

PULSE MEASUREMENT APPLICATION

Specifications

R&S®FSW/FSWP/FSMR3-K6 Pulse Measurement Application

R&S®FSV3/FSV/FPS/VSE-K6 Pulse Measurement Application

R&S®FSWP-K6P Pulse Stability Measurements

R&S®FSW/FSWP-K6S Time Sidelobe Measurements

R&S®VSE-K6A Phased Array Measurements



Specifications
Version 15.02

ROHDE & SCHWARZ

Make ideas real



CONTENTS

Definitions	3
Specifications	5
General remarks	5
Overview.....	6
Pulse measurement	6
Measurement uncertainty (nominal)	14
Ordering information	20
Hardware options required for R&S®FSWP-K6P pulse stability measurements	23
Oscilloscopes supported by R&S®VSE-K6A option	23
Oscilloscopes supported by R&S®FSW-B2000 option.....	24
Oscilloscopes supported by R&S®FSW-B2000 and R&S®FSW-B5000 options	24
Recommended extras	24

Definitions

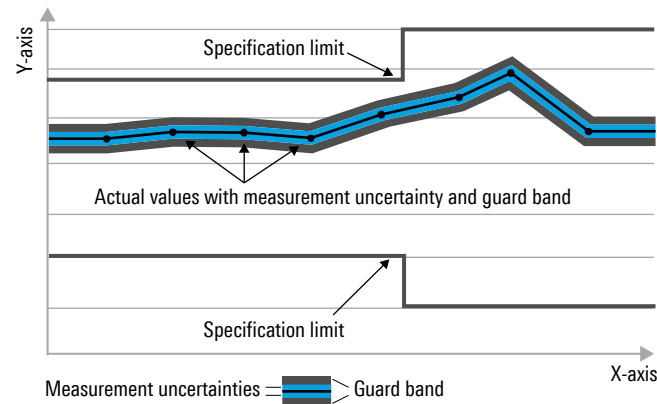
General

Product data applies under the following conditions:

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

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \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.



Non-traceable specifications with limits (n. trc.)

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

Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with $<$, $>$ or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: "parameter: value".

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

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

Specifications

The specifications of the R&S®VSE-K6/R&S®FSx-K6 pulse measurements, the R&S®VSE-K6A phased array measurements, the R&S®FSx-K6S time sidelobe measurements and the R&S®FSWP-K6P pulse stability measurements are based on the specifications of the R&S®FSW, R&S®FSWP, R&S®FSMR3000, R&S®FSVA3000, R&S®FSV3000, R&S®FSVA, R&S®FSV, and R&S®FPS signal and spectrum analyzers as well as the R&S®RTO and the R&S®RTP oscilloscopes. They have not been checked separately and are not verified during instrument calibration. Measurement uncertainties are given as 95 % confidence intervals. The specified level measurement errors do not take into account systematic errors due to reduced signal-to-noise ratio (SNR).

General remarks

This specification covers the R&S®FSW-K6, R&S®FSW-K6S, R&S®FSWP-K6, R&S®FSWP-K6S, R&S®FSWP-K6P, R&S®FSMR3-K6, R&S®FSV3-K6 and R&S®FPS-K6 as well as the R&S®VSE-K6 and R&S®VSE-K6A.

The R&S®FSW-K6, R&S®FSWP-K6, R&S®FSMR3-K6, R&S®FSV3-K6 and R&S®FPS-K6 are summarized with the term R&S®FSx-K6.

The R&S®FSW-K6S and the R&S®FSWP-K6S are summarized with the term R&S®FSx-K6S.

The R&S®FSx-K6 and the R&S®FSx-K6S are summarized with the term R&S®FSx-K6/S.

The R&S®FSWP-K6, R&S®FSWP-K6S and the R&S®FSWP-K6P are summarized with the term R&S®FSWP-K6/S/P.

The R&S®FSW, R&S®FSWP, R&S®FSMR3000, R&S®FSVA3000, R&S®FSV3000, R&S®FSV, R&S®FSVA, R&S®FPS, R&S®FPL1000 instruments are summarized with the term R&S®FSx.

The R&S®FSx-K6S time sidelobe measurements are provided as an upgrade to the R&S®FSx-K6 pulse measurement application. The R&S®FSx-K6S option therefore requires the corresponding R&S®FSx-K6 option.

The R&S®FSWP-K6P pulse stability measurements are provided as an upgrade to the R&S®FSWP-K6 pulse measurement application. The R&S®FSWP-K6P option therefore requires the corresponding R&S®FSWP-K6 option.

The R&S®FSx-K6/S/P runs on the device itself.

The R&S®VSE-K6A phased array measurements are provided as an upgrade to the R&S®VSE-K6 pulse measurement application. The R&S®VSE-K6A option therefore requires the corresponding R&S®VSE-K6 option.

The R&S®VSE-K6 runs on a PC and can communicate with the following analyzers: R&S®FSW, R&S®FSWP, R&S®FSVA3000, R&S®FSV3000, R&S®FSVA, R&S®FSV, R&S®FPS and R&S®FPL. The R&S®VSE-K6 and R&S®VSE-K6A run on a PC and can communicate with the R&S®RTO and the R&S®RTP oscilloscopes.

If not stated otherwise, the specified values in this document are device-specific, e.g. the same value applies to R&S®FSW-K6 and R&S®VSE-K6 with connected R&S®FSW.

For feature tables the following convention applies:

•	Feature always supported i.e. by the R&S®VSE-K6 connected to the device and by the corresponding R&S®FSx-K6 option when running directly on the device
• (VSE)	Feature supported only by the R&S®VSE-K6 connected to the device; not by the corresponding R&S®FSx-K6 option when running directly on the device
• (FSx-K6/S/P)	Feature supported only when running directly on the device with the corresponding R&S®FSx-K6/S/P option; not supported by the R&S®VSE-K6
–	Feature not supported by this device

Overview

		R&S®FSW	R&S®FSWP	R&S®FSMR3000	R&S®FSVA3000, R&S®FSV3000	R&S®FSVA, R&S®FSV	R&S®FPS	R&S®FPL	R&S®RTO	R&S®RTP
R&S®FSx-K6/ S/P	software that runs on device	• (FSW-K6/S)	• (FSWP-K6/ S/P)	• (FSMR3-K6)	• (FSV3-K6)	–	• (FPS-K6)	–	–	–
R&S®VSE-K6	PC software that can be connected to device	•	•	–	• (R&S®VSE, firmware version 1.62 or higher required)	•	•	–	•	•
R&S®VSE-K6A	PC software that can be connected to device, requires R&S®VSE-K6	–	–	–	–	–	–	–	•	•

Pulse measurement

Frequency

Frequency range	RF input	same as supported instrument
-----------------	----------	------------------------------

Level

Level range	RF input	same as supported instrument
-------------	----------	------------------------------

Signal acquisition

		R&S®FSW	R&S®FSWP	R&S®FSMR3000	R&S®FSVA3000	R&S®FSV3000	R&S®FSVA, R&S®FSV (R&S®VSE)	R&S®FPS	R&S®FPL (R&S®VSE)	R&S®RTO (R&S®VSE)	R&S®RTP (R&S®VSE)
Inputs	RF input	•	•	•	•	•	•	•	•	•	•
	digital baseband input	• (FSW-K6) ¹	–	–	–	–	–	–	–	–	–
	analog baseband input	• (FSW-K6) ²	–	–	–	–	–	–	–	–	–
	file	•	•	•	•	•	•	•	•	•	•
	MSRA I/Q data capture	• (FSW-K6)	• (FSWP-K6)	• (FSMR3-K6)	–	–	–	• (FPS-K6)	–	–	–
	MSRT I/Q data capture	• (FSW-K6)	–	–	–	–	–	–	–	–	–
	external mixer	• (FSW-K6)	–	–	–	–	–	–	–	–	–
Input channels	simultaneous	1								1, 2 or 4 ³	
Usable I/Q bandwidth	standard	28 MHz	10 MHz	10 MHz	28 MHz	28 MHz	28 MHz	28 MHz	10 MHz	600 MHz	4 GHz
	up to ⁴	8312 MHz	320 MHz	80 MHz	1000 MHz	200 MHz	160 MHz	160 MHz	40 MHz	6 GHz	16 GHz
Usable I/Q record length ⁵	standard	same as for the R&S®VSE base system, R&S®RTO, R&S®RTP or R&S®FSx instruments									
	up to ⁴	1300 Msample ⁶ , 5600 Msample ⁷ , 6440 Msample ⁸	–	–	800 Msample ⁹		–	–	–	–	–

¹ Only with R&S®FSW-B17 option.² Only with R&S®FSW-B71 option.³ R&S®VSE-K6A required for simultaneous multichannel analysis.⁴ Depends on the hardware configuration. For details, see R&S®FSW/FSWP/FSMR3000/FSVA3000/FSV3000/FSVA/FSV/FPS and R&S®RTO/RTP specifications.⁵ Maximum record length will be reduced with multiple measurement application channels opened simultaneously.⁶ With R&S®FSW-B106 option for sample rates up to 200 Msample/s or with R&S®FSW-B108 option for sample rates up to 600 Msample/s.⁷ With R&S®FSW-B124 option for sample rates between 100 Msample/s and 5000 Msample/s.⁸ With R&S®FSW-B124 option for sample rates greater than 5000 Msample/s.⁹ With R&S®FSV3-B114 option.

		R&S®FSW	R&S®FSWP	R&S®FSMR3000	R&S®FSVA3000	R&S®FSV3000	R&S®FSVA, R&S®FSV (R&S®VSE)	R&S®FPS	R&S®FPL (R&S®VSE)	R&S®RTO (R&S®VSE)	R&S®RTP (R&S®VSE)
Gaussian filter bandwidths ¹⁰	standard	100/200/400/800 Hz, 1.6/3.2/6.4/12.5/25/50/100/200/400/800 kHz, 1.6/3/5/8/10 MHz									
	18 MHz	●	● ¹⁷	● ¹¹	●	●	●	●	●	●	●
	28 MHz	● ¹²	● ¹⁷	● ¹¹	● ¹³	● ¹³	● ¹⁴	● ¹⁵	—	●	●
	40 MHz	● ¹⁶	● ¹⁷	● ¹¹	● ¹⁸	● ¹⁸	● ¹⁹	● ²⁰	—	●	●
	50/80/100 MHz	● ²¹	● ²²	—	● ¹⁸	● ¹⁸	● ¹⁹	● ²³	—	●	●
	160 MHz	● ²⁴	● ²²	—	● ¹⁸	● ¹⁸	—	● ²⁵	—	●	●
	200 MHz	● ²⁶	● ²²	—	● ¹⁸	● ¹⁸	—	—	—	●	●
	250 MHz	● ²⁶	● ²²	—	● ²⁷	—	—	—	—	●	●
	320 MHz	● ²⁸	—	—	● ²⁷	—	—	—	—	●	●
	500 MHz	● ²⁹	—	—	—	—	—	—	—	●	●
	1 GHz	● ²⁹	—	—	—	—	—	—	—	● ³⁰	●
	2 GHz	● ³¹	—	—	—	—	—	—	—	—	—
	3 GHz	● ³¹	—	—	—	—	—	—	—	—	—
4 GHz	● ³²	—	—	—	—	—	—	—	—	—	
5 GHz	● ³²	—	—	—	—	—	—	—	—	—	

¹⁰ 3-dB-bandwidth given. All Gaussian filters are limited to the usable I/Q bandwidth. For certain bandwidths this can result in a “Gaussian top” filter shape as described in the user manual.

¹¹ R&S®FSMR3-B80 bandwidth option or higher required.

¹² R&S®FSW-B40 bandwidth option or higher required with PC software (R&S®VSE-K6).

¹³ R&S®FSV3-B40 bandwidth option or higher required.

¹⁴ R&S®FSV-B70 bandwidth option or higher required for R&S®FSV. Bandwidth option R&S®FSVA-B40 or higher required for R&S®FSVA.

¹⁵ R&S®FPS-B40 bandwidth option or higher required.

¹⁶ R&S®FSW-B40 bandwidth option or higher required on device (R&S®FSW-K6/S), R&S®FSW-B80 option or higher required with PC software (R&S®VSE-K6).

¹⁷ R&S®FSWP-B80 bandwidth option or higher required.

¹⁸ R&S®FSV3-B200 bandwidth option or higher required.

¹⁹ R&S®FSV-B160 bandwidth option required.

²⁰ R&S®FPS-B40 bandwidth option or higher required on device (R&S®FPS-K6), R&S®FPS-B160 option or higher required with PC software (R&S®VSE-K6).

²¹ R&S®FSW-B160 bandwidth option or higher required.

²² R&S®FSWP-B320 bandwidth option required.

²³ R&S®FPS-B160 bandwidth option required.

²⁴ R&S®FSW-B160 bandwidth option or higher required on device (FSW-K6/S), R&S®FSW-B320 option or higher required with PC software (R&S®VSE-K6).

²⁵ R&S®FPS-B160 bandwidth option required on device (R&S®FPS-K6), not available with PC software (R&S®VSE-K6).

²⁶ R&S®FSW-B320 bandwidth option or higher required.

²⁷ R&S®FSV3-B400 bandwidth option required.

²⁸ R&S®FSW-B512 bandwidth option or higher required.

²⁹ R&S®FSW-B2001 bandwidth option or R&S®FSW-B2000 and corresponding R&S®RTO device as external digitizer are required.

³⁰ R&S®RTO with 2 GHz bandwidth or higher required.

³¹ R&S®FSW-B4001 bandwidth option or higher is required.

³² R&S®FSW-B6001 bandwidth option or higher is required.

Triggering

		R&S®FSW	R&S®FSWP, R&S®FSMR3000	R&S®FSVA3000, R&S®FSV3000	R&S®FSVA, R&S®FSV (R&S®VSE)	R&S®FPS	R&S®FPL (R&S®VSE)	R&S®RTO (R&S®VSE)	R&S®RTP (R&S®VSE)
RF input ³³		same as supported instrument						manual ³⁴ and external trigger	
	frequency mask ³⁵	• (FSW-K6)	–	–	–	–	–	–	–
Baseband input	baseband power	• (FSW-K6)	–	–	–	–	–	–	–
File input	magnitude	• (VSE)							

Segmented signal acquisition (R&S®FSx-K6)

		R&S®FSW (R&S®FSW-K6)	R&S®FSWP (R&S®FSWP-K6) ³⁶	R&S®FSMR3000 (R&S®FSMR3-K6)	R&S®FSVA3000 (R&S®FSV3-K6)	R&S®FSV3000 (R&S®FSV3-K6)	
No. of segments	maximum	200 000	200 000	200 000	200 000	200 000	
Usable I/Q bandwidth	standard up to ³⁷	10 MHz 8000 MHz	10 MHz 160 MHz	10 MHz 80 MHz	28 MHz 1000 MHz	28 MHz 200 MHz	
Max. measurement time (compressed) using internal digitizer	flat filter						
	10 MHz	30.8 s	30.8 s	30.8 s	24 s	24 s ³⁸	
	40 MHz	7.7 s	7.7 s	7.7 s	6 s	6 s ³⁸	
	80 MHz	3.85 s	3.85 s	3.85 s	3 s	3 s ³⁸	
	160 MHz	1.92 s	10.0 s ³⁹	1.92 s	–	1.5 s	1.5 s ³⁸
	500 MHz	641.7 ms	3.2 s ³⁹	–	–	480 ms	–
	1000 MHz	308 ms	1.6 s ³⁹	–	–	240 ms	–
	2000 MHz	154 ms	800 ms ³⁹	–	–	–	–
	4000 MHz	77 ms	400 ms ³⁹	–	–	–	–
	6000 MHz	51 ms	266 ms ³⁹	–	–	–	–
8000 MHz	38 ms	200 ms ³⁹	–	–	–	–	
	Gaussian filter						
	see list of supported filter bandwidths on page 11	at least max. measurement time (compressed) for the corresponding flat filter bandwidth divided by 3.2					

³³ Trigger availability depends on the instrument used.

³⁴ Configuration of the trigger directly on the device.

³⁵ Using MSRT I/Q data capture; R&S®FSW-K160R, R&S®FSW-K512R or R&S®FSW-K800R option is required.

³⁶ Segmented acquisition is not supported by R&S®FSWP-K6P option when using the “low noise” digitizer mode.

³⁷ Depends on hardware configuration, for details, see R&S®FSW/FSWP/FSMR3000/FSVA3000/FSV3000 specifications. Segmented capture not supported by R&S®FSW-B320 option above 160 MHz I/Q bandwidth.

³⁸ Maximum measurement time with R&S®FSV3000 requires R&S®FSV3-B114 enhanced computing power option.

³⁹ Maximum measurement time requires one of R&S®FSW-B4001/-B6001/-B8001 bandwidth extension and R&S®FSV3-B124 I/Q memory extension. Supported by R&S®FSW v5.00 or later.

		R&S®FSW (R&S®FSW-K6)	R&S®FSWP (R&S®FSWP-K6) ³⁶	R&S®FSMR3000 (R&S®FSMR3-K6)	R&S®FSVA3000 (R&S®FSV3-K6)	R&S®FSV3000 (R&S®FSV3-K6)
Max. measurement time (compressed) using R&S®FSW-B2000 or R&S®FSW-B5000 option and corresponding R&S®RTO device	The maximum measurement time (compressed) depends on the oscilloscope model, memory configuration and the number of segments. See user manual R&S®FSW-K6 for detailed information.		–	–	–	–
	trigger mode	IF power				
	flat filter					
	with R&S®FSW-B2000 option					
	80 MHz to 2 GHz	< 100 ms	< 100 ms			
	with R&S®FSW-B5000 option					
	80 MHz to 3 GHz	< 100 ms	< 100 ms			
3 GHz to 5 GHz	< 60 ms	< 60 ms				
Gaussian filter						
80 MHz to 1 GHz	< 50 ms	< 50 ms				
Supported Gaussian filter bandwidths ⁴⁰	standard	100/200/400/800 Hz, 1.6/3.2/6.4/12.5/25/50/100/200/400/800 kHz, 1.6/3/5/8/10 MHz				
	18 MHz	● ⁴¹	● ⁴²	● ¹¹	●	●
	28 MHz	● ⁴¹	● ⁴²	● ¹¹	●	●
	40 MHz	● ⁴³	● ⁴⁵	● ¹¹	●	●
	50/80/100/160 MHz	● ⁴⁴	● ⁴⁵	–	●	●
	200/250/320 MHz	● ⁴⁶	–	–	●	–
	500/1000 MHz	● ⁴⁷	–	–	–	–
2000 MHz	● ⁴⁸	–	–	–	–	
Trigger modes	RF input					
	external	●	●	●	●	●
	RF power	●	●	●	●	●

⁴⁰ 3-dB-bandwidth given. All Gaussian filters are limited to the usable I/Q bandwidth. For certain bandwidths this can result in a “Gaussian top” filter shape as described in the user manual.

⁴¹ R&S®FSW-B28 bandwidth option or higher required.

⁴² R&S®FSWP-B80 bandwidth option or higher required.

⁴³ R&S®FSW-B40 bandwidth option or higher required.

⁴⁴ R&S®FSW-B160 bandwidth option or higher required.

⁴⁵ R&S®FSWP-B320 bandwidth option or higher required.

⁴⁶ R&S®FSW-B500 bandwidth option or higher required.

⁴⁷ R&S®FSW-B2001 bandwidth option or higher required; or R&S®FSW-B2000/-B5000 bandwidth option and corresponding oscilloscope as external digitizer is required.

⁴⁸ R&S®FSW-B4001 bandwidth option or higher required.

Segmented signal acquisition (R&S®VSE-K6)

		R&S®FSW ⁴⁹ (R&S®VSE)	R&S®RTO (R&S®VSE)	R&S®RTP (R&S®VSE)
No. of segments	maximum	200 000	200 000	200 000
Usable I/Q bandwidth	standard	10 MHz	10 MHz	10 MHz
	up to	8 GHz	6 GHz	16 GHz
No. of channels	standard	1	1	
	with R&S®VSE-K6A option	–	1, 2 or 4 simultaneously	
Max. measurement time (compressed)	The maximum measurement time (compressed) depends on the device, memory configuration and the number of segments.			
	flat filter	385 Msample	< 100 ms	< 100 ms
	Gaussian filter	385 Msample	< 50 ms	< 50 ms
Supported Gaussian filter bandwidths ⁵⁰	standard	same as connected device	10/18/28/40/50/80/100/160/200/250/320/500/1000 MHz	
Trigger modes	external	•	•	•
	power	•	–	–
	separate input channel	–	•	•
	manual ³⁴	–	•	•

Signal acquisition (low noise)

		R&S®FSWP (R&S®FSWP-K6P)
Usable I/Q bandwidth	standard	10 MHz
	up to ⁴⁵	80 MHz
Max. measurement time	flat filter	
	10 MHz	36.6 s
	80 MHz	4.6 s
	Gaussian filter	at least max. measurement time for the corresponding flat filter bandwidth divided by 3.2
Supported Gaussian filter bandwidths ⁴⁰	standard	100/200/400/800 Hz, 1.6/3.2/6.4/12.5/25/50/100/200/400/800 kHz, 1.6/3/5/8/10/18/28/40 MHz
Acquisition modes	absolute	RF input
	additive	RF input with internal or external source ⁵¹ , supported for center frequency from 1.025 GHz to 18 GHz.
Signal source	pulse mode	user configurable constant pulse width and pulse period
	burst mode	sequence of pulse “bursts”, each containing a configurable number of pulses, pulse width, pulse period and burst length
	level settings and accuracy	see R&S®FSWP specifications, section “Signal source”
Trigger modes	RF input	external, internal (each pulse, each burst, specific burst, entire sequence), IF power

⁴⁹ Segmented capture supported by R&S®VSE v2.10 and R&S®FSW v5.00 or later.

⁵⁰ 3-dB-bandwidth given. All Gaussian filters are limited to the usable I/Q bandwidth. For certain bandwidths this can result in a “Gaussian top” filter shape as described in the user manual.

⁵¹ Use of external source requires R&S®FSWP-B21 option.

Measurement capability (nom.)

Pulse detection	measured pulses	1 to 200 000
	min. pulse width for measurement bandwidth (flat acquisition filter) ⁵²	
	10 MHz	400 ns
	28 MHz	150 ns
	40 MHz	100 ns
	80 MHz	50 ns
	160 MHz	25 ns
	320 MHz	12.5 ns
	500 MHz	8 ns
	2000 MHz	2 ns
System rise time	4000 MHz	1 ns
	8000 MHz	500 ps
	measurement bandwidth (flat acquisition filter) ⁵²	
	10 MHz	< 110 ns
	28 MHz	< 40 ns
	40 MHz	< 28 ns
	80 MHz	< 14 ns
	160 MHz	< 7 ns
	320 MHz	< 3.5 ns
	500 MHz	< 2.2 ns
	2 GHz	< 0.6 ns
	4 GHz	< 275 ps
	6 GHz	< 180 ps
	8 GHz	< 140 ps
	measurement bandwidth (Gaussian acquisition filter) ⁵³	
	10 MHz	< 73 ns
	28 MHz	< 26 ns
	40 MHz	< 23 ns
	80 MHz	< 12 ns
	160 MHz	< 6 ns
250 MHz	< 4 ns	
320 MHz	< 3 ns	
500 MHz	< 2 ns	
1 GHz	< 1 ns	
2 GHz	< 400 ps	
3 GHz	< 270 ps	
4 GHz	< 200 ps	
5 GHz	< 160 ps	

⁵² Available bandwidths depend on the hardware configuration. For details, see R&S®FSx, R&S®RTO and R&S®RTP specifications.

⁵³ Available Gaussian filter bandwidths depend on the hardware configuration and are listed in the section signal acquisition of this specifications document.

Pulse parameters	timing	timestamp, settling time, rise time, fall time, pulse width, off time, duty ratio, duty cycle, pulse repetition interval, pulse repetition frequency
	amplitude	top power, base power, average on power, average transmitted power, minimum power, peak power, peak-to-average on power ratio, peak-to-average transmitted power ratio, peak-to-min power ratio, droop, ripple, overshoot, power (at point), pulse-to-pulse power ratio (at point), in-phase amplitude, quadrature amplitude
	frequency	frequency (at point), pulse-to-pulse frequency difference (at point), frequency deviation, frequency error (peak), frequency error (RMS), chirp rate
	phase	phase (at point), pulse-to-pulse phase difference (at point), phase deviation, phase error (peak), phase error (RMS)
	envelope model	rise/fall base-point time, rise/fall low-point time, rise/fall mid-point time, rise/fall high-point time, rise/fall top-point time, rise/fall low-point level, rise/fall mid-point level, rise/fall high-point level, rise/fall top-point level
	time sidelobe ⁵⁴	peak-to-sidelobe level, integrated sidelobe level, mainlobe 3 dB width, sidelobe delay, compression ratio, mainlobe power (integrated) mainlobe power (average), peak correlation, mainlobe phase, mainlobe frequency
	stability ⁵⁵	burst number, position in burst, pulse phase stability, pulse amplitude stability, total pulse stability
Result displays	inter-pulse analysis	table with numeric values per pulse, table with statistics (average, standard deviation, max., min.), trend plot of parameter versus time, scatter plot of parameter versus parameter, spectrum of parameter versus time, histogram of parameter distribution, spectrum of pulse-to-pulse I and Q, stability waterfall ⁵⁵
	intra-pulse analysis	traces aligned to pulse for magnitude versus time, frequency versus time, phase (wrapped or unwrapped) versus time, pulse I and Q versus time, power spectrum, correlated magnitude ⁵⁴ , frequency error ⁵⁴ , phase error ⁵⁴ , pulse stability ⁵⁵

⁵⁴ Requires the R&S®FSx-K6S time sidelobe measurement upgrade option, not available in the R&S®VSE-K6 application.

⁵⁵ Requires the R&S®FSWP-K6P pulse stability measurements upgrade option, not available in the R&S®VSE-K6 application.

Measurement uncertainty (nominal)

Specifications apply under the following conditions: temperature range from +20 °C to +30 °C; signal level ≥ -10 dBm unless otherwise stated; properly adjusted reference level and attenuation.

Frequency and phase parameters (CW pulse modulation)

The total frequency accuracy is comprised of absolute frequency accuracy and a statistical uncertainty due to measurement noise. The absolute frequency accuracy is given in the corresponding R&S®FSx specifications.

The statistical measurement uncertainty is given below as a 95 % confidence interval at stated center frequencies (CF) and measurement bandwidths (flat acquisition filter) for a pulse modulated CW carrier.

	Measured bandwidth ⁵⁶	R&S®FSW ⁵⁷	R&S®FSWP ⁵⁷ , R&S®FSMR3000 ⁵⁷	R&S®FSVA3000 ⁵⁷	R&S®FSV3000 ⁵⁷	R&S®FPS ⁵⁸
Residual frequency error (RMS) Measurement range: 50 % of pulse top, pulse width ≥ 100 /measurement bandwidth	CF = 2 GHz					
	10 MHz	< 1.5 kHz	< 1.0 kHz	< 1.6 kHz	< 1.7 kHz	< 2 kHz
	28 MHz	< 5.5 kHz	< 4.5 kHz	< 5.8 kHz	< 6.1 kHz	< 6.5 kHz
	40 MHz	< 9.5 kHz	< 8.0 kHz	< 10.0 kHz	< 10.5 kHz	< 13.5 kHz
	80 MHz	< 43 kHz	< 40 kHz	< 45.1 kHz	< 47.4 kHz	< 47 kHz
	160 MHz	< 85 kHz	–	< 89.2 kHz	< 93.7 kHz	< 130 kHz
	320 MHz	< 260 kHz	–	< 273.0 kHz	–	–
	500 MHz	< 430 kHz	–	–	–	–
	CF = 8 GHz					
	10 MHz	< 2 kHz	< 1 kHz	< 2.1 kHz	< 2.2 kHz	< 2.5 kHz
	28 MHz	< 5 kHz	< 4.5 kHz	< 5.2 kHz	< 5.5 kHz	< 5.5 kHz
	40 MHz	< 8.5 kHz	< 8.0 kHz	< 8.9 kHz	< 9.4 kHz	< 10.5 kHz
	80 MHz	< 40 kHz	< 30 kHz	< 42.0 kHz	< 44.1 kHz	< 40 kHz
	160 MHz	< 80 kHz	–	< 84.0 kHz	< 88.2 kHz	< 80 kHz
	320 MHz	< 230 kHz	–	< 241.5 kHz	–	–
	500 MHz	< 370 kHz	–	–	–	–
	CF = 20 GHz					
	10 MHz	< 3 kHz	< 2 kHz	< 3.1 kHz	< 3.3 kHz	< 3 kHz
	28 MHz	< 8.5 kHz	< 8.5 kHz	< 8.9 kHz	< 9.4 kHz	< 8.5 kHz
	40 MHz	< 14.5 kHz	< 14 kHz	< 15.2 kHz	< 16.0 kHz	< 14.5 kHz
	80 MHz	< 60 kHz	< 45 kHz	< 63.0 kHz	< 66.2 kHz	< 60 kHz
	160 MHz	< 100 kHz	–	< 105.0 kHz	< 110.2 kHz	< 105 kHz
	320 MHz	< 300 kHz	–	< 315.0 kHz	–	–
	500 MHz	< 500 kHz	–	–	–	–

⁵⁶ Available bandwidths depend on the hardware configuration. For details, see R&S®FSW/FSWP/FSMR3000/FSVA3000/FSV3000/FPS specifications.

⁵⁷ 100 MHz external reference locked to sender, PRI ≤ 10 ms.

⁵⁸ 10 MHz external reference locked to sender, PRI ≤ 1 ms.

	Measured bandwidth ⁵⁶	R&S®FSW ⁵⁷	R&S®FSWP ⁵⁷ , R&S®FSMR3000 ⁵⁷	R&S®FSVA3000 ⁵⁷	R&S®FSV3000 ⁵⁷	R&S®FPS ⁵⁸
Pulse-to-pulse frequency Pulse-to-pulse measurement point occurs at least 10/measurement bandwidth after the rising edge (i.e. 50 % level crossing) and 10/measurement bandwidth before the falling edge (i.e. 50 % level crossing)	CF = 2 GHz					
	10 MHz	±2.5 kHz	±2.0 kHz	±2.6 kHz	±2.8 kHz	±4.5 kHz
	28 MHz	±12 kHz	±10 kHz	±12.6 kHz	±13.2 kHz	±15 kHz
	40 MHz	±22 kHz	±18 kHz	±23.1 kHz	±24.3 kHz	±30 kHz
	80 MHz	±90 kHz	±80 kHz	±94.5 kHz	±99.2 kHz	±105 kHz
	160 MHz	±200 kHz	–	±210.0 kHz	±220.5 kHz	±320 kHz
	320 MHz	±650 kHz	–	±682.5 kHz	–	–
	500 MHz	±1100 kHz	–	–	–	–
	CF = 8 GHz					
	10 MHz	±3 kHz	±2.5 kHz	±3.1 kHz	±3.3 kHz	±5 kHz
	28 MHz	±11.5 kHz	±10.5 kHz	±12.1 kHz	±12.7 kHz	±11.5 kHz
	40 MHz	±21 kHz	±18 kHz	±22.1 kHz	±23.2 kHz	±21.5 kHz
	80 MHz	±70 kHz	±60 kHz	±73.5 kHz	±77.2 kHz	±70 kHz
	160 MHz	±190 kHz	–	±199.5 kHz	±209.5 kHz	±195 kHz
	320 MHz	±625 kHz	–	±656.2 kHz	–	–
	500 MHz	±900 kHz	–	–	–	–
	CF = 20 GHz					
	10 MHz	±6 kHz	±5 kHz	±6.3 kHz	±6.6 kHz	±6 kHz
	28 MHz	±20 kHz	±19.5 kHz	±21.0 kHz	±22.1 kHz	±20 kHz
	40 MHz	±35 kHz	±33.5 kHz	±36.8 kHz	±38.6 kHz	±35 kHz
	80 MHz	±130 kHz	±90 kHz	±136.5 kHz	±143.3 kHz	±130 kHz
	160 MHz	±230 kHz	–	±241.5 kHz	±253.6 kHz	±240 kHz
	320 MHz	±750 kHz	–	±787.5 kHz	–	–
	500 MHz	±1325 kHz	–	–	–	–

	Measured bandwidth ⁵⁶	R&S®FSW ⁵⁷	R&S®FSWP ⁵⁷ , R&S®FSMR3000 ⁵⁷	R&S®FSVA3000 ⁵⁷	R&S®FSV3000 ⁵⁷	R&S®FPS ⁵⁸
Pulse-to-pulse phase Pulse-to-pulse measurement point occurs at least 10/measurement bandwidth after the rising edge (i.e. 50 % level crossing) and 10/measurement bandwidth before the falling edge (i.e. 50 % level crossing)	CF = 2 GHz					
	10 MHz	±0.11°	±0.08°	±0.23°	±0.24°	±0.44°
	28 MHz	±0.13°	±0.09°	±0.17°	±0.18°	±0.86°
	40 MHz	±0.15°	±0.10°	±0.18°	±0.19°	±0.87°
	80 MHz	±0.20°	±0.14°	±0.21°	±0.22°	±0.55°
	160 MHz	±0.29°	–	±0.30°	±0.32°	±0.60°
	320 MHz	±0.39°	–	±0.41°	–	–
	500 MHz	±0.45°	–	–	–	–
	CF = 8 GHz					
	10 MHz	±0.15°	±0.12°	±0.53°	±0.55°	±0.64°
	28 MHz	±0.18°	±0.13°	±0.52°	±0.54°	±0.67°
	40 MHz	±0.18°	±0.15°	±0.51°	±0.55°	±0.69°
	80 MHz	±0.20°	±0.18°	±0.52°	±0.54°	±0.72°
	160 MHz	±0.30°	–	±0.49°	±0.56°	±0.65°
	320 MHz	±0.36°	–	±0.60°	–	–
	500 MHz	±0.43°	–	–	–	–
	CF = 20 GHz					
	10 MHz	±0.35°	±0.28°	±1.41°	±1.48°	±2°
	28 MHz	±0.40°	±0.30°	±1.27°	±1.33°	±3.9°
	40 MHz	±0.40°	±0.30°	±1.41°	±1.48°	±3.7°
	80 MHz	±0.45°	±0.36°	±1.32°	±1.39°	±1.6°
	160 MHz	±0.55°	–	±1.55°	±1.62°	±1.6°
	320 MHz	±0.70°	–	±1.46°	–	–
	500 MHz	±0.90°	–	–	–	–

Frequency and phase parameters (linear FM pulse modulation)

The total frequency accuracy is comprised of absolute frequency accuracy and a statistical uncertainty due to measurement noise.

The absolute frequency accuracy is given in the R&S®FSx specifications.

The statistical measurement uncertainty is given below as a 95 % confidence interval at stated center frequencies and measurement bandwidths (flat acquisition filter) for a pulsed and linearly frequency modulated carrier.

	Measured bandwidth ⁵⁹	R&S®FSW ⁶⁰	R&S®FSWP ⁶⁰ , R&S®FSMR3000 ⁶⁰	R&S®FSVA3000 ⁶⁰	R&S®FSV3000 ⁶⁰	R&S®FPS ⁶¹
Residual frequency error (RMS) Measurement range: 50 % of pulse top, pulse width ≥ 1000/measurement bandwidth	CF = 2 GHz					
	10 MHz	< 2 kHz	< 1.5 kHz	< 2.1 kHz	< 2.2 kHz	< 3 kHz
	28 MHz	< 6 kHz	< 4 kHz	< 6.3 kHz	< 6.6 kHz	< 12.5 kHz
	40 MHz	< 8 kHz	< 7 kHz	< 8.4 kHz	< 8.8 kHz	< 20 kHz
	80 MHz	< 29 kHz	< 25 kHz	< 30.4 kHz	< 32.0 kHz	< 52 kHz
	160 MHz	< 75 kHz	–	< 78.8 kHz	< 82.7 kHz	< 140 kHz
	320 MHz	< 230 kHz	–	< 241.5 kHz	–	–
	500 MHz	< 390 kHz	–	–	–	–
	CF = 8 GHz					
	10 MHz	< 2.5 kHz	< 1.2 kHz	< 2.7 kHz	< 2.9 kHz	< 2.5 kHz
	28 MHz	< 6 kHz	< 5.5 kHz	< 8.1 kHz	< 8.5 kHz	< 6 kHz
	40 MHz	< 12 kHz	< 9 kHz	< 12.0 kHz	< 12.6 kHz	< 11 kHz
	80 MHz	< 36 kHz	< 30 kHz	< 37.8 kHz	< 39.7 kHz	< 36 kHz
	160 MHz	< 85 kHz	–	< 89.2 kHz	< 93.7 kHz	< 85 kHz
	320 MHz	< 250 kHz	–	< 262.5 kHz	–	–
	500 MHz	< 410 kHz	–	–	–	–
	CF = 20 GHz					
	10 MHz	< 3 kHz	< 2 kHz	< 8.8 kHz	< 9.8 kHz	< 3 kHz
	28 MHz	< 10 kHz	< 7.5 kHz	< 23.1 kHz	< 25.9 kHz	< 10 kHz
	40 MHz	< 16 kHz	< 13 kHz	< 32.4 kHz	< 36.6 kHz	< 16 kHz
	80 MHz	< 50 kHz	< 40 kHz	< 68.8 kHz	< 77.5 kHz	< 50 kHz
	160 MHz	< 120 kHz	–	< 162.8 kHz	< 171.0 kHz	< 120 kHz
	320 MHz	< 370 kHz	–	< 447.3 kHz	–	–
	500 MHz	< 675 kHz	–	–	–	–

⁵⁹ Available bandwidths depend on the hardware configuration. For details, see R&S®FSW/FSWP/FSMR3000/FSVA3000/FSV3000/FPS specifications.

⁶⁰ 10 MHz external reference locked to sender, PRI ≤ 10 ms.

⁶¹ 10 MHz external reference locked to sender, PRI ≤ 1 ms.

	Measured bandwidth ⁵⁹	R&S®FSW ⁶⁰	R&S®FSWP ⁶⁰ , R&S®FSMR3000 ⁶⁰	R&S®FSVA3000 ⁶⁰	R&S®FSV3000 ⁶⁰	R&S®FPS ⁶¹
Pulse-to-pulse frequency Pulse-to-pulse measurement point occurs at least 10/measurement bandwidth after the rising edge (i.e. 50 % level crossing) and 10/measurement bandwidth before the falling edge (i.e. 50 % level crossing)	CF = 2 GHz					
	10 MHz	±5 kHz	±3.5 kHz	±5.2 kHz	±5.5 kHz	±9 kHz
	28 MHz	±21 kHz	±15 kHz	±29.9 kHz	±31.4 kHz	±36 kHz
	40 MHz	±28 kHz	±20 kHz	±29.4 kHz	±30.9 kHz	±64 kHz
	80 MHz	±110 kHz	±65 kHz	±115.5 kHz	±121.3 kHz	±150 kHz
	160 MHz	±190 kHz	–	±199.5 kHz	±209.5 kHz	±410 kHz
	320 MHz	±625 kHz	–	±656.2 kHz	–	–
	500 MHz	±1100 kHz	–	–	–	–
	CF = 8 GHz					
	10 MHz	±6.5 kHz	±10 kHz	±6.8 kHz	±7.2 kHz	±6.5 kHz
	28 MHz	±28 kHz	±28 kHz	±29.4 kHz	±30.9 kHz	±28 kHz
	40 MHz	±31 kHz	±35 kHz	±42.2 kHz	±44.3 kHz	±37 kHz
	80 MHz	±110 kHz	±90 kHz	±115.5 kHz	±121.3 kHz	±110 kHz
	160 MHz	±230 kHz	–	±241.5 kHz	±253.6 kHz	±240 kHz
	320 MHz	±725 kHz	–	±761.2 kHz	–	–
	500 MHz	±1075 kHz	–	–	–	–
	CF = 20 GHz					
	10 MHz	±8.5 kHz	±8.5 kHz	±9.6 kHz	±10.1 kHz	±8.5 kHz
	28 MHz	±31 kHz	±31 kHz	±32.5 kHz	±40.8 kHz	±31 kHz
	40 MHz	±49 kHz	±49 kHz	±51.5 kHz	±54.0 kHz	±49 kHz
	80 MHz	±160 kHz	±145 kHz	±168.0 kHz	±176.4 kHz	±160 kHz
	160 MHz	±1175 kHz	–	±1.2 MHz	±1.3 MHz	±1175 kHz
	320 MHz	±1100 kHz	–	±1.2 MHz	–	–
	500 MHz	±1975 kHz	–	–	–	–

Pulse stability trace

The pulse stability is given below for an example with an acquisition of 100 pulses having constant pulse repetition interval (PRI).

The pulse-to-pulse average trace stability is specified for a pulse width of 5 μ s generated using the R&S®FSWP internal signal source and DUT bypass: on. The signal source level is +10 dBm. The R&S®FSWP-B61 cross correlation (low phase noise) option is assumed.

The digitizer configuration is "low noise" with filter type "flat" and bandwidth 10 MHz. In general, the additive stability values for phase or amplitude will increase with 3 dB every time the bandwidth doubles. I.e. add $10 \cdot \log_{10}(\text{Measurement bandwidth}/10 \text{ MHz})$ each for amplitude and phase stability. The "low noise" configuration supports up to 80 MHz of I/Q bandwidth.

The stability values specified below are median values and the 95 % confidence intervals on the pulse-phase stability trace results for the given measurement configuration, which apply to the center 75 % of the pulse width.

For phase, the RMS stability in radians (δ_{rad}) can be calculated from the values below (δ_{dB}) using the formula $\delta_{\text{rad}} = 10^{\delta_{\text{dB}}/20}$.

E.g. "–60 dB" implies 1 mrad (RMS) phase stability.

For amplitude, the RMS stability as a percentage ($\delta_{\%}$) of the average amplitude, can be calculated from the values below (δ_{dB}) using the formula $\delta_{\%} = 100 \cdot 10^{\delta_{\text{dB}}/20}$.

E.g. "–60 dB" implies 0.1 % (RMS) amplitude stability.

For more details on the calculation of stability, see the user manual of the R&S®FSWP-K6 pulse measurement application.

Specification for R&S®FSWP26 with R&S®FSWP-B61 option						
Measurement bandwidth 10 MHz	PRI	Center frequency				
		2 GHz	4 GHz	8 GHz	12 GHz	18 GHz
Pulse-to-pulse phase stability in dB, values given as median value and with 95 % confidence interval in brackets						
Absolute	10 μ s	< –73.5 (–72.5)	< –70.0 (–69.0)	< –65.5 (–64.5)	< –63.5 (–62.5)	< –61.5 (–60.0)
	100 μ s	< –73.5 (–72.5)	< –70.0 (–69.0)	< –65.5 (–64.5)	< –63.5 (–62.5)	< –61.5 (–60.0)
	1 ms	< –73.0 (–71.5)	< –68.5 (–67.5)	< –63.5 (–62.5)	< –61.0 (–59.5)	< –58.0 (–57.0)
	10 ms	< –65.5 (–64.0)	< –59.5 (–58.0)	< –53.5 (–51.5)	< –50.0 (–48.0)	< –46.5 (–45.0)
Additive	10 ms	< –80.0 (–79.0)	< –80.5 (–79.0)	< –77.0 (–75.0)	< –72.5 (–71.5)	< –69.0 (–67.5)
Pulse-to-pulse amplitude stability in dB						
Absolute, additive	10 ms	< –80.0 (–78.5)	< –82.0 (–80.5)	< –74.0 (–72.5)	< –74.0 (–72.5)	< –70.5 (–69.0)

Specification for R&S®FSWP50 with R&S®FSWP-B61 option						
Measurement bandwidth 10 MHz	PRI	Center frequency				
		2 GHz	4 GHz	8 GHz	12 GHz	18 GHz
Pulse-to-pulse phase stability in dB, values given as median value and with 95 % confidence interval in brackets						
Absolute	10 μ s	< –71.0 (–70.0)	< –65.5 (–64.5)	< –60.0 (–59.5)	< –57.0 (–56.5)	< –54.0 (–53.0)
	100 μ s	< –70.0 (–69.0)	< –64.5 (–63.5)	< –58.5 (–57.5)	< –55.5 (–55.0)	< –52.0 (–51.5)
	1 ms	< –69.5 (–68.5)	< –64.0 (–63.0)	< –58.0 (–57.5)	< –55.0 (–54.0)	< –52.0 (–49.5)
	10 ms	< –68.0 (–66.0)	< –62.0 (–60.0)	< –55.5 (–54.0)	< –52.5 (–51.0)	< –49.0 (–47.5)
Additive	10 ms	< –81.5 (–80.5)	< –81.5 (–80.0)	< –78.0 (–77.0)	< –72.0 (–71.0)	< –71.0 (–69.5)
Pulse-to-pulse amplitude stability in dB						
Absolute, additive	10 ms	< –81.5 (–80.5)	< –83.5 (–82.5)	< –75.0 (–73.5)	< –73.5 (–72.5)	< –71.0 (–69.5)

Ordering information

Designation	Type	Order No.
Pulse measurement application	R&S®FSW-K6	1313.1322.02
Time sidelobe measurements (requires R&S®FSW-K6)	R&S®FSW-K6S	1325.3783.02
Pulse measurement application (requires R&S®FSWP-B1)	R&S®FSWP-K6	1325.4421.02
Time sidelobe measurements (requires R&S®FSWP-K6)	R&S®FSWP-K6S	1325.5363.02
Pulse stability measurements (requires R&S®FSWP-K6, R&S®FSWP-B60 or R&S®FSWP-B61 and R&S®FSWP-B64)	R&S®FSWP-K6P	1338.3106.02
Pulse measurement application (requires R&S®FSMR3-B1)	R&S®FSMR3-K6	1345.3137.02
Pulse measurement application	R&S®FSV3-K6	1346.3330.02
Pulse measurement application	R&S®FPS-K6	1331.3169.02
Pulse measurement application (requires R&S®VSE and R&S®FSPC or R&S®FSPC-FL)	R&S®VSE-K6	1320.7516.06
Phased array measurements (requires R&S®VSE-K6 and supported oscilloscope, see page 23)	R&S®VSE-K6A	1345.1286.06
Analyzers		
R&S®FSW⁶²		
Signal and spectrum analyzer, 2 Hz to 8 GHz	R&S®FSW8	1331.5003.08
Signal and spectrum analyzer, 2 Hz to 13.6 GHz	R&S®FSW13	1331.5003.13
Signal and spectrum analyzer, 2 Hz to 26.5 GHz	R&S®FSW26	1331.5003.26
Signal and spectrum analyzer, 2 Hz to 43.5 GHz	R&S®FSW43	1331.5003.43
Signal and spectrum analyzer, 2 Hz to 50 GHz	R&S®FSW50	1331.5003.50
Signal and spectrum analyzer, 2 Hz to 67 GHz	R&S®FSW67	1331.5003.67
Signal and spectrum analyzer, 2 Hz to 85 GHz	R&S®FSW85	1331.5003.85
R&S®FSWP		
Phase noise analyzer and VCO tester, 1 MHz to 8 GHz	R&S®FSWP8	1322.8003.08
Phase noise analyzer and VCO tester, 1 MHz to 26.5 GHz	R&S®FSWP26	1322.8003.26
Phase noise analyzer and VCO tester, 1 MHz to 50 GHz	R&S®FSWP50	1322.8003.50
Spectrum analyzer, 10 Hz to 8 GHz	R&S®FSWP-B1	1322.9997.08
Spectrum analyzer, 10 Hz to 26 GHz	R&S®FSWP-B1	1322.9997.26
Spectrum analyzer, 10 Hz to 50 GHz	R&S®FSWP-B1	1322.9997.50
R&S®FSMR3000		
Measuring receiver, 100 kHz to 8 GHz	R&S®FSMR3008	1345.4004.08
Measuring receiver, 100 kHz to 26.5 GHz	R&S®FSMR3026	1345.4004.26
Measuring receiver, 100 kHz to 50 GHz	R&S®FSMR3050	1345.4004.50
Spectrum analyzer, 2 Hz to 8 GHz	R&S®FSMR3-B1	1345.3050.08
Spectrum analyzer, 2 Hz to 26 GHz	R&S®FSMR3-B1	1345.3050.26
Spectrum analyzer, 2 Hz to 50 GHz	R&S®FSMR3-B1	1345.3050.50
R&S®FSVA3000		
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSVA3004	1330.5000.05
Signal and spectrum analyzer, 10 Hz to 7.5 GHz	R&S®FSVA3007	1330.5000.08
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FSVA3013	1330.5000.14
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSVA3030	1330.5000.31
Signal and spectrum analyzer, 10 Hz to 44 GHz	R&S®FSVA3044	1330.5000.44

⁶² Firmware version 2.21 or higher required for use with R&S®VSE-K6.

Designation	Type	Order No.
R&S®FSV3000		
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSV3004	1330.5000.04
Signal and spectrum analyzer, 10 Hz to 7.5 GHz	R&S®FSV3007	1330.5000.07
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FSV3013	1330.5000.13
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSV3030	1330.5000.30
Signal and spectrum analyzer, 10 Hz to 44 GHz	R&S®FSV3044	1330.5000.43
R&S®FSVA		
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSVA4	1321.3008.05
Signal and spectrum analyzer, 10 Hz to 7 GHz	R&S®FSVA7	1321.3008.08
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FSVA13	1321.3008.14
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSVA30	1321.3008.31
Signal and spectrum analyzer, 10 Hz to 40 GHz	R&S®FSVA40	1321.3008.41
R&S®FSV⁶³		
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSV4	1321.3008.04
Signal and spectrum analyzer, 10 Hz to 7 GHz	R&S®FSV7	1321.3008.07
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FSV13	1321.3008.13
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSV30	1321.3008.30
Signal and spectrum analyzer, 10 Hz to 40 GHz ⁶⁴	R&S®FSV40	1321.3008.39
Signal and spectrum analyzer, 10 Hz to 40 GHz	R&S®FSV40	1321.3008.40
R&S®FPS⁶⁵		
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FPS4	1319.2008.04
Signal and spectrum analyzer, 10 Hz to 7 GHz	R&S®FPS7	1319.2008.07
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FPS13	1319.2008.13
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FPS30	1319.2008.30
Signal and spectrum analyzer, 10 Hz to 40 GHz	R&S®FPS40	1319.2008.40

⁶³ Firmware version 2.30 or higher required for use with R&S®VSE-K6.

⁶⁴ Maximum bandwidth: 10 MHz.

⁶⁵ Firmware version 1.30 or higher required for use with R&S®VSE-K6. Firmware version 1.40 or higher required for the R&S®FPS-K6 option.

Designation	Type	Order No.
Oscilloscopes		
R&S®RTO1000 ^{66, 67}		
Oscilloscope, 600 MHz, 10 Gsample/s, 20/40 Msample, 2 channels	R&S®RTO1002	1316.1000.02
Oscilloscope, 600 MHz, 10 Gsample/s, 20/80 Msample, 4 channels	R&S®RTO1004	1316.1000.04
Oscilloscope, 1 GHz, 10 Gsample/s, 20/40 Msample, 2 channels	R&S®RTO1012	1316.1000.12
Oscilloscope, 1 GHz, 10 Gsample/s, 20/80 Msample, 4 channels	R&S®RTO1014	1316.1000.14
Oscilloscope, 2 GHz, 10 Gsample/s, 20/40 Msample, 2 channels	R&S®RTO1022	1316.1000.22
Oscilloscope, 2 GHz, 10 Gsample/s, 20/80 Msample, 4 channels	R&S®RTO1024	1316.1000.24
Oscilloscope, 4 GHz, 20 Gsample/s, 20/80 Msample, 4 channels	R&S®RTO1044	1316.1000.44
R&S®RTO2000 ⁶⁸		
Oscilloscope, 600 MHz, 2 channels	R&S®RTO2002	1329.7002.02
Oscilloscope, 600 MHz, 4 channels	R&S®RTO2004	1329.7002.04
Oscilloscope, 1 GHz, 4 channels	R&S®RTO2012	1329.7002.12
Oscilloscope, 1 GHz, 2 channels	R&S®RTO2014	1329.7002.14
Oscilloscope, 2 GHz, 4 channels	R&S®RTO2022	1329.7002.22
Oscilloscope, 2 GHz, 2 channels	R&S®RTO2024	1329.7002.24
Oscilloscope, 3 GHz, 4 channels	R&S®RTO2034	1329.7002.32
Oscilloscope, 3 GHz, 2 channels	R&S®RTO2034	1329.7002.34
Oscilloscope, 4 GHz, 4 channels	R&S®RTO2044	1329.7002.44
Oscilloscope, 6 GHz, 4 channels	R&S®RTO2064	1329.7002.64
R&S®RTP		
Oscilloscope, 4 GHz, 4 channels	R&S®RTP044	1320.5007.04
Oscilloscope, 6 GHz, 4 channels	R&S®RTP064	1320.5007.06
Oscilloscope, 8 GHz, 4 channels	R&S®RTP084	1320.5007.08
Oscilloscope, 13 GHz, 4 channels	R&S®RTP134	1320.5007.13
Oscilloscope, 16 GHz, 4 channels	R&S®RTP164	1320.5007.16
Vector signal explorer		
R&S®VSE basic edition	R&S®VSE	1345.1011.06
R&S®VSE enterprise edition	R&S®VSE Enterprise Edition	1345.1105.06
R&S®VSE software maintenance	R&S®VSE-SWM	1320.7622.81
License dongle	R&S®FSPC	1310.0002.03
Floating license dongle	R&S®FSPC-FL	1310.0002.04

⁶⁶ Firmware version 2.51.1.0 or higher required for use with R&S®VSE-K6.

⁶⁷ R&S®RTO-K11 option required for use with R&S®VSE-K6.

⁶⁸ Firmware version 3.50.3.1 or higher required.

Hardware options required for R&S®FSWP-K6P pulse stability measurements

The R&S®FSWP-K6P pulse stability measurements option requires one of R&S®FSWP-B60 or R&S®FSWP-B61 as well as R&S®FSWP-B64.

Designation	Type	Order No.
Cross correlation, 8 GHz	R&S®FSWP-B60	1322.9800.08
Cross correlation, 26 GHz	R&S®FSWP-B60	1322.9800.26
Cross correlation, 50 GHz	R&S®FSWP-B60	1322.9800.50
Cross correlation (low phase noise), 8 GHz	R&S®FSWP-B61	1325.3719.08
Cross correlation (low phase noise), 26 GHz	R&S®FSWP-B61	1325.3719.26
Cross correlation (low phase noise), 50 GHz	R&S®FSWP-B61	1325.3719.50
Additive phase noise measurements	R&S®FSWP-B64	1322.9900.26

Oscilloscopes supported by R&S®VSE-K6A option

The R&S®VSE-K6A phased array measurements option requires the R&S®VSE-K6 application and one of the following supported oscilloscopes.

Designation	Type	Order No.
R&S®RTO2000 ⁶⁹		
Oscilloscope, 600 MHz, 4 channels	R&S®RTO2004	1329.7002.04
Oscilloscope, 1 GHz, 2 channels	R&S®RTO2014	1329.7002.14
Oscilloscope, 2 GHz, 2 channels	R&S®RTO2024	1329.7002.24
Oscilloscope, 3 GHz, 4 channels	R&S®RTO2034	1329.7002.32
Oscilloscope, 3 GHz, 2 channels	R&S®RTO2034	1329.7002.34
Oscilloscope, 4 GHz, 4 channels	R&S®RTO2044	1329.7002.44
Oscilloscope, 6 GHz, 4 channels	R&S®RTO2064	1329.7002.64
R&S®RTP		
Oscilloscope, 4 GHz, 4 channels	R&S®RTP044	1320.5007.04
Oscilloscope, 6 GHz, 4 channels	R&S®RTP064	1320.5007.06
Oscilloscope, 8 GHz, 4 channels	R&S®RTP084	1320.5007.08
Oscilloscope, 13 GHz, 4 channels	R&S®RTP134	1320.5007.13
Oscilloscope, 16 GHz, 4 channels	R&S®RTP164	1320.5007.16

⁶⁹ Firmware version 3.50.3.1 or higher required.

Oscilloscopes supported by R&S®FSW-B2000 option

Designation	Type	Order No.
Oscilloscope, 4 GHz, 20 Gsample/s, 20/80 Msample, 4 channels	R&S®RTO1044	1316.1000.44
OCXO 10 MHz	R&S®RTO-B4	1304.8305.02
Memory upgrade, 50 Msample per channel	R&S®RTO-B101	1304.8428.02
Memory upgrade, 100 Msample per channel	R&S®RTO-B102	1304.8434.02
Memory upgrade, 200 Msample per channel	R&S®RTO-B103	1304.8440.02
Memory upgrade, 400 Msample per channel	R&S®RTO-B104	1304.8457.02
Oscilloscope, 4 GHz, 20 Gsample/s, 20/80 Msample, 4 channels	R&S®RTO2044	1329.7002.44
OCXO 10 MHz	R&S®RTO-B4	1304.8305.02
Memory upgrade, 100 Msample per channel	R&S®RTO-B101	1329.7060.02
Memory upgrade, 200 Msample per channel	R&S®RTO-B102	1329.7077.02
Memory upgrade, 400 Msample per channel	R&S®RTO-B104	1329.7083.02
Memory upgrade, 1 Gsample per channel	R&S®RTO-B110	1329.7090.04

Oscilloscopes supported by R&S®FSW-B2000 and R&S®FSW-B5000 options

Designation	Type	Order No.
Oscilloscope, 6 GHz, 20 Gsample/s, 50/200 Msample, 4 channels	R&S®RTO2064	1329.7002.64
OCXO 10 MHz	R&S®RTO-B4	1304.8305.02
Memory upgrade, 100 Msample per channel	R&S®RTO-B101	1329.7060.02
Memory upgrade, 200 Msample per channel	R&S®RTO-B102	1329.7077.02
Memory upgrade, 400 Msample per channel	R&S®RTO-B104	1329.7083.02
Memory upgrade, 1 Gsample per channel	R&S®RTO-B110	1329.7090.04

Recommended extras

Designation	Type	Order No.
R&S®FSW		
OCXO precision frequency reference	R&S®FSW-B4	1313.0703.02
RF preamplifier, 100 kHz to 13.6 GHz	R&S®FSW-B24	1313.0832.13
RF preamplifier, 100 kHz to 26.5 GHz	R&S®FSW-B24	1313.0832.26
RF preamplifier, 100 kHz to 43.5 GHz	R&S®FSW-B24	1313.0832.43
RF preamplifier, 100 kHz to 50 GHz	R&S®FSW-B24	1313.0832.50
RF preamplifier, 100 kHz to 67 GHz	R&S®FSW-B24	1313.0832.67
28 MHz analysis bandwidth	R&S®FSW-B28	1313.1645.02
40 MHz analysis bandwidth	R&S®FSW-B40	1313.0861.02
80 MHz analysis bandwidth	R&S®FSW-B80	1313.0878.02
160 MHz analysis bandwidth	R&S®FSW-B160	1325.4850.04
320 MHz analysis bandwidth	R&S®FSW-B320	1325.4867.04
512 MHz analysis bandwidth	R&S®FSW-B512	1331.7106.04
1200 MHz analysis bandwidth	R&S®FSW-B1200	1331.6400.04
2000 MHz analysis bandwidth	R&S®FSW-B2001	1331.6916.04
4.4 GHz analysis bandwidth	R&S®FSW-B4001	1338.5215.14
6.4 GHz analysis bandwidth	R&S®FSW-B6001	1338.5221.14

Designation	Type	Order No.
8.312 GHz analysis bandwidth	R&S®FSW-B8001	1338.5238.14
2 GHz analysis bandwidth ⁷⁰	R&S®FSW-B2000	1325.4750.26
2 GHz analysis bandwidth ⁷¹	R&S®FSW-B2000	1325.4750.02
5 GHz analysis bandwidth	R&S®FSW-B5000	1331.6997.43
5 GHz analysis bandwidth	R&S®FSW-B5000	1331.6997.85
I/Q memory extension, 6 Gbyte	R&S®FSW-B106	1331.6451.02
I/Q memory extension, 8 Gbyte	R&S®FSW-B108	1331.6751.02
Digital baseband interface	R&S®FSW-B17	1313.0784.02
Analog baseband inputs for R&S®FSW8/13, 40 MHz analysis bandwidth	R&S®FSW-B71	1313.1651.13
Analog baseband inputs for R&S®FSW26/43/50, 40 MHz analysis bandwidth	R&S®FSW-B71	1313.1651.26
Analog baseband inputs for R&S®FSW67, 40 MHz analysis bandwidth	R&S®FSW-B71	1313.1651.67
Analog baseband inputs for R&S®FSW85, 40 MHz analysis bandwidth	R&S®FSW-B71	1313.1651.85
Analog baseband inputs, 80 MHz analysis bandwidth	R&S®FSW-B71E	1313.6547.02
Real-time spectrum analyzer, 160 MHz, POI ≤ 15 μs ⁷²	R&S®FSW-B160R	1325.4850.06
Real-time spectrum analyzer, 512 MHz, POI ≤ 15 μs ⁷³	R&S®FSW-B512R	1331.7106.06
Real-time spectrum analyzer, 800 MHz	R&S®FSW-B800R	1331.6400.16
I/Q memory extension, 6 Gbyte	R&S®FSW-B106	1331.6451.02
I/Q memory extension, 8 Gbyte	R&S®FSW-B108	1331.6751.02
I/Q memory extension, 24 Gbyte	R&S®FSW-B124	1338.5273.02
Highpass filter for harmonic measurements	R&S®FSW-B13	1313.0761.02
LO/IF connections for external mixers	R&S®FSW-B21	1313.1100.26
LO/IF connections for external mixers	R&S®FSW-B21	1313.1100.43
Harmonic mixer, 40 GHz to 60 GHz	R&S®FS-Z60	1089.0799.02
Harmonic mixer, 50 GHz to 75 GHz	R&S®FS-Z75	1048.0271.02
Harmonic mixer, 60 GHz to 90 GHz	R&S®FS-Z90	1048.0371.02
Harmonic mixer, 75 GHz to 110 GHz	R&S®FS-Z110	1048.0471.02
R&S®FSWP		
High stability OCXO	R&S®FSWP-B4	1325.3890.02
RF preamplifier, 100 kHz to 8 GHz	R&S®FSWP-B24	1325.3725.08
RF preamplifier, 100 kHz to 26.5 GHz	R&S®FSWP-B24	1325.3725.26
RF preamplifier, 100 kHz to 50 GHz	R&S®FSWP-B24	1325.3725.50
LO/IF connections for external mixers	R&S®FSWP-B21	1325.3848.02
80 MHz analysis bandwidth	R&S®FSWP-B80	1325.4338.02
320 MHz analysis bandwidth	R&S®FSWP-B320	1338.3235.04
R&S®FSMR3000		
OCXO, precision frequency reference	R&S®FSMR3-B4	1345.3072.02
80 MHz analysis bandwidth	R&S®FSMR3-B80	1345.3608.02

⁷⁰ For R&S®FSW26 ex-factory, for later upgrade of R&S®FSW26 instruments use R&S®FSW-U2000 option.

⁷¹ For R&S®FSW43/50/67/85, contact service center.

⁷² Includes 160 MHz analysis bandwidth; no export license required.

⁷³ Includes 512 MHz analysis bandwidth and 200 MHz IF filter; export license required.

Designation	Type	Order No.
R&S®FSVA3000/FSV3000		
OCXO frequency reference	R&S®FSV3-B4	1330.3794.02
YIG preselector bypass ⁷⁴	R&S®FSV3-B11	1330.3865.02
40 MHz analysis bandwidth ⁷⁵	R&S®FSV3-B40	1330.4103.02
200 MHz analysis bandwidth ⁷⁶	R&S®FSV3-B200	1330.4132.02
400 MHz analysis bandwidth ⁷⁹	R&S®FSV3-B400	1330.7154.02
600 MHz analysis bandwidth	R&S®FSV3-B600	1330.4910.04
1000 MHz analysis bandwidth	R&S®FSV3-B1000	1330.4910.04
Enhanced computing power	R&S®FSV3-B114	1330.4910.02
R&S®FSVA/FSV		
OCXO reference frequency	R&S®FSV-B4	1310.9522.02
OCXO extended frequency stability	R&S®FSV-B4	1310.9522.03
Ultra-high precision frequency reference	R&S®FSV-B14	1310.9980.02
RF preamplifier, 9 kHz to 7 GHz	R&S®FSV-B22	1310.9600.02
RF preamplifier, 9 kHz to 13.6 GHz	R&S®FSV-B24	1310.9616.13
RF preamplifier, 9 kHz to 30 GHz	R&S®FSV-B24	1310.9616.30
RF preamplifier, 9 kHz to 40 GHz	R&S®FSV-B24	1310.9616.40
Electronic attenuator, 1 dB steps	R&S®FSV-B25	1310.9622.02
YIG preselector bypass for R&S®FSVA13 (not retrofittable)	R&S®FSVA-B11	1321.3714.13
YIG preselector bypass for R&S®FSVA30 (not retrofittable)	R&S®FSVA-B11	1321.3714.30
YIG preselector bypass for R&S®FSVA40 (not retrofittable)	R&S®FSVA-B11	1321.3714.40
40 MHz analysis bandwidth ⁷⁷	R&S®FSV-B70	1310.9645.02
40 MHz analysis bandwidth ⁷⁸	R&S®FSVA-B40	1329.0214.02
160 MHz analysis bandwidth ^{79, 80}	R&S®FSV-B160	1311.2015.02
160 MHz analysis bandwidth ^{81, 82}	R&S®FSV-B160	1311.2015.13
160 MHz analysis bandwidth ^{83, 84}	R&S®FSV-B160	1311.2015.40
R&S®FPL1000		
Spectrum analyzer, 5 kHz to 3 GHz	R&S®FPL1003	1304.0004.03

⁷⁴ For R&S®FSVA3013/FSV3013, R&S®FSVA3030/FSV3030 and R&S®FSVA3044/FSV3044.

⁷⁵ User-retrofittable (license key).

⁷⁶ For frequencies > 7.5 GHz, R&S®FSV3-B11 option is required.

⁷⁷ User-retrofittable, for frequencies ≤ 7 GHz, not available for R&S®FSV40, model .39.

⁷⁸ User-retrofittable, for frequencies ≤ 7 GHz, with R&S®FSVA-B11 option also for f > 7 GHz.

⁷⁹ For R&S®FSVA4 and R&S®FSVA7, excludes R&S®FSV-B10 and R&S®FSV-B14.

⁸⁰ For R&S®FSV4 and R&S®FSV7, R&S®FSVA4 and R&S®FSVA7, excludes R&S®FSV-B10 and R&S®FSV-B14.

⁸¹ For R&S®FSV13 for frequencies ≤ 7 GHz, excludes R&S®FSV-B10 and R&S®FSV-B14.

⁸² For R&S®FSVA13 for frequencies ≤ 7 GHz, with R&S®FSVA-B11 option (not retrofittable) also for f > 7 GHz, excludes R&S®FSV-B10 and R&S®FSV-B14.

⁸³ For R&S®FSV30 and R&S®FSV40 for frequencies ≤ 7 GHz, excludes R&S®FSV-B10 and R&S®FSV-B14. Not available for R&S®FSV40, model .39.

⁸⁴ For R&S®FSVA30 and R&S®FSVA40 for frequencies ≤ 7 GHz, with R&S®FSVA-B11 option (not retrofittable) also for f > 7 GHz, excludes R&S®FSV-B10 and R&S®FSV-B14.

Designation	Type	Order No.
R&S®FPS		
OCXO reference frequency	R&S®FPS-B4	1321.4291.02
YIG preselector bypass ⁸⁵	R&S®FPS-B11	1326.5467.30
YIG preselector bypass ⁸⁶	R&S®FPS-B11	1326.5467.40
RF preamplifier, 9 kHz to 7 GHz	R&S®FPS-B22	1321.4027.02
Electronic attenuator, 1 dB steps	R&S®FPS-B25	1321.4033.02
RF preamplifier, 9 kHz to 13.6 GHz	R&S®FPS-B24	1321.4279.13
RF preamplifier, 9 kHz to 30 GHz	R&S®FPS-B24	1321.4279.30
RF preamplifier, 9 kHz to 40 GHz	R&S®FPS-B24	1321.4279.40
40 MHz analysis bandwidth	R&S®FPS-B40	1321.4040.02
160 MHz analysis bandwidth ⁸⁷	R&S®FPS-B160	1321.4285.02
160 MHz analysis bandwidth ⁸⁸	R&S®FPS-B160	1321.4285.13
160 MHz analysis bandwidth ⁸⁹	R&S®FPS-B160	1321.4285.40

⁸⁵ For R&S®FPS30.

⁸⁶ For R&S®FPS40.

⁸⁷ For R&S®FPS4 and R&S®FPS7; retrofit in service center.

⁸⁸ For R&S®FPS13 for frequencies ≤ 7 GHz.

⁸⁹ For R&S®FPS30 and R&S®FPS40; for $f > 7$ GHz: R&S®FPS-B11 option required.

Service at Rohde & Schwarz
You're in great hands

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

Rohde & Schwarz

The Rohde & Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test & measurement, technology systems and networks & cybersecurity. Founded 90 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

Sustainable product design

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



Rohde & Schwarz GmbH & Co. KG

www.rohde-schwarz.com

Rohde & Schwarz customer support

www.rohde-schwarz.com/support

