multi-instrument synchronization can be easily activated on site via software keycodes.

The fully software-defined option concept eliminates potential downtime typically required to retrofit instruments with new capabilities.

In this way, the R&S®SFI100A can be precisely customized to suit the applications at hand and can be enhanced whenever new requirements arise. Users only have to purchase what they currently need and can decide on upgrades according to future requirements.

Option concept

All features of the R&S®SFI100A can be upgraded via software keycodes installable by the user, without the need to send the instrument to a service center.

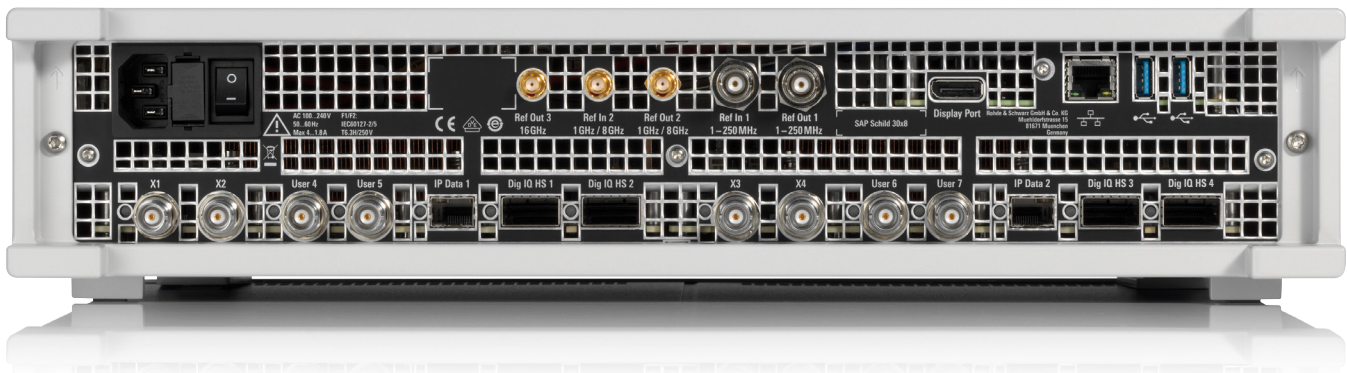


¹⁾ R&S®WinIQSIM2 requires an external PC.

SPECIFICATIONS IN BRIEF

| Specifications in brief | | |
|-----------------------------------|--|--|
| Frequency | with R&S®SFI-B1016 | 11 GHz to 21 GHz |
| | with R&S®FE110ST and R&S®SFI-K553 | 70 GHz to 110 GHz |
| | with R&S®FE170ST and R&S®SFI-K553 | 110 GHz to 170 GHz (overrange: up to 175 GHz) |
| Specified level range (PEP) | with R&S®SFI-B1016 | -50 dBm to 0 dBm |
| | with R&S®FE110ST | see R&S®FE110ST specifications (PD 3683.9470.22) |
| | with R&S®FE170ST | see R&S®FE170ST specifications (PD 3609.9240.22) |
| Spectral purity | | |
| Harmonics | 11 GHz < f ≤ 21 GHz, CW, level ≤ 0 dBm | < -30 dBc |
| Non-harmonics | 11 GHz < f ≤ 21 GHz, CW, level = -10 dBm | < -40 dBc |
| SSB phase noise | f = 16 GHz | < -120 dBc |
| I/Q modulation frequency response | optimization mode: high quality table | |
| | 11.0 GHz < f ≤ 15.9 GHz | < 1.4 dB, < 0.5 dB (meas.) |
| | 15.9 GHz < f ≤ 16.1 GHz | < 2.7 dB, < 2.0 dB (meas.) |
| | 16.1 GHz < f ≤ 21.0 GHz | < 1.4 dB, < 0.5 dB (meas.) |
| DAC resolution | | 12 bit |
| Baseband generator | | |
| Signal bandwidth | with R&S®SFI-K510 | 4 GHz |
| | with R&S®SFI-K529 | 8 GHz |
| | with R&S®SFI-K530 | 10 GHz |
| ARB memory depth | standard | 2 Gsample |
| | with R&S®SFI-K517 | 8 Gsample |
| Sample resolution | | 16 bit |
| Analog I/Q output | R&S®SFI-K17 | single-ended, differential, direct DAC |
| Digital standards | with R&S®WinIQSIM2 | custom digital modulation, OFDM, multicarrier CW (MCCW), IEEE 802.11ad/ay, 5G NR Releases 15 to 18 |
| Calibration interval | recommended | 3 years |

R&S®SFI100A rear view.



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| | SERVICE PLANS | ON DEMAND |
|---------------------|--------------------------------|-----------------------|
| Calibration | Up to five years ¹⁾ | Pay per calibration |
| Warranty and repair | Up to five years ¹⁾ | Standard price repair |

¹⁾ For extended periods, contact your Rohde & Schwarz sales office.

Instrument management made easy

The R&S® InstrumentManager makes it easy to register and manage your instruments. It lets you schedule calibration dates and book services.

Find out more
about our service
portfolio under:



For more information, see www.rohde-schwarz.com/product/sfi100a and

- ▶ R&S® SF100A specifications (PD 3685.0134.22)
- ▶ “Digital Standards for Signal Generators” specifications (PD 5213.9434.22)

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