Цифровой широкополосный регистратор IQW

AT A GLANCE

The R&S®IQW wideband I/Q data recorder is a versatile instrument for fast and reliable real-time recording, storage and playback of wideband I/Q data streams. In contrast to field tests, recording of live RF scenarios allows users to perform tests in the lab under real-world conditions reproducibly and at lower cost.

The wide recording bandwidth and high sampling rate and bit depth of the R&S®IQW make the instrument ideal for deployment in areas such as aerospace and defense, and for R&D of wideband communications systems.

In combination with signal and spectrum analyzers and signal generators, the R&S®IQW can be used in a wide variety of situations for recording, archiving and playback of GNSS, communications and radar signals, as well as complex signal scenarios.

The smart GUI concept makes working with I/Q data quick and easy. Easily removable and lockable SSD memory packs provide the necessary flexibility and security. With its very short boot time, the Linux based operating system ensures fast availability while reducing vulnerability to external malware attacks.

Along with wide bandwidth and high speed, the R&S®IQW features easy operation and a high level of security.

Key facts

- Real-time recording, storage and playback of digital I/Q data with bandwidths up to 1000 MHz
- Accurate data acquisition with a sampling rate up to 1200 Msample/s
- Fast data provision and memory expansion with easily removable memory packs (SSD) up to 15 Tbyte
- Easy operation with the 5.7" TFT touchscreen user interface or by remote control with the SCPI command set and web based responsive GUI
- Import and export of I/Q data via USB 3.0 and 10 Gbit/40 Gbit LAN interface
- Recording, import and export of GPS coordinates
- Partial export of recorded I/Q data to reduce data and improve file handling
- Continuous playback of recorded I/Q data
- Supports R&S®VSE vector signal explorer, R&S®CA100 signal analysis and signal processing software and R&S®TPA technical pulse analysis

HIGH-PRECISION DATA ACQUISITION

Data recording and playback with up to 1000 MHz bandwidth and no sample loss

With the R&S®IQW, I/Q data with a bandwidth up to 1000 MHz can be recorded, stored and played back without any sample loss. This allows users to capture wideband live RF scenarios. Unlike artificially generated signals, users can employ the signals for lab tests relying on realistic scenarios. These real-world scenarios include effects such as signal reflection, attenuation and scattering, which make it possible to simulate true-to-life test environments in the lab at low cost.

Precise timestamping

Timestamping at the frame level allows users to precisely evaluate the timing of the recorded I/Q data so that they can determine exactly which data was recorded at what time. This makes it possible to accurately correlate the captured I/Q data to events and ambient conditions during the recording session.

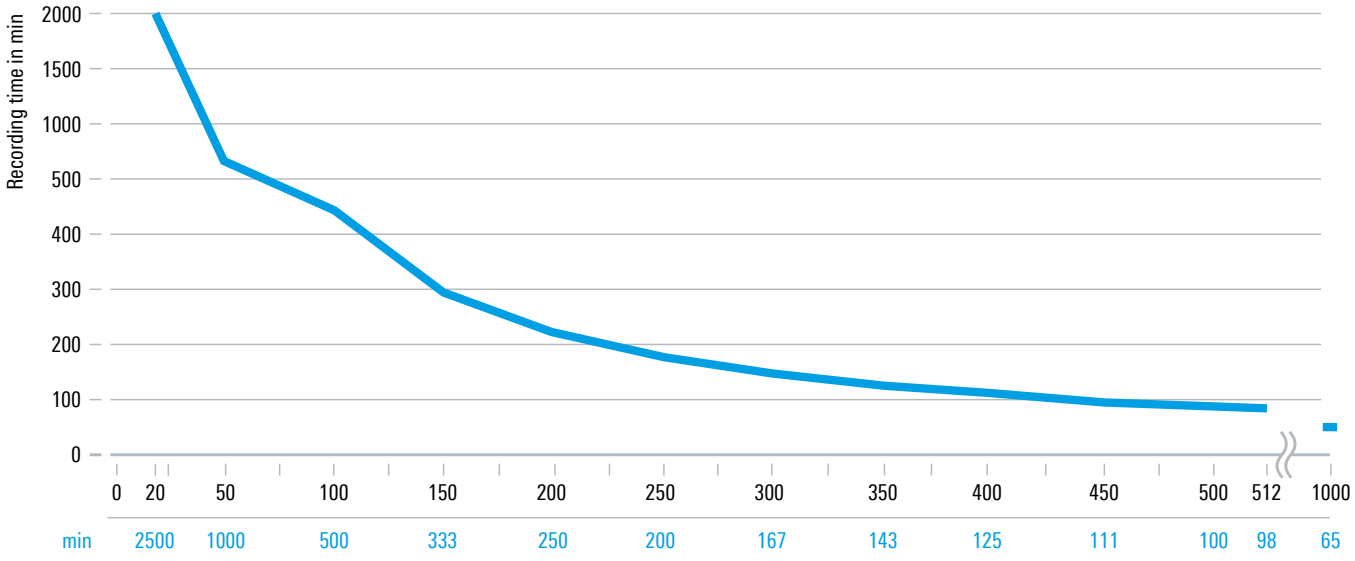
Removable memory packs for more flexibility

The R&S®IQW has a sturdy stainless steel case, and its 3 HU by ½ 19" format is very compact, making it suitable for both stationary and mobile use. It contains a removable SSD memory pack that can be released by a lever mechanism. For users, this means fast data provision, allowing data to be exchanged easily and reliably between different users. In addition, memory expansion is possible by choosing a memory pack with a higher capacity.

Different memory sizes are available for the R&S®IQW. The R&S®IQW-BD115 option contains a 15 Tbyte SSD memory pack and the R&S®IQW-BD106 option contains a 6.4 Tbyte SSD memory pack for recording bandwidths up to 1000 MHz. The R&S®IQW-BD115 allows real-time recording up to 65 minutes. Reducing the bandwidth increases the recording time. The relationship between bandwidth and recording time is shown in the chart below.

Removable SSD memory pack

Recording time as a function of bandwidth with R&S®IQW-BD115 15 Tbyte SSD

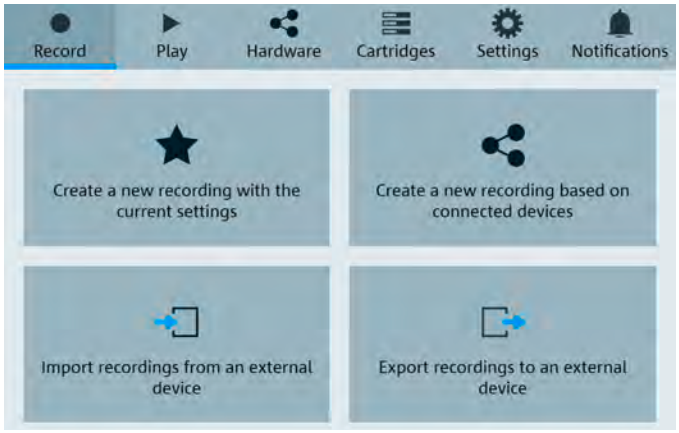


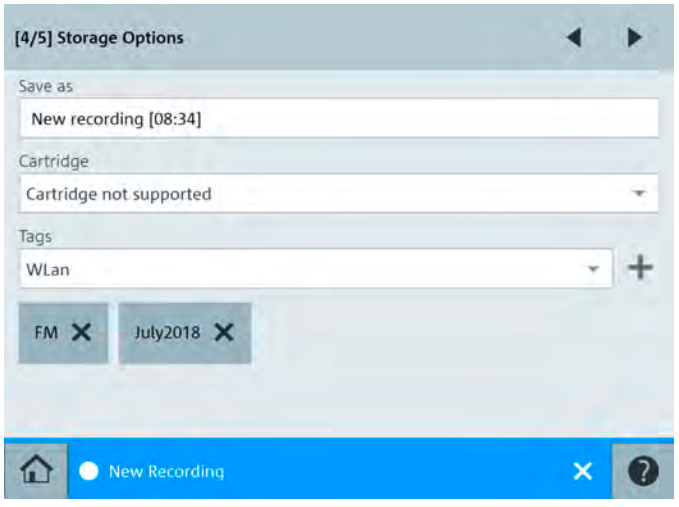
SMART OPERATING CONCEPT

Operation of the R&S®IQW is based on a smart, intuitive user interface, allowing users to quickly make the desired settings and start recording.

The recorder can be operated locally or by remote control. Local control is via the touchscreen, with the option of connecting an accessory keyboard and mouse.

Easy-to-use GUI





Convenient remote control

A web based user interface enables control of the recorder via a web browser. The responsive GUI automatically adapts to the screen size, so a smartphone can also be used for remote control. This allows one or more users to operate the instrument conveniently via a LAN from their workstation or on the go with a smartphone.

Another option for remote control is to use the SCPI command set for automatic operation. Context-sensitive online help provides detailed explanations of all parameters, such as specific default settings or associated SCPI commands.

Simplified data management

The R&S®IQW provides helpful functions to assist users in working with the acquired I/Q data. GPS data can be recorded and displayed as auxiliary information to facilitate geographical correlation of I/Q data for convenient evaluation. Archiving and sorting of recordings is supported by setting tags so that data can later be searched for, filtered and sorted according to user-defined criteria.

Manual/triggered start and stop of recordings

Recordings can be started and stopped manually or by using a trigger signal. The recorder can trigger on either the rising or falling edge of the trigger signal.

Fast I/Q data import and export via USB 3.0 and LAN

The R&S®IQW-K110 option makes it possible to import and export I/Q data. The base unit comes with a USB 3.0 and 1 Gbit LAN interface for import and export of files. The R&S®IQW-B40G hardware option speeds up the export and import of recorded files by providing a 10 Gbit and 40 Gbit LAN interface.

Partial export of I/Q data using time and event markers

The R&S®IQW allows partial export using time and event markers. This reduces the amount of data and facilitates data handling and downstream analysis. Event markers are used to indicate interesting events in large files and can be set by signal sources such as spectrum analyzers or be imported from an external data source.

Continuous playback

When continuous playback mode is activated, the recorded I/Q file is replayed seamlessly and without sample loss.

SECURITY FIRST

Securing confidential measurement data

The removable memory pack ensures the confidentiality of user measurements by preventing unauthorized access to the recorded data. Once the memory pack is removed, no measurement data remains in the instrument. The instrument's boot medium, which contains user data such as instrument settings, can also be removed. As a result, the R&S®IQW can be sent in for calibration or handed over to another user without any security concerns, because confidential measurement data and settings always remain with the rightful user. The standardized Kensington lock fitting on the instrument and the memory pack locking mechanism hinders potential data theft.

Protected against external malware

Susceptibility to external attacks is significantly reduced through the use of a Linux based operating system, delivering higher security. Furthermore, Linux provides high system stability by protecting important system data and preventing it from being modified. Easily and quickly installable firmware updates ensure that the software is always up-to-date and secure, offering the latest functions and improvements.

Always up-to-date with free firmware updates

The firmware of the R&S®IQW can be updated using a USB stick or a LAN-connected PC. Several different firmware versions can be installed concurrently on the R&S®IQW. This allows users to safely evaluate a new firmware version before using it.

The locking mechanism of the memory pack hinders potential data theft.

WHEN SPEED COUNTS

The R&S®IQW is designed for high data rates. This includes the HS Digital I/Q interface as well as the entire hardware architecture and the data storage media.

HS Digital I/Q interface (proprietary) The HS Digital I/Q interface enables fast data recording with a high sampling rate, wide bandwidth and 16-bit memory depth.

Consistent use of PCIe

The consistent use of PCIe is another factor that contributes to the high system speed.

High-quality SSD memory packs

The high-quality SSD memory packs, which are normally used in servers, combine high availability and reliability with short latencies.

Linux based operating system

The operating system of the R&S®IQW has short boot times, so the recorder is very quickly ready for use at all times.

THE SYSTEM MAKES THE DIFFERENCE

Numerous ports at the front and rear

The R&S®IQW has numerous interfaces for data recording and instrument control. The arrangement of the interface ports ensures easy cabling to keep the workstation uncluttered.

Interfaces for data transfer

The two HS Digital I/Q ports are the key interfaces of the R&S®IQW for I/Q data recording and playback. These bidirectional interfaces can receive data from or send data to a device. This does away with reconnecting cables when switching between recording and playback of I/Q data. In addition to the HS Digital I/Q interfaces, the R&S®IQW comes with a standard digital I/Q interface for lower data rates and a bandwidth up to 160 MHz. The associated BNC ports can be used for digital start/stop triggering of recordings and for the input and output of reference clock signals for instrument and test setup synchronization. Via the GPS port, an antenna can be connected to the integrated GPS module. This makes it possible to record GPS data in order to assign recorded I/Q data to its exact geographical locations. GPS data can also be imported and exported.

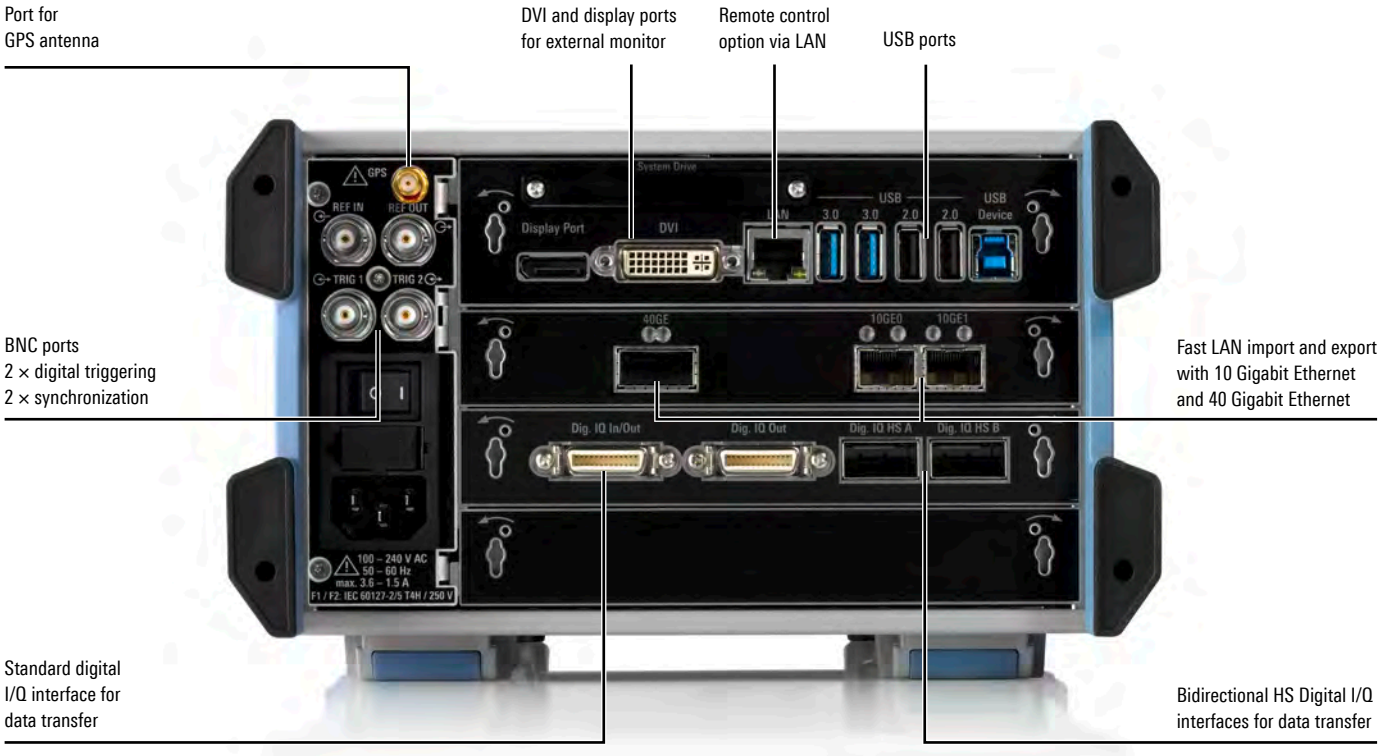
Universal interfaces for communications and control

The Ethernet interface provides access to the recorder via a web based GUI or through SCPI commands. Import and export of I/Q data files is available via USB 3.0, 10 Gigabit Ethernet and 40 Gigabit Ethernet. Input devices such as a mouse and keyboard can be connected via USB to create a convenient workstation.

Test setup with a signal and spectrum analyzer and a signal generator

A signal and spectrum analyzer for receiving live RF signals and a signal generator for reconstructing and emitting RF signals can be connected to the R&S®IQW. The R&S®FSW and the R&S®SMW200A communicate with the R&S®IQW via the HS Digital I/Q interfaces. With this setup, wideband RF scenarios received by the R&S®FSW can be stored in the R&S®IQW. Using the R&S®SMW200A, the recorded RF scenarios can be emitted, for example during lab tests. This allows test runs to be performed more efficiently and with lower resource usage, and therefore at lower cost, than field tests, which must be carried out by experts. Further instruments supported by the R&S®IQW are the R&S®SMM100A, R&S®SMBV100B, R&S®SGT100A and R&S®SMCV100B.

Universal interfaces for communications and control



Postprocessing software

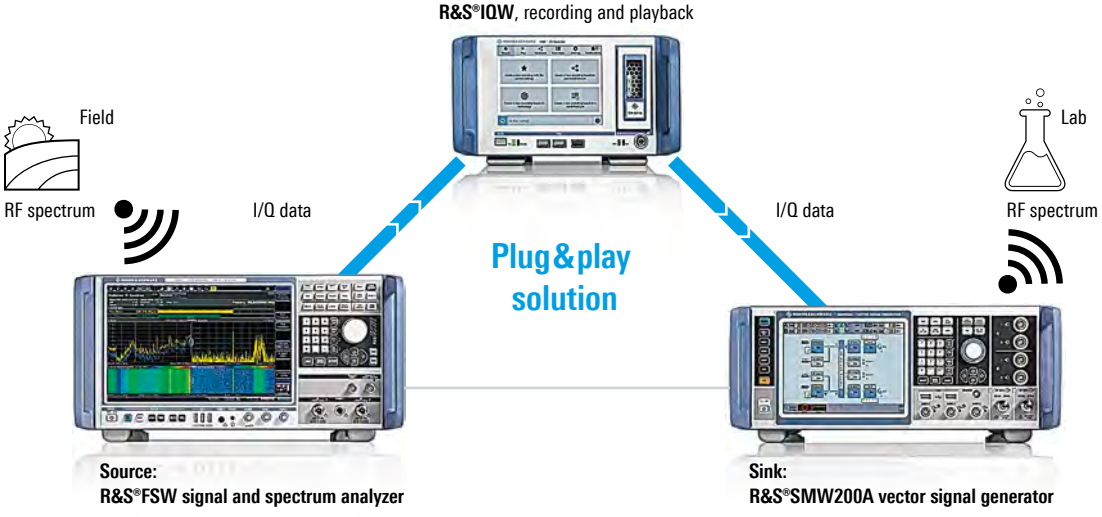
The R&S®IQW supports the R&S®VSE signal analysis software for postprocessing. R&S®VSE enables PC based signal analysis of recordings stored on an R&S®IQW. Furthermore, the R&S®IQW supports R&S®TPA technical pulse analysis for downstream signal analysis.

Testing DUTs in the lab with the R&S®FSW and the R&S®SMW200A

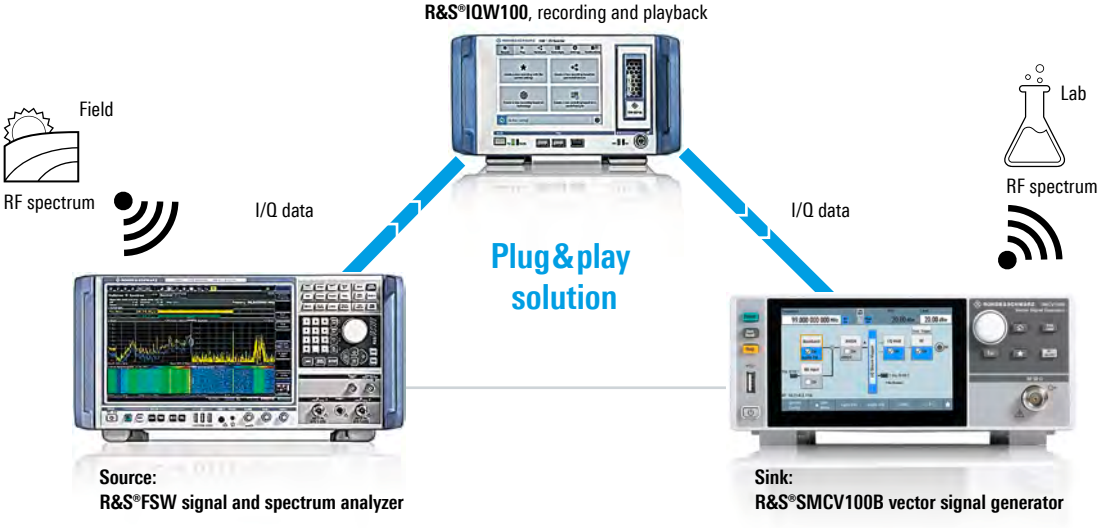
With the R&S®FSW, real RF spectra can be captured. The R&S®FSW converts analog signals to digital I/Q data, which is recorded and stored in the R&S®IQW.

This recording function enables users to test equipment under real-world conditions, including impairments such as multipath propagation, signal obstruction, diffraction and interference. The R&S®IQW can record different RF scenarios for lab testing of DUTs, allowing different realistic scenarios to be simulated in the lab to test DUTs under different RF conditions. The R&S®SMW200A reconverts the stored digital I/Q data to an RF signal, which can be replayed. Thus the same device test can be performed repeatably under identical real-world conditions with minimal effort.

Recording, storage and playback of RF live signals (i.e. radar signals)



Recording, storage and playback of RF live signals (i.e. communications signals)



TRAINING COURSE

Training course		
Operator training, with R&S®IQW	R&S®IQW-T100	3638.8890.02

The R&S®IQW training course combines classroom based theory lessons with practical exercises. It covers the most important topics that must be understood in order to effectively use the R&S®IQW for recording and playback of I/Q data.

The course provides operators with the necessary knowledge to understand the role and use of the R&S®IQW in a recording and replay system including other instruments for RF signal reception and transmission. The course is instructor-led with an interactive approach. A final exam will be held to ensure effective knowledge transfer.

SPECIFICATIONS IN BRIEF

Specifications in brief		
I/Q data transfer		
RF bandwidth		1000 MHz
I/Q word size	per I/Q sample	16 bit for I and 16 bit for Q, up to 512 MHz
I/Q word size	per I/Q sample	12 bit for I and 12 bit for recordings from 512 to 1000 MHz
Sampling rate	R&S®IQW	1200 Msample/s
HS digital I/Q interface		full duplex, QSFP+, 40 Gbit/s
Standard digital I/Q interface		input/output, 26-pin MDR connector
Interfacing instruments	I/Q data source for recording	R&S®FSW, R&S®FSWT (does not work with the R&S®FSV(A)3000)
	I/Q data sink for playback	R&S®SMW200A, R&S®SMBV100B, R&S®SGT100A, R&S®SMM100A, R&S®SMCV100B
General data		
Display	with touchscreen	5.7" TFT color display, 640 × 480 pixel, LED backlighting
USB interfaces		4 × USB 2.0, 3 × USB 3.0
LAN interface	remote control	Ethernet 10/100/1000 Mbit/s
Power supply	AC power supply	100 V to 240 V AC (±10%), ≤ 150 VA, 50 Hz to 60 Hz/400 Hz (±5%), 1.5 A to 3.6 A
Temperature range	operating	0°C to +40°C
	storage	–20°C to +70°C
Overall dimensions	W × H × D	249 mm × 150 mm × 451 mm (9.80 in × 5.90 in × 17.76 in)
	for 19" rackmounting	½ 19", 3 HU
Weight		6.3 kg (25.4 lb)

ORDERING INFORMATION

Designation	Type	Order No.
Base unit (without memory pack)		
I/Q wideband data recorder, midrange, with touchscreen, optimized for SSD memory packs	R&S®IQW100	1525.7551K02
I/Q wideband data recorder, with touchscreen, optimized for SSD memory packs	R&S®IQW	1525.7551K05
I/Q wideband recorder	R&S®IQW1000	1525.7551.10
Memory packs		
3.2 Tbyte SSD memory pack, for maximum RF bandwidth of 200 MHz	R&S®IQW-BC103	1525.8293.03
6.4 Tbyte SSD memory pack, for maximum RF bandwidth of 1000 MHz	R&S®IQW-BD106	1525.8293.06
15 Tbyte SSD memory pack, for maximum RF bandwidth of 1000 MHz	R&S®IQW-BD115	1525.8293.15
Accessories		
Cable for standard I/Q interface, length: 2 m	R&S®SMU-Z6	1415.0201.02
Cable for HS digital I/Q interface and LAN 40 Gbit/s, length: 3 m	R&S®DIGIQ-HS	3641.2948.03
Copper cable, including two SFP+ connectors for 10 Gbit/s, length: 5 m	R&S®GX460-CCG	4094.8635.02
Optical cable, including two SFP+ optical transceivers for 10 Gbit/s, length: 20 m	R&S®GX460-OCG	4094.8641.02
19" rack adapter (R&S®IQW + blind)	R&S®IQW-Z19	1525.7574.02
Options		
I/Q data export/import	R&S®IQW-K110	1525.8370.02
Recording of GPS coordinates	R&S®IQW-K112	1525.8393.02
Bandwidth extension, up to 200 MHz for R&S®IQW100	R&S®IQW-K200	1525.8429.02
LAN interface board, with 2 × 10 Gbit/s and 1 × 40 Gbit/s connector	R&S®IQW-B40G	1525.8264.02
Training course		
Operator training, with R&S®IQW	R&S®IQW-T100	3638.8890.02

Service options		
Extended warranty, one year	R&S®WE1	Please contact your local sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty, three years	R&S®WE3	
Extended warranty, four years	R&S®WE4