Version 02.00

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Signal Source Analyzer R&S®FSUP

Specifications

ROHDE&SCHWARZ

Specifications

Specifications are valid under the following conditions:
30 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and total calibration performed. Data without tolerances: typical values only. Data designated 'nominal' applies to design parameters and is not tested.

Operating modes	
	Signal source analyzer Spectrum analyzer
Signal source analyzer	
	Phase noise measurement with spectrum analyzer method Phase noise measurement with PLL method without cross-correlation Internal reference External reference Phase noise measurement with PLL method with cross-correlation Transients measurements VCO parameter characterization

All operating modes

Internal reference frequency

Reference frequency, internal, nominal	**standard OCXO**	
Aging per day	after 30 days of continuous operation	1×10^{-9}
Aging per year	after 30 days of continuous operation	1×10^{-7}
Temperature drift	+5 °C to +45 °C	8×10^{-8}
Total frequency error	per year	1.8×10^{-7}
Reference frequency, internal, nominal	**option R&S FSU-B4**	
Aging per day	after 30 days of continuous operation	2×10^{-10}
Aging per year	after 30 days of continuous operation	3×10^{-8}
Temperature drift	+5 °C to +45 °C	1×10^{-9}
Total frequency error	per year	5×10^{-8}
External reference frequency		1 MHz to 20 MHz, 1 Hz steps[1)]

Signal source analyzer mode

Phase noise measurement with PLL method without cross-correlation

(Internal reference oscillator, internal phase detector)

Frequency range		
	R&S FSUP8	10 MHz to 8 GHz
	R&S FSUP26	10 MHz to 26.5 GHz
	R&S FSUP50	10 MHz to 50 GHz
Frequency resolution		0.01 Hz
Offset frequency range		1 Hz to 30 MHz
RF level input		–10 dBm to 30 dBm
Loop bandwidth	PLL control of internal reference	1 Hz to 30 kHz[2)]
	PLL control of DUT	1 Hz to 100 kHz[2)]

1) With option R&S FSUP-B60, only 10 MHz can be used as an external reference frequency.

2) Limits may vary dependent on DUT tuning slope and resulting loop stability.

Phase noise measurement, PLL method without cross-correlation

Spurious level, internal reference	offset > 1 kHz	
	f ≤ 8 GHz	–80 dBc
	8 GHz to 16 GHz	–74 dBc
	16 GHz to 26.5 GHz	–68 dBc
	26.5 GHz to 50 GHz	–62 dBc
Measurement uncertainty		
	100 Hz to 10 MHz offset	typ. <1 dB
	1 Hz to 100 Hz or 10 MHz to 30 MHz offset	typ. <3 dB
Spectral purity, SSB phase noise (1 Hz)	f = 640 MHz Internal reference oscillator and phase detector, input level = 15 dBm, 7^{th} harmonic selected, temp : +20°C to +30°C; LNA gain = 30 dB, loop bandwidth = 10 Hz, cross correlation off	
	frequency offset	SSB phase noise
	1 Hz	<–60 dBc (1 Hz), nom
	10 Hz	<–90 dBc (1 Hz), nom.
	100 Hz	<–105 dBc (1 Hz)
	1 kHz	<–128 dBc (1 Hz)
	10 kHz	<–135 dBc (1 Hz)
	100 kHz	<–144 dBc (1 Hz)
	1 MHz	<–159 dBc (1 Hz)
	10 MHz	<–165 dBc (1 Hz), nom.
	30 MHz	<–165 dBc (1 Hz), nom.
Measurement modes	internal reference, internal phase detector external reference, internal phase detector	

Phase noise sensitivity with internal reference oscillator and phase detector (nominal values)
Input level >+5 dBm (with option R&S FSUP-B60 >+10 dBm), harmonic auto selected, temp : +20 °C to +30 °C.
LNA gain 30 dB, loop bandwidth ≤ 10 × frequency offset, max 10 kHz.

Frequency offset	Input frequency, values in dBc (1 Hz)							
	10 MHz	100 MHz	1 GHz	3 GHz	10 GHz	18 GHz	26 GHz	50 GHz
1 Hz	–105	–85	–65	–55	–45	–40	–35	–32
10 Hz	–127	–107	–87	–77	–67	–62	–59	–53
100 Hz	–144	–127	–108	–98	–88	–83	–80	–74
1 kHz	–158	–146	–126	–116	–106	–101	–98	–92
10 kHz	–162	–151	–134	–123	–114	–109	–106	–100
100 kHz	–164	–157	–144	–134	–124	–119	–116	–110
1 MHz	–166	–166	–161	–154	–144	–139	–136	–130
10 MHz	–	–166	–165	–163	–160	–160	–160	–145
30 MHz	–	–166	–165	–163	–160	–160	–160	–145

Phase noise measurement, PLL method with cross-correlation

R&S FSUP-B60 Low Phase Noise Option

Frequency range		
	R&S FSUP8	10 MHz to 8 GHz
	R&S FSUP26	10 MHz to 8 GHz
	R&S FSUP50	10 MHz to 8 GHz
Number of correlations		1 to 10000
Phase noise sensitivity improvement by cross-correlation (typ.)		
	number of correlations (average factor)	phase noise sensitivity values without cross correlation are improved up to
	100	10 dB
	10000	20 dB

Transient Measurements

Measurement capabilities		frequency versus time phase versus time amplitude versus time carrier power versus time
Max. recording length		131200 samples
Bandwidth	sampling rate	max. recording time
100 Hz	122.0 Hz	1069 s
200 Hz	244.1 Hz	534 s
400 Hz	488.3 Hz	267 s
800 Hz	977.6 Hz	133 s
1.6 kHz	1.953 kHz	66.8 s
3.2 kHz	3.906 kHz	33.4 s
6.4 kHz	7.812 kHz	16.7 s
12.5 kHz	15.62 kHz	8.36 s
25 kHz	31.25 kHz	4.18 s
50 kHz	62.5 kHz	2.09 s
100 kHz	125 kHz	1.04
200 kHz	250 kHz	522 ms
400 kHz	500 kHz	261 ms
800 kHz	1 MHz	131 ms
1.6 MHz	2 MHz	65.3 ms
3 MHz	4 MHz	32.6 ms
5 MHz	8 MHz	16.3 ms
8 MHz	16 MHz	8.2 ms
10 MHz	32 MHz	4.1 ms
18 MHz	32 MHz	4.1 ms
30 MHz	64 MHz	2 ms
Trigger functions		free run, external, IF power
Transients carrier power measurement		
Display range		noise floor to +30 dBm
Max. dynamic range	demodulation bandwidth 200 kHz	typ. 75 dB
Display linearity	S/N>16 dB	typ. 0.2 dB
Measurement uncertainty	S/N>16 dB (RF = 50 kHz to 3 GHz)	typ. 1 dB
Transients frequency measurement		
Measurement range		0 Hz to 14 MHz
Frequency deviation uncertainty		<3 % of measured value + residual FM
Residual FM	demodulation bandwidth ≤ 200 kHz, RMS	
	RF ≤ 1 GHz	15 Hz
	RF = 3 GHz	65 Hz
Distortion	deviation <400 kHz	0.3 %
Transients phase measurement		
Measurement range		<1000 rad

VCO parameter characterization

Measurement parameters		VCO tuning characteristic VCO tuning sensitivity RF power pushing ON/OFF measurement of harmonics VCO DC characteristic summary
Frequency range	R&S FSUP8	20 Hz to 8 GHz
	R&S FSUP26	20 Hz to 26.5 GHz
	R&S FSUP50	20 Hz to 50 GHz
Power supplies		
Tuning ports		2 tuning ports
DC ports		2 DC ports
AUX ports		1 auxiliary port
VCO tuning characteristics		
Display		automatic scaling numerical values of key parameters
Pushing		display of 3 traces for 3 different voltages in parallel
VCO tuning sensitivity		
Display		automatic scaling numerical values of key parameters
Pushing		display of 3 traces for 3 different voltages in parallel
RF power		
Display		automatic scaling numerical values of key parameters
		combined display of tuning and power characteristic
Pushing		display of 3 traces for 3 different voltages in parallel
Pulling[3)]	option R&S FSP-B28. TTL- switching signals for a user pulling unit (external) are supported	display of 3 traces for 3 different termination impedances in parallel
Measurement of harmonics		
Display		automatic scaling numerical values of key parameters
	number of displayed harmonics	display of 3 traces for 3 harmonics
Order of harmonics	user-selectable	0 to 10
VCO DC characteristics		
Display		automatic scaling numerical values of key parameters
Additional features		switching sequence for power ports

3) Requires option R&S FSP-B28 installed.

Parameters of DC ports 1 and 2

Voltage	minimum value	0 V
	maximum value	12 V
	measurement accuracy (+20 °C to +30 °C)	± (0.4 % of readout value +5 mV)
	noise voltage (1 Hz) at 10 kHz offset	<10 nV nom.
Current	maximum current	500 mA[4)]
	measurement accuracy (+20 °C to +30 °C)	± (2 % of readout value +5 mA)
Additional settings		minimum and maximum voltage limit setting
		maximum current limit
	pushing	pushing voltage settable

Parameters of AUX port

Voltage	minimum voltage	–10 V
	maximum voltage	0 V
	measurement accuracy (+20 °C to +30 °C)	±(0.4 % of readout +5 mV)
	noise voltage (1 Hz) at 10 kHz offset	<20 nV nom.
Current	maximum current	500 mA
	measurement accuracy (+20 °C to +30 °C)	± (2 % of readout +5 mA) nom.

Parameters of tuning ports 1 and 2

Voltage	minimum value	–10 V
	maximum value	28 V
Setting	setting accuracy (+20 °C to +30 °C)	± (0.2 % of set value +5 mV)[5)]
	noise voltage (1 Hz) at 10 kHz offset	1 nV nom.
Current	maximum current (source impedance 1 kΩ)	20 mA [5)]
	measurement accuracy (+20 °C to +30 °C)	± (2 % of readout +2 mA)
Source impedance		3 kΩ max.

4) If both DC ports are active the maximum current of 500 mA is the sum current of both ports.

5) If current is drawn from the tuning port the tuning voltage may decrease due to a voltage drop over the source impedance.

Spectrum analyzer mode

Frequency

Frequency range			
	R&S FSUP8	DC coupled	20 Hz to 8 GHz
		AC coupled	1 MHz to 8 GHz
	R&S FSUP26	DC coupled	20 Hz to 26.5 GHz
		AC coupled	10 MHz to 26.5 GHz
	R&S FSUP50	DC coupled	20 Hz to 50 GHz
Frequency resolution			0.01 Hz

Frequency display		with marker or frequency counter
Marker resolution		span/624
Maximum deviation	sweep time >3 × auto sweep time	±(marker frequency × reference error + 0.5 % × span +10 % × resolution bandwidth + ½ (last digit))
Frequency counter resolution	selectable	0.1 Hz to 10 kHz
Count accuracy	S/N >25 dB	±(frequency × reference error + ½ (last digit))
Display range for frequency axis		0 Hz, 10 Hz to max. frequency
Resolution		0.1 Hz
Max. span deviation		1 %

Spectral purity, SSB phase noise (1 Hz)	f = 640 MHz	
Residual FM	RBW 10 kHz, RMS	1 Hz nominal
Carrier offset	10 Hz	–86 dBc, nominal
	100 Hz	<–98 dBc,. typ. –104 dBc
	1 kHz	<–116 dBc, typ. –124 dBc
	10 kHz	<–128 dBc, typ. –133 dBc
	100 kHz	<–130 dBc, typ. –134 dBc
	1 MHz	<–140 dBc, typ. –150 dBc
	10 MHz	typ. –160 dBc

Sweep

Sweep time	time sweep, span = 0 Hz	1 µs to 16000 s in 5 % steps
	frequency sweep, span ≥10 Hz	2.5 ms to 16000 s in steps of ≤10 %
Max. deviation of sweep time		3 %
Measurement in time domain		with marker and cursor lines (resolution 31.25 ns)

Resolution bandwidths

Sweep filters		
3 dB bandwidths		10 Hz to 20 MHz in 1/2/3/5 sequence, 50 MHz
Bandwidth uncertainty	10 Hz to 100 kHz (digital)	<3 %
	200 kHz to 5 MHz (analog)	<10 %
	10 MHz	–30 % to +10 %
	20 MHz	–20 % to +20 %
	50 MHz, f ≤ 3.6 GHz	–20 % to +20 %
	50 MHz, f > 3.6 GHz	–30 % to +100 %

Shape factor 60 dB:3 dB	≤100 kHz	<6
	200 kHz to 2 MHz	<12
	3 MHz to 10 MHz	<7
	20 MHz, 50 MHz	<6, nominal

FFT filters		
3 dB bandwidths		1 Hz to 30 kHz in 1/2/3/5 sequence
Bandwidth uncertainty		5 %, nominal
Shape factor 60 dB:3 dB		<3, nominal

EMI filters		
6 dB bandwidths		200 Hz, 9 kHz, 120 kHz
Bandwidth uncertainty		3 %, nominal
Shape factor 60 dB:3 dB		<6, nominal

Channel filters		
Bandwidths		100, 200, 300, 500 Hz, 1, 1.5, 2, 2.4, 2.7, 3, 3.4, 4, 4.5, 5, 6, 8.5, 9, 10, 12.5, 14, 15, 16, 18 (RRC), 20, 21, 24.3 (RRC), 25, 30, 50, 100, 150, 192, 200, 300, 500 kHz, 1, 1.2288, 1.28 (RRC), 1.5, 2, 3, 3.84 (RRC), 4.096 (RRC), 5 MHz
Shape factor 60 dB:3 dB		<2, nominal
Bandwidth uncertainty		2 %, nominal

Video bandwidths		1 Hz to 10 MHz in 1/2/3/5 sequence

Level

Display range		displayed noise floor to +30 dBm

Maximum input level		
DC voltage	RF input AC coupled RF input DC coupled	50 V 0 V
CW RF power	RF attenuation 0 dB RF attenuation ≥10 dB	20 dBm (= 0.1 W) 30 dBm (= 1 W)
Pulse spectral density		97 dBµV/MHz
Max. pulse voltage	RF attenuation ≥10 dB	150 V
Max. pulse energy	RF attenuation ≥10 dB, 10 µs	1 mWs

Intermodulation		
1 dB compression of input mixer	0 dB RF attenuation ≤3.6 GHz >3.6 GHz R&S FSUP8 R&S FSUP26, R&S FSUP50	 +13 dBm, nominal +10 dBm, nominal +7 dBm, nominal
Third-order intercept point (TOI)	level 2 × –10 dBm, Δf > 5 × RBW or 10 kHz, whichever is larger R&S FSUP8 10 MHz ≤ f < 300 MHz 300 MHz ≤ f ≤ 3.6 GHz 3.6 GHz ≤ f ≤ 8 GHz R&S FSUP26, R&S FSUP50 10 MHz ≤ f < 300 MHz 300 MHz ≤ f < 3.6 GHz 3.6 GHz ≤ f < 26.5 GHz R&S FSUP50 26.5 GHz ≤ f < 28 GHz 28 GHz ≤ f ≤ 40 GHz f > 40 GHz	 >17 dBm, typ. 20 dBm >20 dBm, typ. 25 dBm >18 dBm, typ. 23 dBm >17 dBm, typ. 20 dBm >22 dBm, typ. 27 dBm >12 dBm, typ. 15 dBm >8 dBm, typ. 11 dBm >12 dBm, typ. 15 dBm 12 dBm, nominal
Second harmonic intercept (SHI)	f < 100 MHz 100 MHz < f ≤ 400 MHz 400 MHz < f ≤ 500 MHz 500 MHz < f ≤ 1 GHz 1 GHz < f ≤ 1.8 GHz f > 1.8 GHz	>35 dBm >45 dBm, typ. 55 dBm >52 dBm, typ. 60 dBm >45 dBm, typ. 55 dBm >35 dBm 80 dBm, nominal

Displayed average noise level	0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time 50 ms, trace average, sweep count = 20, mean marker, normalized to 10 Hz RBW	
	all models 20 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz 10 MHz	 <–80 dBm <–100 dBm <–110 dBm <–120 dBm <–120 dBm <–130 dBm <–143 dBm
	R&S FSUP8 20 MHz ≤ f < 2.0 GHz 2 GHz ≤ f < 8 GHz	 <–143 dBm, typ. –145 dBm <–140 dBm, typ. –142 dBm
	R&S FSUP26 20 MHz ≤ f < 2 GHz 2 GHz ≤ f < 3.6 GHz 3.6 GHz ≤ f < 8 GHz 8 GHz ≤ f < 13 GHz 13 GHz ≤ f < 18 GHz 18 GHz ≤ f < 22 GHz 22 GHz ≤ f < 26.5 GHz	 <–140 dBm, typ. –145 dBm <–138 dBm, typ. –143 dBm <–142 dBm, typ. –146 dBm <–140 dBm, typ. –143 dBm <–138 dBm, typ. –141 dBm <–137 dBm, typ. –140 dBm <–135 dBm, typ. –138 dBm

	R&S FSUP50	
	20 MHz ≤ f < 2 GHz	<–140 dBm, typ. –145 dBm
	2 GHz ≤ f < 3.6 GHz	<–138 dBm, typ. –143 dBm
	3.6 GHz ≤ f < 13 GHz	<–140 dBm, typ. –143 dBm
	13 GHz ≤ f < 18 GHz	<–138 dBm, typ. –141 dBm
	18 GHz ≤ f < 22 GHz	<–137 dBm, typ. –140 dBm
	22 GHz ≤ f < 26.5 GHz	<–135 dBm, typ. –138 dBm
	26.5 GHz ≤ f < 32 GHz	<–128 dBm, typ. –131 dBm
	32 GHz ≤ f < 46 GHz	<–123 dBm, typ. –126 dBm
	46 GHz ≤ f < 50 GHz	<–118 dBm, typ. –121 dBm

Maximum dynamic range		
1 dB compression to DANL (1 Hz)		170 dB

Immunity to interference		
Image frequency	f ≤ 3.6 GHz f > 3.6 GHz f > 40 GHz	>90 dB, typ. >110 dB >70 dB, typ. >100 dB typ. 70 dB
Intermediate frequency	f ≤ 3.6 GHz 3.6 GHz < f ≤ 4.2 GHz f > 4.2 GHz	>90 dB, typ. >110 dB typ. 70 dB >70 dB, typ. >90 dB
Spurious response	f > 1 MHz, without input signal, 0 dB RF attenuation	<–103 dBm
Other interfering signals	∆f > 100 kHz mixer level <–10 dBm, f ≤ 2.3 GHz mixer level <–35 dBm, 2.3 GHz < f < 4 GHz mixer level <–10 dBm 4 GHz ≤ f < 8 GHz 8 GHz ≤ f < 16 GHz 16 GHz ≤ f < 26 GHz 26.5 GHz ≤ f < 40 GHz f ≥ 40 GHz	 <–80 dBc <–70 dBc <–70 dBc <–64 dBc <–58 dBc <–52 dBc <–52 dBc, nom.

Level display		
Screen		625 × 500 pixel (one diagram), max. 2 diagrams with independent settings
Logarithmic level axis		1 dB to 200 dB, in steps of 1/2/5
Linear level axis		10 % of reference level per level division, 10 divisions or logarithmic scaling
Number of traces	1 measurement diagram 2 measurement diagrams	3 6
Trace detector		Max Peak, Min Peak, Auto Peak (normal), Sample, RMS, Average, Quasi Peak
Number of measurement points	default value range	625 155 to 10001 in steps of about a factor of 2
Trace functions		Clear/Write, MaxHold, MinHold, Average
Trace update rate	local measurement, display update rate, 625 points, zero span remote measurement, display off: zero span/sweep time 1 ms span = 10 MHz, sweep time 2.5 ms	80/s 70/s 50/s
Setting range of reference level	logarithmic level display	–130 dBm to (+5 dBm + RF attenuation), max. 30 dBm, in steps of 0.1 dB
	linear level display	7.0 nV to 7.07 V in steps of 1 %
Units of level axis	logarithmic level display linear level display	dBm, dBµV, dBmV, dBµA, dBpW µV, mV, µA, mA, pW, nW

Level measurement uncertainty		
Absolute level uncertainty at 128 MHz	RBW = 10 kHz, level –30 dBm, reference level –30 dBm, RF attenuation 10 dB	<0.2 dB (σ = 0.07 dB)
Frequency response referenced to 128 MHz	DC coupling, RF attenuation ≥10 dB, +20 °C to +30 °C 10 MHz ≤ f < 3.6 GHz 3.6 GHz ≤ f < 8 GHz, span < 1 GHz 8 GHz ≤ f < 22 GHz, span < 1 GHz 22 GHz ≤ f < 26.5 GHz, span < 1 GHz 26.5 GHz ≤ f < 40 GHz, span < 1 GHz 40 GHz ≤ f < 50 GHz, span < 1 GHz, RF attenuation ≤ 40 dB f ≥ 3.6 GHz, span ≥ 1 GHz +5 °C to +45 °C 10 MHz ≤ f < 3.6 GHz 3.6 GHz ≤ f < 26.5 GHz f ≥ 26.5 GHz	 <0.3 dB (σ = 0.1 dB) <1.5 dB (σ = 0.5 dB) <2 dB (σ = 0.7 dB) <2.5 dB (σ = 0.8 dB) <2.5 dB (σ = 0.8 dB) <3 dB (σ = 1.0 dB) add 0.5 dB to above values <0.6 dB (σ = 0.2 dB) add 0.5 dB to above values add 1.0 dB to above values
Attenuator switching uncertainty	f = 128 MHz 0 dB to 70 dB, referenced to 10 dB attenuation	<0.2 dB (σ = 0.07 dB)
Uncertainty of reference level setting	RF attenuation 10 dB, referenced to –10 dBm reference level setting	<0.15 dB (σ = 0.05 dB)

Display nonlinearity	+20 °C to +30 °C, mixer level ≤–10 dBm	
Logarithmic level display	RBW ≤ 100 kHz or channel filters, S/N >20 dB 0 dB to –70 dB –70 dB to –90 dB	 <0.1 dB (σ = 0.03 dB) <0.3 dB (σ = 0.1 dB)
	200 kHz ≤ RBW ≤ 10 MHz, S/N >16 dB 0 dB to –50 dB –50 dB to –70 dB	 <0.2 dB (σ = 0.07 dB) <0.5 dB (σ = 0.17 dB)
	RBW > 10 MHz, S/N >16 dB 0 dB to –50 dB	 <0.5 dB (σ = 0.17 dB)
Linear level display		5 % of reference level
Bandwidth switching error	referenced to RBW = 10 kHz 1 Hz to 100 kHz 200 kHz to 3 MHz 5 MHz to 50 MHz FFT filter 1 Hz to 3 kHz	 <0.1 dB (σ = 0.03 dB) <0.2 dB (σ = 0.07 dB) <0.5 dB (σ = 0.15 dB) <0.2 dB (σ = 0.07 dB)

Total measurement uncertainty		
	0 dB to –70 dB, S/N >20 dB, span/RBW < 100, 95 % confidence level, +20 °C to +30 °C, mixer level ≤–10 dBm f < 3.6 GHz, RBW ≤100 kHz f < 3.6 GHz, RBW >100 kHz 3.6 GHz ≤ f < 8 GHz 8 GHz ≤ f < 18 GHz 18 GHz ≤ f < 26.5 GHz 26.5 GHz ≤ f < 40 GHz 40 GHz ≤ f < 50 GHz	 0.3 dB 0.5 dB 2.0 dB 2.5 dB 3.0 dB 3.0 dB 3.5 dB

I/Q data

Interface		GPIB or LAN interface
Memory length		max. 512 k samples I and Q
Sample length		24 bit, each I and Q
Sample rate	settable in steps of 0.5 (32 MHz × 2–n, n = 0 to 11)	15.625 kHz to 32 MHz
Max. signal bandwidth	sample rate ≤2 MHz 4 MHz 8 MHz 16 MHz 32 MHz	0.8 × sample rate 2.8 MHz 4.8 MHz 7 MHz 9 MHz
IF prefilter bandwidth		300 kHz to 10 MHz, 1/2/3/5 steps

Trigger functions

Trigger		
Trigger source		free run, video, external, IF level (mixer level 10 dBm to –50 dBm)
Trigger offset	span ≥10 Hz	125 ns to 100 s, resolution 125 ns min. (or 1 % of offset)
	span = 0 Hz	± (125 ns to 100 s), resolution 125 ns min., dependent on sweep time
Max. deviation of trigger offset		± (31.25 ns + (0.1 % × trigger offset))
Gated sweep		
Gate source		external, IF level, video
Gate delay		1 µs to 100 s
Gate length		125 ns to 100 s, resolution min. 125 ns or 1% of gate length
Max. deviation of gate length		±(31.25 ns + (0.05 % × gate length))

Inputs and outputs (front panel)

RF input		
Impedance		50 Ω
Connector	R&S FSUP8 R&S FSUP26 R&S FSUP50	N female test port adapter APC 3.5 mm/N female test port adapter 2.4 mm/N female
VSWR	RF attenuation ≥10 dB, DC coupled f < 3.6 GHz R&S FSUP8 3.6 GHz ≤ f < 8 GHz R&S FSUP26; R&S FSUP50 3.6 GHz ≤ f < 18 GHz 18 GHz ≤ f < 26.5 GHz 26.5 GHz ≤ f < 40 GHz 40 GHz ≤ f ≤ 50 GHz	 <1.5 <2 <1.8 <2.0 <2.5 <3, nom.
	RF attenuation <10 dB or AC coupling	typ.1.5
Setting range of attenuator		0 dB to 75 dB, in 5 dB steps

Probe power supply		
Supply voltages		+15 V DC, –12.6 V DC and ground, max. 150 mA, nom.

Power supply for antennas, etc		5-pin connector
Supply voltages		±10 V and ground, max. 100 mA, nom.

DC ports 1 and 2		BNC connector
Supply voltages		0 V to 12 V, max. 500 mA, nom.

Tuning ports 1 and 2		BNC connector
Supply voltages		–10 V to 28 V, max. 20 mA, nom.

AUX port		BNC connector
Supply voltages		–10 V to 0 V, max. 500 mA, nom.

Keyboard connector		PS/2 female for MF-2 keyboard
AF output		
Connector		3.5 mm mini jack
Output impedance		10 Ω
Open-circuit voltage		up to 1.5 V, adjustable
Power supply for noise source		BNC female
Output voltage		0 V and 28 V, switchable, nominal

Inputs and outputs (rear panel)

IF 20.4 MHz		BNC female
Impedance		50 Ω
Bandwidth	RBW ≤ 30 kHz	1.67 × resolution bandwidth, min. 2.6 kHz
	RBW = 50 kHz, 100 kHz	400 kHz
	200 kHz ≤ RBW ≤ 10 MHz	equal to resolution bandwidth
Level	RBW ≤ 100 kHz, FFT filter, mixer level >–70 dBm	–20 dBm at reference level
	RBW = 200 kHz to 10 MHz, mixer level >–50 dBm	0 dBm at reference level

IF 404.4 MHz	active only if RBW > 10 MHz	BNC female
Impedance		50 Ω
Bandwidth	RBW > 10 MHz	equal to resolution bandwidth
Level	mixer level ≤0 dBm	mixer level typ. –10 dB

Video output		BNC female
Impedance		50 Ω
Output voltage	RBW ≥ 200 kHz, logarithmic scaling, full scale	0 V to 1 V (EMF)

Reference output		BNC female
Impedance		50 Ω
Output frequency		10 MHz
Level		>0 dBm, nominal

Reference input		BNC female
Impedance		50 Ω
Input frequency range		1 MHz ≤ f_{in} ≤ 20 MHz, in 1 Hz steps
Required level		>0 dBm from 50 Ω

Sweep output		BNC female
Output voltage		0 V to 5 V, proportional to displayed frequency

External trigger/gate input		BNC female
Trigger voltage		1.4 V (TTL)
Input impedance		≥10 kΩ

IEC/IEEE bus control		interface to IEC 625-2 (IEEE 488.2)
Command set		SCPI 1997.0 or HP8566 compatible
Connector		24-pin Amphenol female
Interface functions		SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0
LAN interface		10/100BaseT, RJ-45
USB interface		type A plug, version 1.1
Serial interface		RS-232-C (COM), 9-pin female connectors
Printer interface		parallel (Centronics compatible)
Mouse interface		PS/2 compatible
Connector for external monitor (VGA)		15-pin D-Sub

General specifications

Display		21 cm LC TFT color display (8.4")
Resolution		800 × 600 pixel (SVGA resolution)
Pixel failure rate		<1 × 10^{-5}

Mass memory		
Mass memory		1.44 Mbyte 3 ½" disk drive, hard disk, USB flash disk (not supplied)
Data storage		>500 instrument settings and traces

Temperature		
Temperature	operating temperature range permissible temperature range	+5 °C to +40 °C 0 °C to +50 °C
Climatic loading		+40 °C at 95 % relative humidity (DIN EN 60068-2-30: 2000-02)

Mechanical resistance		
	sinusoidal vibration	5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; in line with DIN EN 60068-2-6: 1996-05, DIN EN 60068-2-30: 2000-02, DIN EN 61010-1,MIL-T-28800D, class 5
	random vibration	10 Hz to 100 Hz, acceleration 1 g (RMS)
	shock	40 g shock spectrum, in line with MIL-STD-810C and MIL-T-28800D, classes 3 and 5
Recommended calibration interval	operation with external reference operation with internal reference	2 years 1 year
RFI suppression		in line with EMC directive of EU (89/336/EEC) and German EMC legislation

Power supply		
AC supply		100 V to 240 V, 3.1 A to 1.3 A, 50 Hz to 400 Hz, class of protection I to VDE 411
Power consumption	R&S FSUP8 R&S FSUP26, R&S FSUP50	typ. 130 VA typ. 150 VA
Safety		in line with EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1, DIN EN 61010-1
Test mark		VDE, GS, CSA, CSA-NRTL
Dimensions	W × H × D	435 mm × 192 mm × 460 mm (17.13 in × 7.56 in × 18.11 in)
Weight (without options)[6)]	R&S FSUP8 R&S FSUP26 R&S FSUP50	17.6 kg (38.8 lb) 18.1 kg (39.9 lb) 18.6 kg (41 lb)

[6)] With option R&S FSUP-B60, 1.2 kg have to be added

R&S FSU-B21 LO/IF Ports for External Mixers (for R&S FSUP26 and R&S FSUP50 only)

LO signal		
Frequency range		7 GHz to 15.5 GHz
Level	+20 °C to +30 °C +5 °C to +45 °C	+15.0 dBm ±1 dB +15.0 dBm ±3 dB

IF input		
IF frequency		404.4 MHz
Full scale level	2-port mixer (LO output/IF input, front panel) 3-port mixer (IF input, front panel)	–20 dBm –20 dBm
Level uncertainty	IF input level –30 dBm, RBW 30 kHz, 2-port mixer, LO output/IF input (front panel) +20 °C to +30 °C +5 °C to +45 °C 3-port mixer, IF input (front panel) +20 °C to +30 °C +5 °C to +45 °C	 <1 dB <3 dB <1 dB <3 dB

Inputs and outputs (front panel)

Option R&S FSU-B21		
LO output/IF input		SMA female, 50 Ω
IF input		SMA female, 50 Ω

R&S FSU-B23 RF Preamplifier
(for R&S FSUP26 only, requires option R&S FSU-B25)

Level measurement uncertainty		
Frequency response	preamplifier = on 3.6 GHz to 8 GHz 8 GHz to 22 GHz 22 GHz to 26.5 GHz	 <2.0 dB (σ = 0.7 dB) <2.5 dB (σ = 0.8 dB) <3.0 dB (σ = 1 dB)

Displayed average noise level	0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time 50 ms, trace average, sweep count = 20, mean marker, normalized to 10 Hz RBW	
	preamplifier = off 3.6 GHz to 8 GHz 8 GHz to 26.5 GHz	 R&S FSUP26 specifications + 2 dB R&S FSUP26 specifications + 3 dB
	preamplifier = on 3.6 GHz to 8 GHz 8 GHz to 13 GHz 13 GHz to 18 GHz 18 GHz to 22 GHz 22 GHz to 26.5 GHz	 <–152 dBm, typ. –155 dBm <–149 dBm, typ. –152 dBm <–147 dBm, typ. –150 dBm <–144 dBm, typ. –149 dBm <–140 dBm, typ. –145 dBm

R&S FSU-B25 Electronic Attenuator

Frequency		
Frequency range	R&S FSUP8	100 kHz to 8 GHz
	R&S FSUP26	100 kHz to 3.6 GHz
	R&S FSUP50	100 kHz to 3.6 GHz

Setting range		
Electronic attenuator		0 dB to 30 dB, in 5 dB steps
Preamplifier		20 dB, switchable

Level measurement uncertainty		
Frequency response	with preamplifier or electronic attenuator	
	10 MHz to 50 MHz	<1 dB (σ = 0.34 dB)
	50 MHz to 3.6 GHz	<0.6 dB (σ = 0.2 dB)
	3.6 MHz to 8 GHz	<2 dB (σ = 0.7 dB)
Reference error	at 128 MHz, RBW ≤100 kHz, reference level –30 dBm, RF attenuation 10 dB	
	electronic attenuator	<0.3 dB (σ = 0.1 dB)
	preamplifier	<0.3 dB (σ = 0.1 dB)

Displayed average noise level	0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time 50 ms, trace average, sweep count = 20, mean marker, normalized to 10 Hz RBW	
	preamplifier on	
	R&S FSUP8, R&S FSUP26 10 MHz to 2 GHz 2 GHz to 3.6 GHz	 <–152 dBm <–150 dBm
	R&S FSUP8 3.6 GHz to 8 GHz	 <–147 dBm
	R&S FSUP50 10 MHz to 40 MHz 40 MHz to 2 GHz 2 GHz to 3.6 GHz	 <–150 dBm <–152 dBm <–150 dBm
	with the R&S FSU-B25 built in, the average noise level values displayed by the base units degrade by (R&S FSU-B25 off)	
	20 Hz to 3.6 GHz	1 dB
	R&S FSUP8 3.6 GHz to 8 GHz	 2 dB
	preamplifier off, electronic attenuator 0 dB	
	20 Hz to 3.6 GHz	typ. 2.5 dB
	R&S FSUP8 3.6 GHz to 8 GHz	 typ. 3.5 dB

Intermodulation		
Third-order intercept point (TOI)	electronic attenuator on, Δf >5 × RBW or 10 kHz	
	10 MHz to 300 MHz	>17 dBm
	300 MHz to 3.6 GHz	>20 dBm
	3.6 GHz to 8 GHz	>18 dBm

Ordering information

Designation	Type	Order No.
Signal Source Analyzer 20 Hz to 8 GHz	R&S FSUP8	1166.3505.08
Signal Source Analyzer 20 Hz to 26.5 GHz	R&S FSUP26	1166.3505.26
Signal Source Analyzer 20 Hz to 50 GHz	R&S FSUP50	1166.3505.50
Accessories supplied Power cable, operating manual, service manual, R&S FSUP26: test port adapter with 3.5 mm female (1021.0512.00) and N female (1021.0535.00) connector R&S FSUP50: test port adapter with 2.4 mm female (1088.1627.02) and N female (1036.4777.00) connector		

Options

Designation	Type	Order No.	Retrofittable	Remarks
Options				
Low-Aging OCXO	R&S FSU-B4	1144.9000.02	yes	
External Generator Control	R&S FSP-B10	1129.7246.02	yes	
LO/IF Ports for External Mixers	R&S FSU-B21	1157.1090.02	yes	for R&S FSUP26 and R&S FSUP50 only
20 dB Preamplifier, 3.6 GHz to 26.5 GHz	R&S FSU-B23	1157.0907.02	no	for R&S FSUP26 only, requires R&S FSU-B25
Electronic Attenuator, 0 dB to 30 dB, and 20 dB Preamplifier (3.6 GHz)	R&S FSU-B25	1044.9298.02	yes	
Trigger Port	R&S FSU-B28	1162.9915.02	yes	
Low Phase Noise	R&S FSU-B60	1169.5544.02	yes	
Firmware/software				
AM/FM/φM Measurement Demodulator	R&S FS-K7	1141.1796.02		
Power Sensor Measurements	R&S FS-K9	1157.3006.02		
Application Firmware for Noise Figure and Gain Measurements	R&S FS-K30	1300.6508.02		preamplifier (e.g. R&S FSU-B25) recommended

Recommended extras

Designation	Type	Order No.
Headphones		0708.9010.00
IEC/IEEE Bus Cable, 1 m	R&S PCK	0292.2013.10
IEC/IEEE Bus Cable, 2 m	R&S PCK	0292.2013.20
19" Rack Adapter	R&S ZZA-411	1096.3283.00
Adapter for mounting on telescopic rails (only with 19" Adapter R&S ZZA-411)	R&S ZZA-T45	1109.3774.00
Matching pads, 50/75 Ω		
L Section, matching at both ends	R&S RAM	0358.5414.02
Series Resistor, 25 Ω, matching at one end (taken into account in instrument function RF INPUT 75 Ω)	R&S RAZ	0358.5714.02
SWR bridges, 50 Ω		
SWR Bridge, 5 MHz to 3 GHz	R&S ZRB2	0373.9017.5X (X = 2/3/5/6)
SWR Bridge, 40 kHz to 4 GHz	R&S ZRC	1039.9492.5X (X = 2/5)
High power attenuators		
100 W, 3/6/10/20/30 dB, 1 GHz	R&S RBU100	1073.8495.XX (XX = 03/06/10/20/30)
50 W, 3/6/10/20/30 dB, 2 GHz	R&S RBU50	1073.8695.XX (XX = 03/06/10/20/30)
50 W, 20 dB, 6 GHz	R&S RDL50	1035.1700.52
Connectors and cables		
Probe power connector, 3-pin		1065.9480.02
DC blocks		
DC Block, 10 kHz to 18 GHz (type N)	R&S FSE-Z4	1084.7443.02
External harmonic mixers (for R&S FSUP26, R&S FSUP50 with option R&S FSU-B21)		
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	1089.0847.02
Harmonic Mixer 60 GHz to 90 GHz	R&S FS-Z90	1089.0899.02
Harmonic Mixer 90 GHz to 110 GHz	R&S FS-Z110	1089.0947.03
For R&S FSUP26 only		
Test port adapter N male		1021.0541.00
Test port adapter 3.5 mm male		1021.0529.00
Microwave Measurement Cable with test port adapter set N male and 3.5 mm male	R&S FSE-Z15	1046.2002.02
For R&S FSUP50 only		
Test port adapter N male		1036.4783.00
Test port adapter K female		1036.4790.00
Test port adapter K male		1036.4802.00

For product brochure, see PD 5213.6729.12
and www.rohde-schwarz.com
(search term: FSUP)

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