TRANSIENT MEASUREMENTS

Specifications

R&S[®]FSW-K60/K60C/K60H/K60P R&S[®]FSWP-K60/K60C/K60H/K60P R&S[®]FSV3-K60/K60C/K60H/K60P R&S[®]VSE-K60/K60C/K60H



Data Sheet Version 05.00

ROHDE&SCHWARZ

Make ideas real



CONTENTS

Definitions	3
Specifications	4
General remarks	
Overview	
Transient measurement	5
Frequency	5
Level	5
Signal acquisition	5
Measurement capability (nom.)	5
Measurement results	6
FM step response (nom.)	7
Chirp rate step response (nom.)	9
FM measurement uncertainty (nom.)	11
R&S [®] FSW signal and spectrum analyzer	11
R&S [®] FSWP phase noise analyzer and VCO tester	12
R&S [®] FSVA3000 signal and spectrum analyzer	
PM measurement uncertainty (nom.)	
R&S [®] FSW signal and spectrum analyzer	
R&S [®] FSWP phase noise analyzer and VCO tester	15
R&S [®] FSVA3000 signal and spectrum analyzer	
Ordering information	16
Oscilloscopes supported by R&S [®] FSW-B2000 option	
Oscilloscopes supported by R&S [®] FSW-B2000 and R&S [®] FSW-B5000 options	
Recommended extras	

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 $\langle, \leq, \rangle, \geq, \pm$, 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.

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-K60/R&S®FSx-K60 transient measurement application, the R&S®VSE-K60C/R&S®FSx-K60C transient chirp measurements, the R&S®VSE-K60H/R&S®FSx-K60H transient hop measurements and the R&S®VSE-K60P transient phase noise measurements are based on the specifications in the data sheets for the R&S®FSW, R&S®FSWP, R&S®FSVA3000 and R&S®FSV3000 signal and spectrum analyzer. They have not been checked separately and are not verified during instrument calibration. Measurement uncertainties are given as 95 % confidence intervals. They apply to the specified center frequencies and measurement bandwidths. The specified measurement uncertainties do not take into account systematic errors due to reduced signal-to-noise ratio (S/N).

General remarks

This data sheet covers the R&S[®]FSW-K60, R&S[®]FSWP-K60, R&S[®]FSV3-K60 and the R&S[®]VSE-K60, the R&S[®]FSW-K60C, R&S[®]FSV3-K60C and the R&S[®]VSE-K60C, the R&S[®]FSW-K60H, R&S[®]FSV3-K60H, R&S[®]FSV3-K60H and the R&S[®]VSE-K60H, the R&S[®]FSW-K60P, R&S[®]FSWP-K60P and the R&S[®]FSV3-K60P.

The R&S[®]FSW-K60, R&S[®]FSWP-K60 and R&S[®]FSV3-K60 are summarized with the term R&S[®]FSx-K60. The R&S[®]FSW-K60C, R&S[®]FSWP-K60C and R&S[®]FSV3-K60C are summarized with the term R&S[®]FSx-K60C. The R&S[®]FSW-K60H, R&S[®]FSWP-K60H and R&S[®]FSV3-K60H are summarized with the term R&S[®]FSx-K60H. The R&S[®]FSW-K60P, R&S[®]FSWP-K60P and R&S[®]FSV3-K60P are summarized with the term R&S[®]FSx-K60P. The R&S[®]FSx-K60, R&S[®]FSx-K60C, R&S[®]FSx-K60H and R&S[®]FSx-K60P are summarized with the term R&S[®]FSx-K60/C/H/P. The R&S[®]VSE-K60, R&S[®]VSE-K60C and R&S[®]VSE-K60H are summarized with the term R&S[®]VSE-K60/C/H.

The R&S®FSW, R&S®FSWP, R&S®FSVA3000, R&S®FSV3000 instruments are summarized with the term R&S®FSx.

The R&S[®]FSx-K60C transient chirp measurements and R&S[®]FSx-K60H transient hop measurements are provided as an upgrade to the R&S[®]FSx-K60 transient measurements. The R&S[®]FSx-K60C and R&S[®]FSx-K60H options therefore require the corresponding R&S[®]FSx-K60 option.

The R&S[®]FSx-K60P transient phase noise measurements are provided as an upgrade to the R&S[®]FSx-K60C transient chirp measurements and/or R&S[®]FSx-K60H transient hop measurements. The R&S[®]FSx-K60P option therefore requires the corresponding R&S[®]FSx-K60C option and/or R&S[®]FSx-K60H option.

The R&S®VSE-K60C transient chirp measurements and R&S®VSE-K60H transient hop measurements are provided as an upgrade to the R&S®VSE-K60 transient measurements. The R&S®VSE-K60C and R&S®VSE-K60H options therefore require the R&S®VSE-K60 option.

The R&S[®]FSx-K60 runs on the device itself.

The R&S®VSE-K60 runs on a PC connected to an R&S®FSW, R&S®FSWP, R&S®FSVA3000 or R&S®FSV3000.

If not stated otherwise, the data sheet values are device-specific, e.g. the same value applies to R&S[®]FSW-K60 and R&S[®]VSE-K60 with connected R&S[®]FSx.

For feature tables the following convention applies:

•	Feature always supported i.e. with the R&S®VSE-K60 connected to the device and with the corresponding
	R&S [®] FSx-K60 option when running directly on the device.
• (R&S [®] VSE)	Feature supported only with the R&S®VSE-K60 connected to the device.
	Not with the corresponding R&S [®] FSx-K60 option when running directly on the device.
 (R&S[®]FSx-K60) 	Feature supported only when running directly on the device with the corresponding
	R&S [®] FSx-K60/C/H/P option. Not supported in the R&S [®] VSE-K60.
-	Feature not supported with this device.

Overview

		R&S [®] FSW	R&S [®] FSWP	R&S [®] FSVA3000	R&S [®] FSV3000
R&S [®] FSx-K60/C/H/P	software that runs	•	•	•	•
	on device				
R&S [®] VSE-K60/C/H	PC software that	•	•	• (R&S [®] VSE,	• (R&S [®] VSE,
	can be connected			firmware version	firmware version
	to device			1.62 or higher	1.62 or higher
				required)	required)

Transient measurement

Frequency

		R&S [®] FSW	R&S [®] FSWP	R&S [®] FSVA3000	R&S [®] FSV3000
Frequency range	RF input	same as supported ir	nstrument		

Level

		R&S [®] FSW	R&S [®] FSWP	R&S [®] FSVA3000	R&S [®] FSV3000
Level range	RF input	same as supported ir	nstrument		

Signal acquisition

		R&S [®] FSW	R&S [®] FSWP	R&S [®] FSVA3000	R&S [®] FSV3000
Input	RF input	•	•	•	•
	file	•	•	•	•
	external mixer	• (R&S [®] FSW-K60)	● (R&S [®] FSWP-K60)	-	-
	MSRA I/Q data capture		• (R&S [®] FSWP-K60)	-	-
	MSRT I/Q data capture	● (R&S [®] FSW-K60)	-	-	-
Measurement	standard	10 MHz	10 MHz	10 MHz	10 MHz
bandwidth	up to ¹	8312 MHz	320 MHz	400 MHz	200 MHz
Measurement time		same as for the R&	same as for the R&S [®] VSE base system or R&S [®] FSx I/Q analyzer ²		

Measurement capability (nom.)

Analysis region	time gate length	101 sample up to max. measurement time	
	time gate start	0 to measurement time – time gate length	
	bandwidth	1 % to 100 % of measurement bandwidth	
	delta frequency	±(measurement bandwidth –	
		bandwidth) / 2	
FM video filter	FM bandwidth	0.1 %, 1 %, 5 %, 10 %, 25 %	
Spectrogram	detector	sum, average, RMS, maximum, minimum,	
		sample	
	window	rectangular, Gauss, Chebyshev, Flattop,	
		Hamming, Hanning, Blackman-Harris	
	FFT length	32, 64, 128, 256, 512, 1024, 2048, 4096	
	history depth	up to 20 000 frames	
Phase noise spectrum ³	resolution bandwidth	10 % of half-decade lower offset frequency	
		(e.g. resolution bandwidth = 100 kHz for	
		offset frequencies 1 MHz to 3 MHz)	
Hop detection ⁴	nominal hop states	up to 1000 states	
	measured hops	up to 100 000 hops	
	minimum dwell time for measurement bandwidth $^{1} = 3 \times FM$ settling time		
	(see FM step response table for settling times), example for FM video filter: none		
	10 MHz	2.2 µs	
	28 MHz	800 ns	
	40 MHz	600 ns	
	80 MHz	300 ns	
	160 MHz	150 ns	
	200 MHz	120 ns	
	320 MHz	75 ns	
	400 MHz	60 ns	
	500 MHz	50 ns	
	1200 MHz	20 ns	
	2000 MHz	13 ns	
	5000 MHz	5 ns	
	8312 MHz	3 ns	

¹ Available measurement bandwidths depend on the hardware configuration. For details, see data sheets of R&S[®]FSW (PD 5215.6749.22), R&S[®]FSWP (PD 3607.2090.22), R&S[®]FSVA3000 (PD 5216.1211.22) and R&S[®]FSV3000 (PD 5216.1334.22).

² Maximum measurement time will reduce with multiple measurement application channels opened simultaneously.

³ Requires R&S[®]FSx-K60P transient phase noise measurements upgrade option.

⁴ Requires R&S[®]FSx-K60H/R&S[®]VSE-K60H transient hop measurements upgrade option.

Chirp detection ⁵	nominal chirp states	up to 1000 states
	measured chirps	up to 100 000 chirps
	min. chirp length for measurement bandwidt	th 6 = 3 × chirp rate settling time
	(see chirp rate step response table for settling times), example for FM video filter: none	
	10 MHz	24 µs
	28 MHz	9 µs
	40 MHz	6 µs
	80 MHz	3 µs
	160 MHz	1.5 µs
	200 MHz	1.2 µs
	320 MHz	750 ns
	400 MHz	600 ns
	500 MHz	500 ns
	1200 MHz	200 ns
	2000 MHz	125 ns
	5000 MHz	50 ns
	8312 MHz	30 ns

Measurement results

Signal characteristic	Analysis range	Result display
I/Q signal	full capture, analysis region, hop ⁷ or chirp ⁵	I/Q time domain
Amplitude modulation	full capture, analysis region, hop ⁷ or chirp ⁵	RF power time domain
Frequency modulation	full capture, analysis region,	FM time domain
	hop ⁷ or chirp ⁵	chirp rate time domain
Frequency modulation error	full capture, analysis region, hop ⁷ or chirp ⁵	frequency deviation time domain
	hop ⁷ or chirp ⁵	frequency deviation spectrogram
	hop ⁷ or chirp ⁵	frequency deviation spectrum
Phase modulation	full capture, analysis region,	PM time domain
	hop ⁷ or chirp ⁵	PM time domain (wrapped)
Phase modulation error	full capture, analysis region, hop ⁷ or chirp ⁵	phase deviation time domain
	hop ⁷ or chirp ⁵	phase deviation spectrogram
	hop ⁷ or chirp ⁵	phase deviation spectrum
Phase noise ⁸	hop ⁷ or chirp ⁵	phase noise spectrum
Spectrum	full capture, analysis region,	frame power spectrum
	hop ⁷ or chirp ⁵	spectrogram
Frequency hopping ⁷	analysis region	results table, statistics table
		state index
		hop begin
		dwell time
		switching time
		state frequency (nominal)
		average frequency
		hop state deviation
		relative frequency (hop-to-hop)
		frequency deviation (peak)
		frequency deviation (RMS)
		frequency deviation (average)
		FM settling point
		FM settling time
		FM settled length
		phase deviation (peak)
		phase deviation (RMS)
		phase deviation (average)
		PM settling point
		PM settling time

 $^{^5}$ Requires R&S FSx-K60C/R&S VSE-K60C transient chirp measurements upgrade option.

⁶ Available measurement bandwidths depend on the hardware configuration. For details, see data sheets of R&S®FSW (PD 5215.6749.22), R&S[®]FSWP (PD 3607.2090.22), R&S[®]FSVA3000 (PD 5216.1211.22) and R&S[®]FSV3000 (PD 5216.1334.22).

⁷ Requires R&S[®]FSx-K60H/R&S[®]VSE-K60H transient hop measurements upgrade option.

⁸ Requires R&S[®]FSx-K60P transient phase noise measurements upgrade option

		PM settled length
		minimum power
		maximum power
		average power
		power ripple
Chirped (linear) FM ⁹	analysis region	results table, statistics table
		state index
		chirp begin
		chirp length
		chirp rate
		chirp state deviation
		average frequency
		nominal bandwidth
		frequency deviation (peak)
		frequency deviation (RMS)
		frequency deviation (average)
		frequency INL (peak)
		frequency INL (RMS)
		frequency INL (average)
		FM settling point
		FM settling time
		FM settled length
		phase deviation (peak)
		phase deviation (RMS)
		phase deviation (average)
		PM settling point
		PM settling time
		PM settled length
		minimum power
		maximum power
		average power
		power ripple
Hop ¹⁰ or chirp ⁹ parameter visualization	analysis region	parameter trend
		trend plot of parameter versus time
		scatter plot of parameter versus parameter
		parameter distribution
		histogram of parameter distribution

FM step response (nom.)

The nominal FM step response is calculated for the internal R&S[®]FSx-K60/R&S[®]VSE-K60 frequency demodulator assuming an ideal input FM "step" signal, which transitions within on sample from one frequency state to another. This represents the "worst-case" overshoot and settling time given an ideal step input signal (for a smoother step transition the overshoot and settling time will typically be lower).

FM video filter: none	overshoot	< 20 % of FM step size		
	frequency settling time ¹¹ for measu	frequency settling time ¹¹ for measurement bandwidth ¹²		
	10 MHz	< 730 ns		
	28 MHz	< 260 ns		
	40 MHz	< 200 ns		
	80 MHz	< 100 ns		
	160 MHz	< 50 ns		
	200 MHz	< 40 ns		
	320 MHz	< 25 ns		
	400 MHz	< 20 ns		
	500 MHz	< 17 ns		
	1200 MHz	< 7 ns		
	2000 MHz	< 5 ns		
	5000 MHz	< 2 ns		
	8312 MHz	< 1.3 ns		

⁹ Requires R&S[®]FSx-K60C/R&S[®]VSE-K60C transient chirp measurements upgrade option.

¹⁰ Requires R&S[®]FSx-K60H/R&S[®]VSE-K60H transient hop measurements upgrade option.

- ¹¹ Time from crossing 50 % of FM step transition until remaining within 1 % of FM step size for a total FM step size of less than 80 % of the measurement bandwidth.
- ¹² Available measurement bandwidths depend on the hardware configuration. For details, see data sheets of R&S[®]FSW (PD 5215.6749.22), R&S[®]FSWP (PD 3607.2090.22), R&S[®]FSVA3000 (PD 5216.1211.22) and R&S[®]FSV3000 (PD 5216.1334.22).

FM video filter:	overshoot	< 17 % of FM step size	
25 % of FM bandwidth	frequency settling time ¹³ for measurement l	bandwidth ¹⁴	
	10 MHz		
	28 MHz	< 570 ps	
	40 MHz	< 400 ps	
		< 200 pp	
		< 200 IIS	
	200 MHZ	< 80 ns	
	320 MHz	< 50 ns	
	400 MHz	< 40 ns	
	500 MHz	< 35 ns	
	1200 MHz	< 14 ns	
	2000 MHz	< 9 ns	
	5000 MHz	< 4 ns	
	8312 MHz	< 2.3 ns	
FM video filter:	overshoot	< 16 % of FM step size	
10 % of FM bandwidth	frequency settling time ¹³ for measurement l	bandwidth ¹⁴	
	10 MHz	< 3.8 µs	
	28 MHz	< 1 4 us	
	40 MHz	< 1 us	
	90 MHz	< 500 pc	
	160 MHz	< 250 ns	
		< 250 fts	
		< 200 hs	
	320 MHZ	< 125 ns	
	400 MHz	< 100 ns	
	500 MHz	< 80 ns	
	1000 MHz	< 40 ns	
	1200 MHz	< 34 ns	
	2000 MHz	< 20 ns	
	5000 MHz	< 8 ns	
	8312 MHz	< 5 ns	
FM video filter:	overshoot	< 15 % of FM step size	
5 % of FM bandwidth	frequency settling time ¹³ for measurement bandwidth ¹⁴		
	10 MHz	< 7.5 µs	
	28 MHz	< 2.7 US	
	40 MHz	< 1 9 US	
	80 MHz	< 960 ns	
	160 MHz	< 480 ns	
	200 MHz	< 400 ns	
		< 240 no	
		< 240 IIS	
	400 MHZ	< 200 ns	
	500 MHZ	< 160 ns	
	1200 MHz	< 64 ns	
		< 40 NS	
	5000 MHz	< 16 ns	
	8312 MHz	< 10 ns	
FM video filter:	overshoot	< 15 % of FM step size	
1 % of FM bandwidth	frequency settling time ¹³ for measurement I	bandwidth ¹⁴	
	10 MHz	< 37 µs	
	28 MHz	< 13 µs	
	40 MHz	< 9.2 µs	
	80 MHz	< 4.6 µs	
	160 MHz	< 2.3 µs	
	200 MHz	< 1.9 µs	
	320 MHz	< 1.1 US	
	320 MHz	< 1.1 µs	
	320 MHz 400 MHz 500 MHz	< 1.1 µs < 1 µs	
	320 MHz 400 MHz 500 MHz	< 1.1 µs < 1 µs < 800 ns	
	320 MHz 400 MHz 500 MHz 1200 MHz	< 1.1 µs < 1 µs < 800 ns < 320 ns	
	320 MHz 400 MHz 500 MHz 1200 MHz 2000 MHz	< 1.1 µs < 1 µs < 800 ns < 320 ns < 200 ns	
	320 MHz 400 MHz 500 MHz 1200 MHz 2000 MHz 5000 MHz	< 1.1 µs < 1 µs < 800 ns < 320 ns < 200 ns < 80 ns	

¹³ Time from crossing 50 % of FM step transition until remaining within 1 % of FM step size for a total FM step size of less than 80 % of the measurement bandwidth.

¹⁴ Available measurement bandwidths depend on the hardware configuration. For details, see data sheets of R&S[®]FSW (PD 5215.6749.22), R&S[®]FSWP (PD 3607.2090.22), R&S[®]FSVA3000 (PD 5216.1211.22) and R&S[®]FSV3000 (PD 5216.1334.22).

FM video filter:	overshoot	< 14 % of FM step size		
0.1 % of FM bandwidth	frequency settling time ¹³ for measurement	frequency settling time ¹³ for measurement bandwidth ¹⁴		
	10 MHz	< 255 µs		
	28 MHz	< 90 µs		
	40 MHz	< 64 µs		
	80 MHz	< 32 µs		
	160 MHz	< 16 µs		
	200 MHz	< 13 µs		
	320 MHz	< 8 µs		
	400 MHz	< 6.5 µs		
	500 MHz	< 5.5 µs		
	1200 MHz	< 2.2 µs		
	2000 MHz	< 1.5 µs		
	5000 MHz	< 600 ns		
	8312 MHz	< 400 ns		

Chirp rate step response (nom.)

The nominal chirp rate step response is calculated for the internal R&S[®]FSx-K60/R&S[®]VSE-K60 chirp rate demodulator assuming an ideal input chirp rate "step" signal, which transitions within on sample from one chirp rate state to another. This represents the "worst-case" overshoot and settling time given an ideal step input signal (for a smoother step transition the overshoot and settling time will typically be lower).

FM video filter:	overshoot	< 3 % of chirp rate step size	
none,	chirp rate settling time ¹⁵ for measurement bandwidth ¹⁶		
25 % of FM bandwidth,	10 MHz	< 8 µs	
10 % of FM bandwidth,	28 MHz	< 2.9 µs	
5 % of FM bandwidth	40 MHz	< 2 µs	
	80 MHz	< 1 µs	
	160 MHz	< 500 ns	
	200 MHz	< 400 ns	
	320 MHz	< 250 ns	
	400 MHz	< 200 ns	
	500 MHz	< 170 ns	
	1200 MHz	< 70 ns	
	2000 MHz	< 45 ns	
	5000 MHz	< 18 ns	
	8312 MHz	< 11 ns	
FM video filter:	overshoot	< 9 % of chirp rate step size	
1 % of FM bandwidth	chirp rate settling time ¹⁵ for measurement bandwidth ¹⁶		
	10 MHz	< 28 µs	
	28 MHz	< 10 µs	
	40 MHz	< 7 µs	
	80 MHz	< 3.6 µs	
	160 MHz	< 1.8 µs	
	200 MHz	< 1.4 µs	
	320 MHz	< 900 ns	
	400 MHz	< 700 ns	
	500 MHz	< 600 ns	
	1200 MHz	< 250 ns	
	2000 MHz	< 150 ns	
	5000 MHz	< 60 ns	
	8312 MHz	< 40 ns	

¹⁵ Time from crossing 50 % of chirp rate step transition until remaining within 1 % of chirp rate step size.

For example, if the chirp rate transitions from -1 MHz/µs to +1 MHz/µs, the chirp rate "step size" is 2 MHz/µs.

¹⁶ Available measurement bandwidths depend on the hardware configuration. For details, see data sheets of R&S[®]FSW (PD 5215.6749.22), R&S[®]FSWP (PD 3607.2090.22), R&S[®]FSVA3000 (PD 5216.1211.22) and R&S[®]FSV3000 (PD 5216.1334.22).

Version 05.00, January 2023

FM video filter:	overshoot	< 11 % of chirp rate step size	
0.1 % of FM bandwidth	chirp rate settling time ¹⁵ for measurement bandwidth ¹⁶		
	10 MHz	< 256 µs	
	28 MHz	< 92 µs	
	40 MHz	< 64 µs	
	80 MHz	< 32 µs	
	160 MHz	< 16 µs	
	200 MHz	< 13 µs	
	320 MHz	< 8 µs	
	400 MHz	< 6.5 µs	
	500 MHz	< 5.5 µs	
	1200 MHz	< 2.2 µs	
	2000 MHz	< 1.5 µs	
	5000 MHz	< 600 ns	
	8312 MHz	< 400 ns	

FM measurement uncertainty (nom.)

The total FM measurement uncertainty is comprised of absolute frequency uncertainty and a statistical uncertainty due to measurement noise. The absolute frequency uncertainty is given in the data sheets of R&S®FSW (PD 5215.6749.22) and R&S®FSWP (PD 3607.2090.22) and R&S®FSVA3000 (PD 5216.1211.22). The statistical measurement uncertainty is given below as a 95 % confidence interval at stated center frequencies and video and measurement bandwidths for a CW carrier ¹⁷.

R&S[®]FSW signal and spectrum analyzer

2 GHz center frequency						
FM video filter						
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ¹⁸		FM bandwidth				
10 MHz	±1.5 kHz	±500 Hz	±300 Hz	±150 Hz	±8 Hz	±0.5 Hz
28 MHz	±8 kHz	±1.5 kHz	±500 Hz	±350 Hz	±40 Hz	±2 Hz
40 MHz	±13 kHz	±2 kHz	±700 Hz	±450 Hz	±75 Hz	±3 Hz
80 MHz	±55 kHz	±5 kHz	±1.5 kHz	±700 Hz	±250 Hz	±7 Hz
160 MHz	±140 kHz	±25 kHz	±5 kHz	±2 kHz	±400 Hz	±35 Hz
320 MHz	±450 kHz	±45 kHz	±15 kHz	±5 kHz	±700 Hz	±70 Hz
500 MHz	±900 kHz	±90 kHz	±30 kHz	±11 kHz	±1.4 kHz	±140 Hz
8 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ¹⁸		FM bandwidth				
10 MHz	±2 kHz	±600 Hz	±400 Hz	±180 Hz	±15 Hz	±1 Hz
28 MHz	±9 kHz	±1.5 kHz	±650 Hz	±500 Hz	±70 Hz	±3 Hz
40 MHz	±15 kHz	±2 kHz	±800 Hz	±600 Hz	±120 Hz	±5 Hz
80 MHz	±60 kHz	±5 kHz	±2 kHz	±800 Hz	±350 Hz	±12 Hz
160 MHz	±140 kHz	±20 kHz	±5 kHz	±2 kHz	±550 Hz	±32 Hz
320 MHz	±450 kHz	±55 kHz	±15 kHz	±5 kHz	±1 kHz	±100 Hz
500 MHz	±900 kHz	±110 kHz	±30 kHz	±11 kHz	±2 kHz	±200 Hz
26 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ¹⁸		FM bandwidth				
10 MHz	±6 kHz	±1.5 kHz	±1 kHz	±500 Hz	±50 Hz	±3 Hz
28 MHz	±26 kHz	±4 kHz	±1.5 kHz	±1 kHz	±200 Hz	±8 Hz
40 MHz	±50 kHz	±6 kHz	±2 kHz	±1.5 kHz	±300 Hz	±10 Hz
80 MHz	±160 kHz	±16 kHz	±5 kHz	±2 kHz	±700 Hz	±25 Hz
160 MHz	±360 kHz	±45 kHz	±12 kHz	±5 kHz	±1.5 kHz	±80 Hz
320 MHz	±1 MHz	±120 kHz	±35 kHz	±12 kHz	±2 kHz	±220 Hz
500 MHz	±2 MHz	±240 kHz	±70 kHz	±24 kHz	±4 kHz	±440 Hz
43 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ¹⁸		FM bandwidth				
10 MHz	±20 kHz	±3 kHz	±1.5 kHz	±700 Hz	±50 Hz	±5 Hz
28 MHz	±80 kHz	±10 kHz	±3 kHz	±2 kHz	±300 Hz	±12 Hz
40 MHz	±150 kHz	±16 kHz	±5 kHz	±3 kHz	±500 Hz	±20 Hz
80 MHz	±500 kHz	±45 kHz	±15 kHz	±5 kHz	±1.5 kHz	±50 Hz
160 MHz	±1.2 MHz	±150 kHz	±40 kHz	±15 kHz	±2.5 kHz	±150 Hz
320 MHz	±3.4 MHz	±400 kHz	±110 kHz	±40 kHz	±4 kHz	±400 Hz
500 MHz	±6 MHz	±800 kHz	±220 kHz	±80 kHz	±8 kHz	±800 Hz

¹⁷ Signal level ≥ 0 dBm, RF level and attenuator: auto, 10 MHz external reference locked to sender, measurement time ≤ 10 ms.

¹⁸ Available measurement bandwidths depend on the hardware configuration. For details, see data sheet of R&S[®]FSW (PD 5215.6749.22).

R&S[®]FSWP phase noise analyzer and VCO tester

2 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ¹⁹		FM bandwidth				
10 MHz	±1.4 kHz	±240 Hz	±110 Hz	±55 Hz	±5 Hz	±0.3 Hz
28 MHz	±6 kHz	±800 Hz	±280 Hz	±150 Hz	±25 Hz	±0.8 Hz
40 MHz	±10 kHz	±1.3 kHz	±400 Hz	±210 Hz	±40 Hz	±1.4 Hz
80 MHz	±32 kHz	±3.5 kHz	±1 kHz	±400 Hz	±90 Hz	±4 Hz
160 MHz	±90 kHz	±10 kHz	±3 kHz	±1 kHz	±180 Hz	±12 Hz
320 MHz	±300 kHz	±30 kHz	±8 kHz	±3 kHz	±350 Hz	±33 Hz
8 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ¹⁹		FM bandwidth				
10 MHz	±1.8 kHz	±600 Hz	±230 Hz	±110 Hz	±8 Hz	±0.8 Hz
28 MHz	±8 kHz	±1.5 kHz	±430 Hz	±280 Hz	±45 Hz	±1.7 Hz
40 MHz	±13 kHz	±2 kHz	±570 Hz	±350 Hz	±80 Hz	±2.5 Hz
80 MHz	±40 kHz	±5 kHz	±1.2 kHz	±580 Hz	±180 Hz	±7 Hz
160 MHz	±120 kHz	±13 kHz	±4 kHz	±1.3 kHz	±300 Hz	±20 Hz
320 MHz	±400 kHz	±40 kHz	±10 kHz	±3.5 kHz	±500 Hz	±60 Hz
26 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ¹⁹		FM bandwidth				
10 MHz	±6 kHz	±1.2 kHz	±600 Hz	±300 Hz	±25 Hz	±2.3 Hz
28 MHz	±26 kHz	±3.5 kHz	±1.3 kHz	±750 Hz	±130 Hz	±5 Hz
40 MHz	±50 kHz	±6 kHz	±1.8 kHz	±1 kHz	±230 Hz	±7 Hz
80 MHz	±170 kHz	±16 kHz	±4.5 kHz	±1.8 kHz	±500 Hz	±20 Hz
160 MHz	±500 kHz	±60 kHz	±15 kHz	±5 kHz	±800 Hz	±60 Hz
320 MHz	±1.7 MHz	±170 kHz	±40 kHz	±15 kHz	±1.5 kHz	±180 Hz

¹⁹ Available measurement bandwidths depend on the hardware configuration. For details, see data sheet of R&S[®]FSWP (PD 3607.2090.22).

R&S[®]FSVA3000 signal and spectrum analyzer

2 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ²⁰		FM bandwidth				
10 MHz	±1.8 kHz	±700 Hz	±400 Hz	±200 Hz	±10 Hz	±2 Hz
28 MHz	±10 kHz	±2 kHz	±600 Hz	±450 Hz	±50 Hz	±3 Hz
40 MHz	±15 kHz	±3 kHz	±850 Hz	±600 Hz	±90 Hz	±5 Hz
80 MHz	±70 kHz	±6.5 kHz	±1.8 kHz	±850 Hz	±350 Hz	±10 Hz
160 MHz	±200 kHz	±30 kHz	±6 kHz	±2.8 kHz	±500 Hz	±50 Hz
320 MHz	±600 kHz	±55 kHz	±18 kHz	±6 kHz	±850 Hz	±85 Hz
400 MHz	±1 MHz	±100 kHz	±30 kHz	±12 kHz	±1.5 kHz	±150 Hz
8 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ²⁰		FM bandwidth				
10 MHz	±3 kHz	±700 Hz	±500 Hz	±200 Hz	±20 Hz	±3 Hz
28 MHz	±12 kHz	±1.8 kHz	±750 Hz	±600 Hz	±90 Hz	±4 Hz
40 MHz	±20 kHz	±2.4 kHz	±1 kHz	±800 Hz	±150 Hz	±7 Hz
80 MHz	±75 kHz	±6 kHz	±2.5 kHz	±1 kHz	±400 Hz	±17 Hz
160 MHz	±180 kHz	±25 kHz	±6 kHz	±2.4 kHz	±650 Hz	±45 Hz
320 MHz	±550 kHz	±70 kHz	±18 kHz	±6 kHz	±1.2 kHz	±120 Hz
400 MHz	±1 MHz	±130 kHz	±38 kHz	±13 kHz	±2.5 kHz	±250 Hz
26 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ²⁰		FM bandwidth				
10 MHz	±7 kHz	±1.8 kHz	±1.2 kHz	±600 Hz	±65 Hz	±5 Hz
28 MHz	±30 kHz	±5 kHz	±1.8 kHz	±1.2 kHz	±230 Hz	±10 Hz
40 MHz	±60 kHz	±7 kHz	±2.3 kHz	±1.8 kHz	±350 Hz	±12 Hz
80 MHz	±180 kHz	±20 kHz	±6 kHz	±2.4 kHz	±800 Hz	±30 Hz
160 MHz	±400 kHz	±50 kHz	±15 kHz	±6 kHz	±1.8 kHz	±150 Hz
320 MHz	±1.2 MHz	±150 kHz	±40 kHz	±15 kHz	±2.5 kHz	±250 Hz
400 MHz	±2.4 MHz	±300 kHz	±85 kHz	±28 kHz	±5 kHz	±500 Hz
43 GHz center frequency						
	FM video filter					
	none	25 % of	10 % of	5 % of	1 % of	0.1 % of
Measurement bandwidth ²⁰		FM bandwidth				
10 MHz	±23 kHz	±3.3 kHz	±1.7 kHz	±800 Hz	±70 Hz	±10 Hz
28 MHz	±100 kHz	±12 kHz	±3.3 kHz	±2.3 kHz	±350 Hz	±15 Hz
40 MHz	±170 kHz	±18 kHz	±6 kHz	±3.5 kHz	±600 Hz	±25 Hz
80 MHz	±550 kHz	±50 kHz	±17 kHz	±6 kHz	±1.8 kHz	±70 Hz
160 MHz	±1.4 MHz	±170 kHz	±48 kHz	±18 kHz	±2.8 kHz	±200 Hz
320 MHz	±3.7 MHz	±450 kHz	±140 kHz	±45 kHz	±4.8 kHz	±500 Hz
400 MHz	±6.8 MHz	±900 kHz	±250 kHz	±90 kHz	±9 kHz	±1 kHz

²⁰ Available measurement bandwidths depend on the hardware configuration. For details, see data sheet of R&S®FSVA3000 (PD 5216.1211.22).

PM measurement uncertainty (nom.)

The total PM measurement uncertainty is comprised of deviation from linear phase and a statistical uncertainty due to measurement noise. The deviation from linear phase is given in the data sheets of R&S[®]FSW (PD 5215.6749.22) and R&S[®]FSWP (PD 3607.2090.22) and R&S[®]FSVA3000 (PD 5216.1211.22). The statistical measurement uncertainty is given below as a 95 % confidence interval at stated center frequencies and video and measurement bandwidths for a CW carrier ²¹.

R&S[®]FSW signal and spectrum analyzer

2 GHz center frequency	measurement bandwidth ²²		
	10 MHz	±0.16°	
	28 MHz	±0.18°	
	40 MHz	±0.18°	
	80 MHz	±0.20°	
	160 MHz	±0.22°	
	320 MHz	±0.28°	
	500 MHz	±0.35°	
8 GHz center frequency	measurement bandwidth 22		
	10 MHz	±0.60°	
	28 MHz	±0.60°	
	40 MHz	±0.63°	
	80 MHz	±0.63°	
	160 MHz	±0.64°	
	320 MHz	±0.66°	
	500 MHz	±0.68°	
26 GHz center frequency	measurement bandwidth ²²		
	10 MHz	±2.0°	
	28 MHz	±2.0°	
	40 MHz	±2.0°	
	80 MHz	±2.0°	
	160 MHz	±2.0°	
	320 MHz	±2.1°	
	500 MHz	±2.1°	
43 GHz center frequency	measurement bandwidth ²²		
	10 MHz	±3.3°	
	28 MHz	±3.3°	
	40 MHz	±3.3°	
	80 MHz	±3.4°	
	160 MHz	±3.6°	
	320 MHz	±3.9°	
	500 MHz	±3.9°	

²¹ Signal level ≥ 0 dBm, RF level and attenuator: auto, 10 MHz external reference locked to sender, measurement time ≤ 10 ms.

²² Available measurement bandwidths depend on the hardware configuration. For details, see data sheet of R&S[®]FSW (PD 5215.6749.22).

R&S[®]FSWP phase noise analyzer and VCO tester

2 GHz center frequency	measurement bandwidth ²³		
	10 MHz	±0.13°	
	28 MHz	±0.13°	
	40 MHz	±0.13°	
	80 MHz	±0.14°	
	160 MHz	±0.16°	
	320 MHz	±0.19°	
8 GHz center frequency	measurement bandwidth 23		
	10 MHz	±0.45°	
	28 MHz	±0.45°	
	40 MHz	±0.45°	
	80 MHz	±0.45°	
	160 MHz	±0.48°	
	320 MHz	±0.50°	
26 GHz center frequency	measurement bandwidth 23		
	10 MHz	±1.5°	
	28 MHz	±1.5°	
	40 MHz	±1.5°	
	80 MHz	±1.5°	
	160 MHz	±1.6°	
	320 MHz	±1.7°	

R&S®FSVA3000 signal and spectrum analyzer

2 GHz center frequency	measurement bandwidth ²⁴			
	10 MHz	±0.22°		
	28 MHz	±0.22°		
	40 MHz	±0.22°		
	80 MHz	±0.22°		
	160 MHz	±0.23°		
	320 MHz	±0.25°		
	400 MHz	±0.35°		
8 GHz center frequency	measurement bandwidth ²⁴			
	10 MHz	±0.72°		
	28 MHz	±0.72°		
	40 MHz	±0.74°		
	80 MHz	±0.75°		
	160 MHz	±0.75°		
	320 MHz	±0.78°		
	400 MHz	±0.81°		
26 GHz center frequency	measurement bandwidth ²⁴			
	10 MHz	±2.5°		
	28 MHz	±2.5°		
	40 MHz	±2.5°		
	80 MHz	±2.5°		
	160 MHz	±2.5°		
	320 MHz	±2.5°		
	500 MHz	±2.8°		
43 GHz center frequency	measurement bandwidth ²⁴			
	10 MHz	±3.7°		
	28 MHz	±3.7°		
	40 MHz	±3.7°		
	80 MHz	±3.7°		
	160 MHz	±3.8°		
	320 MHz	±4.2°		
	500 MHz	±4.2°		

²³ Available measurement bandwidths depend on the hardware configuration. For details, see data sheet of R&S[®]FSWP (PD 3607.2090.22).

²⁴ Available measurement bandwidths depend on the hardware configuration. For details, see data sheet R&S®FSVA3000 (PD 5216.1211.22).

Ordering information

Designation	Type	Order No.
R&S [®] FSW		
Transient measurement application	R&S [®] FSW-K60	1313.7495.02
Transient hop measurements (requires R&S [®] FSW-K60)	R&S [®] FSW-K60H	1322.9916.02
Transient chirp measurements (requires R&S [®] FSW-K60)	R&S [®] FSW-K60C	1322.9745.02
Transient phase noise measurements (requires R&S [®] FSW-K60	R&S [®] FSW-K60P	1353.2413.02
and R&S [®] FSW-K60C and/or R&S [®] FSW-K60H)		
R&S [®] FSWP	1	1
Transient measurement application (requires R&S [®] FSWP-B1)	R&S [®] FSWP-K60	1338.4525.02
Transient hop measurements (requires R&S [®] FSWP-K60)	R&S [®] FSWP-K60H	1338.4548.02
Transient chirp measurements (requires R&S [®] FSWP-K60)	R&S [®] FSWP-K60C	1338.4531.02
Transient phase noise measurements (requires R&S [®] FSWP-K60	R&S [®] FSWP-K60P	1353.2420.02
and R&S ^e FSWP-K60C and/or R&S ^e FSWP-K60H)		
R&S [®] FSVA3000, R&S [®] FSV3000	1	1
Transient measurement application	R&S [®] FSV3-K60	1346.4350.02
Transient hop measurements (requires R&S [®] FSV3-K60)	R&S [®] FSV3-K60H	1346.4372.02
Transient chirp measurements (requires R&S [®] FSV3-K60)	R&S [®] FSV3-K60C	1346.4366.02
Transient phase noise measurements (requires R&S [®] FSV3-K60	R&S [®] FSV3-K60P	1346.6298.02
and R&S [®] FSV3-K60C and/or R&S [®] FSV3-K60H)		
R&S®VSE	1	1
Transient measurement application (requires R&S [®] VSE and	R&S [®] VSE-K60	1320.7868.02
R&S [®] FSPC)		
Transient hop measurements (requires R&S [®] VSE-K60)	R&S [®] VSE-K60H	1320.7880.02
Transient chirp measurements (requires R&S®VSE-K60)	R&S [®] VSE-K60C	1320.7874.02
Analyzers	1	1
R&S [®] FSW ²⁵		
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 option, 10 Hz to 8 GHz	R&S [®] FSWP-B1	1322.9997.08
Spectrum analyzer option, 10 Hz to 26 GHz	R&S [®] FSWP-B1	1322.9997.26
Spectrum analyzer option, 10 Hz to 50 GHz	R&S [®] FSWP-B1	1322.9997.50
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
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
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

 $^{^{25}\,}$ Firmware version 2.21 or higher required for use with R&S®VSE-K60.

Oscilloscopes supported by R&S[®]FSW-B2000 option

Designation	Туре	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

Designation	Туре	Order No.
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	Туре	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	Туре	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
8.312 GHz analysis bandwidth	R&S [®] FSW-B8001	1338.5238.14
2 GHz analysis bandwidth ²⁶	R&S [®] FSW-B2000	1325.4750.26
2 GHz analysis bandwidth ²⁷	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
I/Q memory extension, 24 Gbyte	R&S [®] FSW-B124	1338.5273.02
Digital baseband interface	R&S [®] FSW-B17	1313.0784.02
Analog baseband inputs for R&S [®] FSW8/13, 40 MHz analysis	R&S [®] FSW-B71	1313.1651.13
bandwidth		
Analog baseband inputs for R&S [®] FSW26/43/50, 40 MHz analysis	R&S [®] FSW-B71	1313.1651.26
bandwidth		
Analog baseband inputs for R&S [®] FSW67, 40 MHz analysis	R&S [®] FSW-B71	1313.1651.67
bandwidth		
Analog baseband inputs for R&S [®] FSW85, 40 MHz analysis	R&S [®] FSW-B71	1313.1651.85
bandwidth		
Analog baseband inputs, 80 MHz analysis bandwidth	R&S [®] FSW-B71E	1313.6547.02
Real-time spectrum analyzer 160 MHz, POI \leq 15 µs ²⁸	R&S [®] FSW-B160R	1325.4850.06
Real-time spectrum analyzer 512 MHz, POI \leq 15 µs ²⁹	R&S [®] FSW-B512R	1331.7106.06
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

²⁶ For R&S[®]FSW26 ex-factory, for later upgrade of R&S[®]FSW26 instruments use R&S[®]FSW-U2000 option.

 $^{^{\}rm 27}\,$ For R&S*FSW43/50/67/85, contact service center.

²⁸ Includes 160 MHz analysis bandwidth; no export license required.

²⁹ Includes 512 MHz analysis bandwidth and 200 MHz IF filter; export license required.

Designation	Туре	Order No.
R&S [®] FSVA3000, R&S [®] FSV3000	· • •	
OCXO frequency reference	R&S [®] FSV3-B4	1330.3794.02
YIG preselector bypass ³⁰	R&S [®] FSV3-B11	1330.3865.02
40 MHz analysis bandwidth ³¹	R&S [®] FSV3-B40	1330.4103.02
200 MHz analysis bandwidth ³²	R&S [®] FSV3-B200	1330.4132.02
400 MHz analysis bandwidth	R&S [®] FSV3-B400	1330.7154.02
Enhanced computing power	R&S [®] FSV3-B114	1330.4910.02

 $^{^{30}\,}$ For R&S*FSVA3013/FSV3013, R&S*FSVA3030/FSV3030 and R&S*FSVA3044/FSV3044.

³¹ User-retrofittable (license key).

 $^{^{32}}$ For frequencies > 7.5 GHz, R&S[®]FSV3-B11 option is 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 more than 85 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.

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 Environmental Management ISO 14001

Rohde & Schwarz training

www.training.rohde-schwarz.com

Rohde & Schwarz customer support

www.rohde-schwarz.com/support



R&S[®] is a registered trademark of Rohde & Schwarz GmbH & Co. KG Trade names are trademarks of the owners PD 5215.0657.22 | Version 05.00 | January 2023 (fi) Transient Measurements

Data without tolerance limits is not binding | Subject to change © 2014 - 2023 Rohde&Schwarz GmbH&Co. KG | 81671 Munich, Germany