Noise Figure Measurement Application

Specifications

R&S®FPL1-K30 Noise Figure Measurement Application
R&S®FPS-K30 Noise Figure Measurement Application
R&S®FSV-K30 Noise Figure Measurement Application
R&S®FSV3-K30 Noise Figure Measurement Application
R&S®FSW-K30 Noise Figure Measurement Application
R&S®FSWP-K30 Noise Figure Measurement Application

ROHDE&SCHWARZ

Data Sheet | Version 06.00

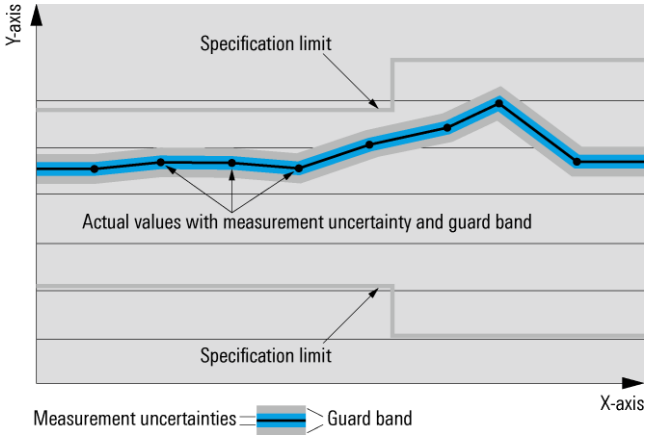
CONTENTS

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 <, ≤, >, ≥, ±, 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.

Specifications

The specifications of the R&S®Fxx-K30 noise figure measurement application are based on the data sheet specifications of

- R&S®FSW signal and spectrum analyzer
- R&S®FSWP phase noise analyzer
- R&S®FSVA3000 signal and spectrum analyzer (R&S®FSV3-K30)
- R&S®FSV3000 signal and spectrum analyzer (R&S®FSV3-K30)
- R&S®FPS signal and spectrum analyzer
- R&S®FSVA signal and spectrum analyzer (R&S®FSV-K30)
- R&S®FSV signal and spectrum analyzer (R&S®FSV-K30)
- R&S®FPL1000 signal and spectrum analyzer
- R&S®ZNL network analyzer

They have not been checked separately and are not verified during instrument calibration. Measurement uncertainties are given as 95 % confidence intervals. The specified errors, accuracies and uncertainties do not take into account systematic errors due to reduced signal-to-noise (S/N) ratio, uncertainties due to imperfect impedance matching, uncertainties of external measurement amplifiers and mixers, uncertainties due to a reduced measurement interval and uncertainties of the noise source. The specified errors, accuracies and uncertainties apply at calibrated measurement frequency points.

Frequency

Frequency range	RF input	
	R&S®FSW-K30	same as R&S®FSW [1]
	R&S®FSWP-K30	same as R&S®FSWP [1, 2]
	R&S®FSV3-K30	same as R&S®FSVA3000/R&S®FSV3000
	R&S®FPS-K30	same as R&S®FPS
	R&S®FSV-K30	same as R&S®FSV/R&S®FSVA
	R&S®FPL1-K30	same as R&S®FPL1000/R&S®ZNL
	external mixer IF input [3]	
	R&S®FSW-K30	same as frequency range of used external mixer
	R&S®FSWP-K30	same as frequency range of used external mixer
	R&S®FSV-K30	same as frequency range of used external mixer

Configuration

DUT configuration		mode	base instrument	with -B10 [4] option	with -B21 [3] option	with -B21 and -B10 [5] options
	RF input	direct	●	●	●	●
		fixed LO, upconverter	●	●	●	●
		fixed LO, downconverter	●	●	●	●
		fixed IF, upconverter		●		●
		fixed IF, downconverter		●		●
	external mixer input [3]	direct			●	●
		fixed LO, upconverter			●	●
		fixed LO, downconverter			●	●
		fixed IF, upconverter				●
		fixed IF, downconverter				●

[1] Restricted IF overload, IF power trigger and auto level functionality depending on carrier frequency and bandwidth at carrier frequencies < 50 MHz.

[2] The R&S®FSWP-B1 option is a prerequisite for using the R&S®FSWP-K30 option with the R&S®FSWP phase noise analyzer.

[3] R&S®FSW26/FSW43/FSW50/FSW67/FSW85 with the R&S®FSW-B21 option and external mixer, R&S®FSWP26/FSWP50 with the R&S®FSWP-B1 and R&S®FSWP-B21 options and external mixer or R&S®FSV30/FSV40/R&S®FSVA30/FSVA40 with the R&S®FSV-B21 option and external mixer are required. Not available for R&S®FSVA3000, R&S®FSV3000, R&S®FPS, R&S®FPL1000 and R&S®ZNL.

[4] R&S®FSW with the R&S®FSW-B10 option, R&S®FSWP with the R&S®FSWP-B1 and R&S®FSWP-B10 options, R&S®FSVA3000 with the R&S®FSV3-B10 option, R&S®FSV3000 with the R&S®FSV3-B10 option, R&S®FPS with the R&S®FPS-B10 option or R&S®FSV with the R&S®FSV-B10 option are required. Not available for R&S®FPL1000 and R&S®ZNL.

[5] R&S®FSW26/FSW43/FSW50/FSW67/FSW85 with the R&S®FSW-B10 and R&S®FSW-B21 options and external mixer, R&S®FSWP26/FSWP50 with the R&S®FSW-B1, R&S®FSW-B10 and R&S®FSWP-B21 options and external mixer or R&S®FSV30/FSV40/R&S®FSVA30/FSVA40 with the R&S®FSV-B10 and R&S®FSV-B21 options and external mixer are required. Not available for R&S®FSVA3000, R&S®FSV3000, R&S®FPS, R&S®FPL1000 and R&S®ZNL.

Measurement configuration	sweep mode	frequency sweep
		frequency table (user-defined)
	noise source type	noise diode, resistor, smart noise source [6]
	ENR	constant, user-defined table, smart noise source table [7]
	input loss	constant, user-defined table
	output loss	constant, user-defined table
	calibration loss	constant, user-defined table
	frequency settings	start frequency, stop frequency, number of frequency points
		center frequency, span, step size
	measurement settings	RBW
		sweep time
		settling time
		average
	level and range settings	reference level (auto, manual)
		auto reference level range
		RF attenuator (manual)
	second stage correction (calibration)	on/off

Remote control			GPIB	LAN (VXI-11)
	control via SCPI command set and application-specific extensions	R&S®FSW and R&S®FSWP	•	•
		R&S®FSVA3000 and R&S®FSV3000	•[8]	•
		R&S®FPS	•	•
		R&S®FSV and R&S®FSVA	•	•
		R&S®FPL1000 and R&S®ZNL	•[9]	•
Uncertainty calculator and result uncertainty calculation	R&S®FSW-K30	on/off		
	R&S®FSWP-K30	on/off		
	R&S®FSV3-K30	on/off		
	R&S®FPS-K30	on/off		
	R&S®FSV-K30	on/off		
	R&S®FPL1-K30	not available		
Preamplifier [10]	R&S®FSW-K30	30 dB/off		
	R&S®FSWP-K30	30 dB/off		
	R&S®FSV3-K30	30 dB/off		
	R&S®FPS-K30	on/off		
	R&S®FSV-K30	on/off		
	R&S®FPL1-K30	on/off		

[6] Smart noise source support not available for R&S®FSV and R&S®FSVA.

[7] Smart noise source table support not available for R&S®FSV and R&S®FSVA.

[8] R&S®FSVA3000 with the R&S®FSV3-B5 option or R&S®FSV3000 with the R&S®FSV3-B5 option are required.

[9] R&S®FPL1000 with the R&S®FPL1-B10 option or R&S®ZNL with the R&S®FPL1-B10 option are required.

[10] R&S®FSW8/FSW13/FSW26/FSW43/FSW50/FSW67 with the R&S®FSW-B24 option, R&S®FSWP8/FSWP26/FSWP50 with the R&S®FSWP-B24 option, R&S®FSVA3004/FSVA3007/FSVA3013/FSVA3030/FSVA3044 with the R&S®FSV3-B24 option, R&S®FSV3004/FSV3007/FSV3013/FSV3030/FSV3044 with the R&S®FSV3-B24 option, R&S®FPS4/FPS7 with the R&S®FPS-B22 option, R&S®FPS13/FPS30/FPS40 with the R&S®FPS-B24 option, R&S®FSV4/FSV7 with the R&S®FSV-B22 option, R&S®FSV13/FSV30/FSV40 with the R&S®FSV-B24 option, R&S®FSVA4/FSVA7 with the R&S®FSV-B22 option,R&S®FSVA13/FSVA30/FSVA40 with the R&S®FSV-B24 option or R&S®FPL1000 with the R&S®FPL1-B22 option are required. Not available for R&S®ZNL.

Results

R&S®FSW-K30, R&S®FSWP-K30, R&S®FSV3-K30 for R&S®FSVA3000/FSV3000, R&S®FPS-K30, R&S®FPL1-K30		
Result display	result table	frequency
		selectable: noise figure, noise temperature, gain, power (hot), power (cold), Y factor
	marker table	marker reference, frequency
		selectable: noise figure, noise temperature, gain, power (hot), power (cold), Y factor
	graph results	noise figure, noise temperature, gain, power (hot), power (cold), Y factor
		x-axis according to frequency settings
		y-axis scaling automatic or user-defined
Trace	trace configuration	up to 4 traces
		clear/write, view, blank
		copy trace
	markers	up to 4 markers (normal/delta)
	limit lines	noise figure, gain

R&S®FSV-K30 for R&S®FSVA/FSV		
Result display	result table	frequency, noise figure, noise temperature, gain
	graph results	noise figure, gain
		x-axis according to frequency settings
		y-axis scaling automatic or user-defined
Trace	trace configuration	measurement traces, up to 3 memory traces
		copy trace
	markers	up to 4 markers
	limit lines	noise figure, gain

Measurement uncertainty (nominal)

Noise figure measurement range	noise source ENR	measurement range
	4 dB to 7 dB	0 dB to 20 dB
	12 dB to 17 dB	0 dB to 30 dB
	20 dB to 22 dB	0 dB to 35 dB
Resolution		0.01 dB
Instrument noise figure uncertainty	R&S®FSW-K30, R&S®FSWP-K30	
	10 MHz to 50 GHz [11]	±0.05 dB [12]
	R&S®FSV3-K30	
	10 MHz to 44 GHz [11]	±0.05 dB [13]
	R&S®FPS-K30	
	10 MHz to 7 GHz [11]	±0.05 dB [14]
	> 7 GHz [11]	±0.05 dB [15]
	R&S®FPL1-K30	
	R&S®FPL1000: 10 MHz to 7 GHz [11]	±0.05 dB [16]
	R&S®ZNL: 10 MHz to 3 GHz	±0.05 dB [17]
	R&S®FSV-K30	
	10 MHz to 7 GHz [11]	±0.05 dB [18]
	> 7 GHz [11]	±0.05 dB [19]
Gain measurement range		–20 dB to +60 dB
Resolution		0.01 dB
Accuracy	R&S®FSW-K30, R&S®FSWP-K30	
	10 MHz to 50 GHz [11]	±0.15 dB [12]
	R&S®FSV3-K30	
	10 MHz to 44 GHz [11]	±0.15 dB [13]
	R&S®FPS-K30	
	10 MHz to 7 GHz [11]	±0.15 dB [14]
	> 7 GHz [10]	±0.15 dB [15]
	R&S®FPL1-K30	
	R&S®FPL1000: 10 MHz to 7 GHz [11]	±0.15 dB [16]
	R&S®ZNL: 10 MHz to 3 GHz	±0.15 dB [17]
	R&S®FSV-K30	
	10 MHz to 7 GHz [11]	±0.15 dB [18]
	> 7 GHz [11]	±0.15 dB [19]

[11] The upper frequency limit depends on the instrument model.

[12] With internal preamplifier (R&S®FSW-B24/FSWP-B24 option), gain 30 dB, sweep time > 300 ms, input attenuator = 0 dB, measured Y factor > 10 dB.

[13] With internal preamplifier (R&S®FSV3-B24), gain 30 dB, sweep time > 300 ms, input attenuator = 0 dB, measured Y factor > 10 dB.

[14] With internal preamplifier (R&S®FPS-B22 option) = on, sweep time > 300 ms, input attenuator = 0 dB, measured Y factor > 10 dB.

[15] With external gain 30 dB, noise figure < 5 dB, sweep time > 300 ms, input attenuator = 0 dB, measured Y factor > 10 dB.

[16] With internal preamplifier (R&S®FPL1-B22 option) = on, sweep time > 300 ms, input attenuator = 0 dB, measured Y factor > 10 dB.

[17] With external gain 30 dB, noise figure < 5 dB, sweep time > 300 ms, input attenuator = 0 dB, measured Y factor > 10 dB.

[18] With internal preamplifier (R&S®FSV-B22 option) = on, sweep time > 300 ms, input attenuator = 0 dB.

[19] With external gain 30 dB, noise figure < 5 dB, sweep time > 300 ms, input attenuator = 0 dB.

Recommended hardware

Designation	Type	Order No.
Smart noise source, 10 MHz to 26.5 GHz	R&S®FS-SNS26	1338.8008.26
Smart noise source, 100 MHz to 40 GHz	R&S®FS-SNS40	1338.8008.40
Smart noise source, 100 MHz to 55 GHz	R&S®FS-SNS55	1338.8008.55
Accessories supplied with each R&S®FS-SNS		
Interface cable	R&S®SNSCABLE	1338.8020.00
Manual, carrying case		
Optional accessories		
Y adapter cable for legacy instruments	R&S®SNSCABLE-Y	1338.8066.00

Noise source [20] NoiseCom NC346	**RF connector**	**Frequency range**	**ENR**
NC 346 A	SMA male	0.01 GHz to 18 GHz	5 dB to 7 dB
NC 346 A precision	APC 3.5 male	0.01 GHz to 18 GHz	5 dB to 7 dB
NC 346 A option1	N male	0.01 GHz to 18 GHz	5 dB to 7 dB
NC 346 A option 2	APC 7	0.01 GHz to 18 GHz	5 dB to 7 dB
NC 346 A option 4	N female	0.01 GHz to 18 GHz	5 dB to 7 dB
NC 346 B	SMA male	0.01 GHz to 18 GHz	14 dB to 16 dB
NC 346 B precision	APC 3.5 male	0.01 GHz to 18 GHz	14 dB to 16 dB
NC 346 B option 1	N male	0.01 GHz to 18 GHz	14 dB to 16 dB
NC 346 A option 2	APC 7	0.01 GHz to 18 GHz	14 dB to 16 dB
NC 346 A option 4	N female	0.01 GHz to 18 GHz	14 dB to 16 dB
NC 346 C	APC 3.5 male	0.01 GHz to 26.5 GHz	13 dB to 17 dB
NC 346 D	SMA male	0.01 GHz to 18 GHz	19 dB to 25 dB
NC 346 D precision	APC 3.5 male	0.01 GHz to 18 GHz	19 dB to 25 dB
NC 346 D option1	N male	0.01 GHz to 18 GHz	19 dB to 25 dB
NC 346 D option 2	APC 7	0.01 GHz to 18 GHz	19 dB to 25 dB
NC 346 D option 3	N female	0.01 GHz to 18 GHz	19 dB to 25 dB
NC 346 E	APC 3.5 male	0.01 GHz to 26.5 GHz	19 dB to 25 dB
NC 346 Ka	K male	0.1 GHz to 40 GHz	10 dB to 17 dB
NC 346 V	V male	0.1 GHz to 55 GHz	7 dB to 21 dB

[20] Noise sources supplied by NoiseCom; specifications from NoiseCom.

Ordering information

Noise figure measurement application

Designation	Type	Order No.
Noise figure measurement application	R&S®FSW-K30	1313.1380.02
Noise figure measurement application [21]	R&S®FSWP-K30	1325.4244.02
Noise figure measurement application	R&S®FSV3-K30	1330.5045.02
Noise figure measurement application	R&S®FPS-K30	1321.4104.02
Noise figure measurement application (for R&S®FPL1000 and R&S®ZNL) [22]	R&S®FPL1-K30	1323.1760.02
Noise figure measurement application	R&S®FSV-K30	1310.8355.02

R&S®FSW signal and spectrum analyzer

Designation	Type	Order No.
Base unit		
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
Options		
External generator control	R&S®FSW-B10	1313.1622.02
LO/IF connections for external mixers (R&S®FSW26)	R&S®FSW-B21	1313.1100.26
LO/IF connections for external mixers (R&S®FSW43/50/67)	R&S®FSW-B21	1313.1100.43
LO/IF connections for external mixers (R&S®FSW85)	R&S®FSW-B21	1313.1100.85
RF preamplifier, 100 kHz to 13.6 GHz (for R&S®FSW8/13)	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	1313.0832.49
RF preamplifier, 100 kHz to 67 GHz	R&S®FSW-B24	1313.0832.66

R&S®FSWP phase noise analyzer

Designation	Type	Order No.
Base unit		
Phase noise analyzer, 1 MHz to 8 GHz	R&S®FSWP8	1322.8003.08
Phase noise analyzer, 1 MHz to 26.5 GHz	R&S®FSWP26	1322.8003.26
Phase noise analyzer, 1 MHz to 50 GHz	R&S®FSWP50	1322.8003.50
Options		
External generator control	R&S®FSWP-B10	1325.5463.02
LO/IF connections for external mixers (R&S®FSWP26/50)	R&S®FSWP-B21	1325.3848.02
RF preamplifier, 100 kHz to 8 GHz (R&S®FSWP8)	R&S®FSWP-B24	1325.3725.08
RF preamplifier, 100 kHz to 26.5 GHz (R&S®FSWP26)	R&S®FSWP-B24	1325.3725.26
RF preamplifier, 100 kHz to 50 GHz (R&S®FSWP50)	R&S®FSWP-B24	1325.3725.50
Mandatory options		
Spectrum analyzer, 10 Hz to 8 GHz	R&S®FSWP-B1	1322.9997.08
Spectrum analyzer, 10 Hz to 26.5 GHz	R&S®FSWP-B1	1322.9997.26
Spectrum analyzer, 10 Hz to 50 GHz	R&S®FSWP-B1	1322.9997.50

[21] The R&S®FSWP-B1 option is a prerequisite for using the R&S®FSWP-K30 option with the R&S®FSWP phase noise analyzer.

[22] The R&S®FPL1-B5 option is a prerequisite for using the R&S®FPL1-K30 option with the R&S®FPL1000 signal and spectrum analyzer.
The R&S®ZNL3-B1 and R&S®FPL1-B5 options are prerequisites for using the R&S®FPL1-K30 option with the R&S®ZNL network analyzer.

R&S®FSVA3000 and R&S®FSV3000 signal and spectrum analyzer

Designation	Type	Order No.
R&S®FSVA3000 signal and spectrum analyzer		
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		
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
Options		
Noise source control via BNC (for use with legacy noise sources)	R&S®FSV3-B28V	1330.6664.02
Additional interfaces	R&S®FSV3-B5	1330.3820.02
External generator control	R&S®FSV3-B10	1330.3859.02
RF preamplifier for R&S®FSVA3004/FSV3004 and R&S®FSVA3007/FSV3007	R&S®FSV3-B24	1330.4049.07
RF preamplifier for R&S®FSVA3013/FSV3013	R&S®FSV3-B24	1330.4049.13
RF preamplifier for R&S®FSVA3030/FSV3030	R&S®FSV3-B24	1330.4049.30
RF preamplifier for R&S®FSVA3044/FSV3044	R&S®FSV3-B24	1330.4049.44

R&S®FPS signal and spectrum analyzer

Designation	Type	Order No.
Base unit		
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
Options		
Noise source control 0 V/28 V (mandatory for R&S®FPS-K30, not retrofittable)	R&S®FPS-B28V	1326.5996.02
RF preamplifier, 9 kHz to 7 GHz	R&S®FPS-B22	1321.4027.02
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
Mandatory option		
Noise source supply, BNC female, switched 28 V, max. 100 mA	R&S®FPS-B28V option noise source control connector on rear panel of R&S®FPS	
Recommended hardware: external preamplifier (for frequency range > 7 GHz; gain: approx. 20 dB; noise figure: max. 5 dB)		

R&S®FSVA and R&S®FSV signal and spectrum analyzer

Designation	Type	Order No.
R&S®FSVA signal and spectrum analyzer		
Signal and spectrum analyzer	R&S®FSVA4	1321.3008.05
Signal and spectrum analyzer	R&S®FSVA7	1321.3008.08
Signal and spectrum analyzer	R&S®FSVA13	1321.3008.14
Signal and spectrum analyzer	R&S®FSVA30	1321.3008.31
Signal and spectrum analyzer	R&S®FSVA40	1321.3008.41
R&S®FSV signal and spectrum analyzer		
Signal and spectrum analyzer	R&S®FSV4	1321.3008.04
Signal and spectrum analyzer	R&S®FSV7	1321.3008.07
Signal and spectrum analyzer	R&S®FSV13	1321.3008.13
Signal and spectrum analyzer	R&S®FSV30	1321.3008.30
Signal and spectrum analyzer [23]	R&S®FSV40	1321.3008.39
Signal and spectrum analyzer	R&S®FSV40	1321.3008.40
Options for R&S®FSVA and R&S®FSV signal and spectrum analyzer		
External generator control	R&S®FSV-B10	1310.9551.02
LO/IF ports for external mixers	R&S®FSV-B21	1310.9597.02
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
Recommended hardware: external preamplifier (for frequency range > 7 GHz; gain: approx. 20 dB; noise figure: max. 5 dB)		

R&S®FPL1000 signal and spectrum analyzer

Designation	Type	Order No.
Base unit		
Signal and spectrum analyzer	R&S®FPL1003	1304.0004.03
Signal and spectrum analyzer	R&S®FPL1007	1304.0004.07
Options		
Additional interfaces	R&S®FPL1-B5	1323.1883.02
RF preamplifier	R&S®FPL1-B22	1323.1719.02
GPIB interface	R&S®FPL1-B10	1323.1890.02

R&S®ZNL network analyzer

Designation	Type	Order No.
Base unit		
Network analyzer	R&S®ZNL3	1323.0012.03
Network analyzer	R&S®ZNL6	1323.0012.06
Options		
Additional interfaces	R&S®FPL1-B5	1323.1883.02
GPIB interface	R&S®FPL1-B10	1323.1890.02
Mandatory option		
Spectrum analysis for R&S®ZNL3	R&S®ZNL3-B1	1323.1802.02
Spectrum analysis for R&S®ZNL6	R&S®ZNL6-B1	1323.2067.02
Recommended hardware: external preamplifier (gain: approx. 20 dB; noise figure: max. 5 dB)		

[23] Max. bandwidth = 10 MHz.