



Version
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Spectrum Analyzer R&S® FSL

Specifications



ROHDE & SCHWARZ

Specifications

Specifications apply under the following conditions:

15 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to.

Data without tolerances: typical values only. Data designated 'nominal' applies to design parameters and is not tested.

Frequency

Frequency range	R&S FSL3	9 kHz to 3 GHz
	R&S FSL6	9 kHz to 6 GHz
Frequency resolution		1 Hz

Reference frequency, internal, nominal		
Aging per year		1×10^{-6}
Temperature drift	0 °C to +50 °C	1×10^{-6}

Reference frequency, internal, nominal	R&S FSL-B4 OCXO reference frequency option	
Aging per year		1×10^{-7}
Temperature drift	0 °C to +50 °C	1×10^{-7}

Frequency readout		with marker or frequency counter
Marker resolution		span/500
Uncertainty		$\pm(\text{marker frequency} \times \text{reference uncertainty} + 2\% \times \text{span} + 10\% \times \text{resolution bandwidth} + \frac{1}{2} \text{ (last digit)})$
Frequency counter resolution		1 Hz
Count uncertainty	S/N >25 dB	$\pm(\text{frequency} \times \text{reference uncertainty} + \frac{1}{2} \text{ (last digit)})$
Frequency span		0 Hz, 10 Hz to 3 GHz/6 GHz
Span uncertainty		3%

Spectral purity SSB phase noise		f = 500 MHz
Carrier offset	1 kHz	typ. -95 dBc(1 Hz)
	10 kHz	<-98 dBc(1 Hz), typ. -103 dBc(1 Hz)
	100 kHz	<-98 dBc(1 Hz), typ. -105 dBc(1 Hz)
	1 MHz	<-115 dBc(1 Hz), typ. -120 dBc(1 Hz)

Sweep time

Sweep time	10 Hz \leq span \leq 1.5 GHz 1.5 GHz < span \leq 3 GHz span > 3 GHz	2.5 ms to 16000 s 5 ms to 16000 s 10 ms to 16000 s
Uncertainty		nom. 3%
Span	0 Hz	1 μ s to 16000 s in 5% steps

Resolution bandwidths

Sweep filters		
Resolution bandwidths		300 Hz to 10 MHz (–3 dB) in 1/3 sequence
	option R&S FSL-B7	10 Hz to 10 MHz (–3 dB) in 1/3 sequence
Resolution bandwidth uncertainty		nom. <3%
Resolution filter shape factor 60:3 dB		nom. <5 (Gaussian type filters)

FFT filters		
	analyzer mode	
3 dB bandwidths		300 Hz to 30 kHz in 1/3 sequence
	option R&S FSL-B7	1 Hz to 30 kHz in 1/3 sequence
Bandwidth uncertainty		nom. 5%
Shape factor 60 dB : 3 dB		nom. 2.5

Channel filters		
Bandwidths	300; 500 Hz; 1; 1.5; 2; 2.4; 2.7; 3; 3.4; 4; 4.5; 5; 6; 8.5; 9 kHz 10; 12.5; 14; 15; 16; 18 (RRC); 20; 21; 24.3 (RRC); 25; 30; 50; 100; 150; 192; 200; 300; 500 kHz 1; 1.228; 1.28 (RRC); 1.5; 2; 3; 3.84 (RRC); 4.096 (RRC); 5 MHz (RRC = root raised cosine)	
	option R&S FSL-B7	100 Hz, 200 Hz additionally

Video bandwidths	(1-pole low pass RC filters)	1 Hz to 10 MHz in 1/3 sequence
Demodulation bandwidth		nom. 20 MHz

Level

Display range		displayed noise floor to +20 dBm
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Maximum rated input level		
DC voltage		50 V
CW RF power		30 dBm (= 1 W)
Peak RF power		36 dBm (= 2 W) < 3 s
Max. pulse voltage		150 V
Max. pulse energy	10 μ s	10 mWs
1 dB compression of input mixer	0 dB RF attenuation, $f > 200$ MHz	nom. +5 dBm

Intermodulation		
Third-order intermodulation	intermodulation-free dynamic range, level 2×-20 dBm, reference level –10 dBm $f < 30$ MHz $f \geq 30$ MHz	typ. 60 dBc >60 dBc (IP3 + 10 dBm), typ. 70 dBc
Second harmonic intercept (SHI)	$f = 20$ MHz to 3 GHz	typ. 40 dBm

Displayed average noise level		
	0 dB RF attenuation, RBW = 1 kHz, VBW = 10 Hz, normalized to 1 Hz	
	frequency	preamplifier = off
	9 kHz to 1 MHz	<–100 dBm(1Hz)
	1 MHz to 10 MHz	<–115 dBm(1Hz)
	10 MHz to 50 MHz	<–130 dBm(1Hz)
	50 MHz to 3 GHz	<–140 dBm(1Hz)
	3 GHz to 5 GHz	<–136 dBm(1Hz)
	5 GHz to 6 GHz	<–130 dBm(1Hz)
	frequency	preamplifier = on
	9 kHz to 1 MHz	<–115 dBm(1Hz)
	1 MHz to 10 MHz	<–130 dBm(1Hz)
	10 MHz to 50 MHz	<–145 dBm(1Hz)
	50 MHz to 3 GHz	<–152 dBm(1Hz)
	3 GHz to 5 GHz	<–146 dBm(1Hz)
	5 GHz to 6 GHz	<–140 dBm(1Hz)

Immunity to interference		
Image frequency	f + 2 × 48.375 MHz f + 2 × 838.375 MHz f + 2 × 7158.375 MHz	>60 dB, typ. -80 dB >60 dB, typ. -80 dB typ. -60 dB
Intermediate frequency	48.375 MHz, 838.375 MHz, 7158.375 MHz	>60 dB, typ. -80 dB
Spurious response, inherent	f > 30 MHz, without input signal, RF attenuation = 0 dB, RBW < 1 MHz	<-90 dBm
Spurious response	related to local oscillators	<-60 dBc
Spurious response	related to A/D conversion	typ. <-70 dBc
Spurious response	related to sub harmonic of first LO (Spur at 7158.375 MHz - 2 × f _{in})	typ. 60 dBc
Spurious response at mixer level <-10 dBm	related to harmonic of first LO (spur at f _{in} - 3579.1875 MHz)	typ. <-60 dBc

Level display		
Logarithmic level axis		10 dB to 100 dB
Linear level axis		0 % to 100 %/10 divisions
Number of traces		4
Trace detectors		max peak, min peak, auto peak, sample, RMS, quasi peak, average
Number of measurement points	default value range	501 125 to 32001 in steps of about a factor of 2
Trace functions		clear/write, max hold, average, min hold, view
Setting range of reference level	logarithmic level display	-80 dBm to 20 dBm in steps of 2 dB, 5 dB or 10 dB
	linear level display	-80 dBm to 20 dBm, 0 % to 100 %
Units of level axis	logarithmic level display	dBm, dBmV, dBμV, dBμA, dBpW
	linear level display	μV, mV, V, μA, mA, A, pW, nW, μW, mW, W

Level measurement uncertainty		
95% confidence level, 20 °C to 30 °C, S/N>16 dB, 0 dB to -50 dB from reference level	10 MHz < f ≤ 3 GHz 3 GHz < f ≤ 6 GHz	<0.5 dB <0.8 dB
Absolute uncertainty at reference frequency		<0.3 dB
Frequency response (20 °C to 30 °C)	f ≤ 3 GHz 3 GHz < f ≤ 6 GHz	<0.5 dB <0.8 dB
Attenuator uncertainty		<0.3 dB
Uncertainty of reference level setting		<0.1 dB (nom.)

Display nonlinearity		
Logarithmic level display	S/N>16 dB 0 dB to -50 dB	<0.2 dB
Bandwidth switching uncertainty	reference: RBW = 10 kHz	<0.1 dB (nom.)

Trigger functions

Trigger		
Trigger source		free run, video, external, IF power
External trigger level		TTL level

Inputs and outputs

RF input		
Impedance		50 Ω
Connector		N female
VSWR	f \leq 3 GHz 3 GHz < f \leq 6 GHz	typ. <1.2 typ. <1.5
Input attenuator		0 dB to 30 dB in 5 dB steps

AF output		
Connector		3.5 mm mini jack
Output impedance		<100 Ω
Open-circuit voltage		up to 1.5 V, adjustable

Tracking generator		
Tracking generator	models 13 and 16 only	N female, 50 Ω
Output level		-20 dBm to 0 dBm in 1 dB steps
Frequency range		1 MHz to 3 GHz/6 GHz
Reverse power		
DC voltage		50 V
CW RF power		30 dBm (= 1 W)
Max. pulse voltage		150 V
Max. pulse energy (10 μ s)		10 mWs

External reference		
Connector		BNC female, 50 Ω
Input level		0 dBm to +10 dBm
Output level	with R&S FSL-B4	typ. 0 dBm
Frequency		10 MHz \pm 5 ppm

External trigger/gate input		
Connector		BNC female, 50 Ω
Input level		TTL compatible

Probe power		
		+15 V DC, -12.6 V DC and ground, max. 150 mA, nominal

General specifications

Remote control		
LAN interface		10/100 BaseT, RJ-45
IEC/IEEE bus (GPIB)	R&S FSL-B10	SCPI 1997.0

Display		
Resolution		640 × 480 pixels
Pixel failure rate		$<2 \times 10^{-5}$

Mass memory		
Mass memory		Flash disk (internal), USB memory stick (not supplied)
Data storage		>500 instrument settings and traces

Temperature		
Temperature	operating temperature range permissible temperature range storage temperature range	+0 °C to +50 °C +0 °C to +55 °C −40 °C to +70 °C
Climatic loading		+25 °C/+40 °C at 95% relative humidity (IEC 60068-2-30)

Mechanical resistance		
	sinusoidal vibration	IEC 60068-2-6
	random vibration	IEC 60068-2-64
	shock	40 g shock spectrum, meets MIL-STD-810E, method 516.4 procedure 1, IEC 60068-2-27

Power supply		
Input voltage range, AC, nominal		100 V to 240 V
AC supply frequency		50 Hz to 400 Hz
Input current, AC		0.9 A to 0.3 A
Input voltage range, DC, nominal		10 V to 28 V
Input current, DC		8.0 A to 2.2 A
Power consumption		typ. 45 W, max. 65 W with all options
Safety		IEC 61010-1, EN 61010-1, UL 61010B-1, CSA C22.2 No. 1010-1
EMC		meets CISPR 11/EN 55011 group 1 class B; meets IEC/EN 61326, emission: class B (residential environment) immunity: industrial environment (excluding operating frequency)
Dimensions	W × H × D in mm with handle without handle	408.8 mm × 158.1 mm × 465.3 mm 342.3 mm × 158.1 mm × 367.0 mm
Weight	without options with battery pack	<7 kg <8 kg

Additional Interfaces R&S FSL-B5

User port		
Connector		9-pin D-Sub male
Output		TTL compatible, 0 V/5 V max. 15 mA
Input		TTL compatible, max. 5 V

Noise source control		
Connector		BNC female
Output		0 V/28 V, max. 100 mA, switchable, supply for noise source

IF/video out		
Connector		BNC female, 50 Ω
Bandwidth	IF and video out	typ. 20 MHz
Output level	video out	typ. 200 mV full scale (open circuit), linear scaling
IF frequency	IF out	typ. 18 MHz
Power sensor		
Connector		6-pin LEMOSA female for supported Power Sensors R&S NRP-Zxx

AM/FM/φM Measurement Demodulator R&S FSL-K7

Measurement of analog modulation signals		
Demodulation bandwidth		100 Hz to 6.4 kHz, binary steps 12.5 kHz to 1.6 MHz, binary steps 3 MHz, 5 MHz, 8 MHz, 10 MHz, 18 MHz
Recording length	maximum	512 ksample
Recording time	demodulation bandwidth	
	100 Hz	3276.8 s
	6.4 kHz	51.2 s
	12.5 kHz	26.6 s
	1.6 MHz	200 ms
	3 MHz	100 ms
	5 MHz	50 ms
	8 MHz	25 ms
	10 MHz	12.5 ms
	18 MHz	12.5 ms
Display	frequency versus time (FM), amplitude versus time (AM), phase versus time (φM), RF power versus time, RF spectrum (FFT), AF spectrum (FFT), table with numeric values for: modulation deviation (peak, RMS), modulation frequency, carrier offset, carrier power (power of unmodulated carrier), THD, SINAD	

AF (modulation frequency)		
Range		≤5 MHz max. 0.5 × demodulation bandwidth
Resolution		5 digits
Measurement uncertainty		0.1 %
AF filters		
Lowpass		3 kHz, 15 kHz, 150 kHz, 5 %, 10 %, 25 % of demodulation bandwidth
Highpass		50 Hz, 300 Hz
Deemphasis		25 μs, 50 μs, 75 μs, 750 μs

AM demodulation		
Measurement range	modulation depth	0 % to 100 %
Modulation depth uncertainty	AF ≤ 1 MHz	<3 % of reading + residual AM
Residual AM	demodulation bandwidth ≤ 200 kHz, RMS, RF ≤ 3 GHz RF input level ≥ (RF attenuation/dB -30) dBm	0.2 %
Distortion	10 Hz ≤ AF ≤ 100 kHz	0.3 %
FM rejection	AF ≤ 1 MHz and AF + deviation ≤ 0.5 × demodulation bandwidth	typ. 1 % + residual AM

FM demodulation		
Measurement range	frequency deviation	≤5 MHz
Deviation uncertainty	AF ≤ 1 MHz and AF + deviation ≤ 0.5 × demodulation bandwidth	<3 % of reading + residual FM
Residual FM	demodulation bandwidth ≤ 100 kHz, RMS, RF input level ≥ (RF attenuation/dB -30) dBm RF ≤ 1 GHz RF = 3 GHz	150 Hz 200 Hz
Distortion	10 Hz ≤ AF ≤ 100 kHz, deviation < 400 kHz	0.3 %
AM rejection	100 Hz ≤ AF ≤ 1 kHz, modulation depth 50 %	30 Hz

φM demodulation		
AF		≤5 MHz, max. 0.5 × demodulation bandwidth
Measurement range	phase deviation	<1000 rad
Residual φM	demodulation bandwidth ≤ 100 kHz, RMS, RF = 1 GHz, highpass 300 Hz, RF input level ≥ (RF attenuation /dB -30 dBm	5 mrad

Carrier power versus time		
Display range		noise floor to +20 dBm
Measurement uncertainty	unmodulated carrier, S/N > 16 dB, RF: 50 kHz to 3 GHz	typ. 1 dB
Max. dynamic range	demodulation bandwidth 200 kHz	typ. 75 dB
Display linearity	S/N >16 dB	typ. 0.2 dB

AF spectrum		
Span		≤9 MHz
Resolution bandwidth		1 Hz to 10 MHz

RF spectrum		
Span		≤18 MHz
Resolution bandwidth		1 Hz to 10 MHz
Shape factor	60 dB/3 dB	2.5, nominal

Modulation distortion		
Measurement functions		THD, SINAD
Measurement range		-100 dB to 0 dB
Resolution		0.01 dB
Measurement uncertainty		typ. 0.5 dB
AF frequency range		10 Hz to 5 MHz

Trigger		
Trigger functions		RF level, AM, FM, φM demodulation

Ordering information

Order designation	Type	Order No.
Spectrum Analyzer 9 kHz to 3 GHz	R&S FSL3	1300.2502.03
Spectrum Analyzer 9 kHz to 3 GHz, with tracking generator	R&S FSL3	1300.2502.13
Spectrum Analyzer 9 kHz to 6 GHz	R&S FSL6	1300.2502.06
Spectrum Analyzer 9 kHz to 6 GHz, with tracking generator	R&S FSL6	1300.2502.16
Accessories supplied		
Power cable, quick start guide and CD-ROM (with operating manual and service manual)		

Options

Order designation	Type	Order No.	Retrofittable	Remarks
Options				
OCXO Reference Frequency	R&S FSL-B4	1300.6008.02	yes	
Additional Interfaces	R&S FSL-B5	1300.6108.02	yes	video out, IF out, noise source control, AUX port, R&S NRP power sensor
TV Trigger	R&S FSL-B6	1300.5901.02	yes	
Narrow Resolution Filters	R&S FSL-B7	1300.5601.02	yes	
Gated Sweep	R&S FSL-B8	1300.5701.02	yes	
GPIB Interface	R&S FSL-B10	1300.6208.02	yes	
RF Preamplifier	R&S FSL-B22	1300.5953.02	yes	
DC Power Supply	R&S FSL-B30	1300.6308.02	yes	
NiMH Battery Pack	R&S FSL-B31	1300.6408.02	yes	requires R&S FSL-B30
Firmware/Software				
AM/FM/φM Measurement Demodulator	R&S FSL-K7	1301.9246.02		
Power Sensor Support	R&S FSL-K9	1301.9530.02		requires R&S FSL-B5 or R&S NRP-Z3/4

Recommended extras

Order designation	Type	Order No.
19" Rackmount Adapter	R&S ZZA-S334	1109.4487.00
Soft Carrying Bag	R&S FSL-Z3	1300.5401.00
Additional Charger Unit	R&S FSL-Z4	1300.5430.02
Matching Pad 75 Ω , L section	R&S RAM	0358.5414.02
Matching Pad 75 Ω , series resistor 25 Ω	R&S RAZ	0358.5714.02
Matching Pad 75 Ω , L section, N to BNC	R&S FSH-Z38	1300.7740.02
SWR Bridge 5 MHz to 3 GHz	R&S ZRB2	0373.9017.52
SWR Bridge 40 kHz to 4 GHz	R&S ZRC	1039.9492.52
SWR Bridge 10 MHz to 3 GHz (incl. open, short, load calibration standards)	R&S FSH-Z2	1145.5767.02

Power sensors supported by R&S FSL-K9

Order designation	Type	Order No.
Average Power Sensor 10 MHz to 8 GHz, 200 mW	R&S NRP-Z11	1138.3004.02
Average Power Sensor 10 MHz to 18 GHz, 200 mW	R&S NRP-Z21	1137.6000.02
Average Power Sensor 10 MHz to 18 GHz, 2 W	R&S NRP-Z22	1137.7506.02
Average Power Sensor 10 MHz to 18 GHz, 15 W	R&S NRP-Z23	1137.8002.02
Average Power Sensor 10 MHz to 18 GHz, 30 W	R&S NRP-Z24	1137.8502.02
Average Power Sensor 9 kHz to 6 GHz, 200 mW	R&S NRP-Z91	1168.8004.02
Thermal Power Sensor 0 Hz to 18 GHz, 100 mW	R&S NRP-Z51	1138.0005.02
Thermal Power Sensor 0 Hz to 40 GHz, 100 mW	R&S NRP-Z55	1138.2008.02



For product brochure, see PD 0758.2790.12
and www.rohde-schwarz.com
(search term: FSL)



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