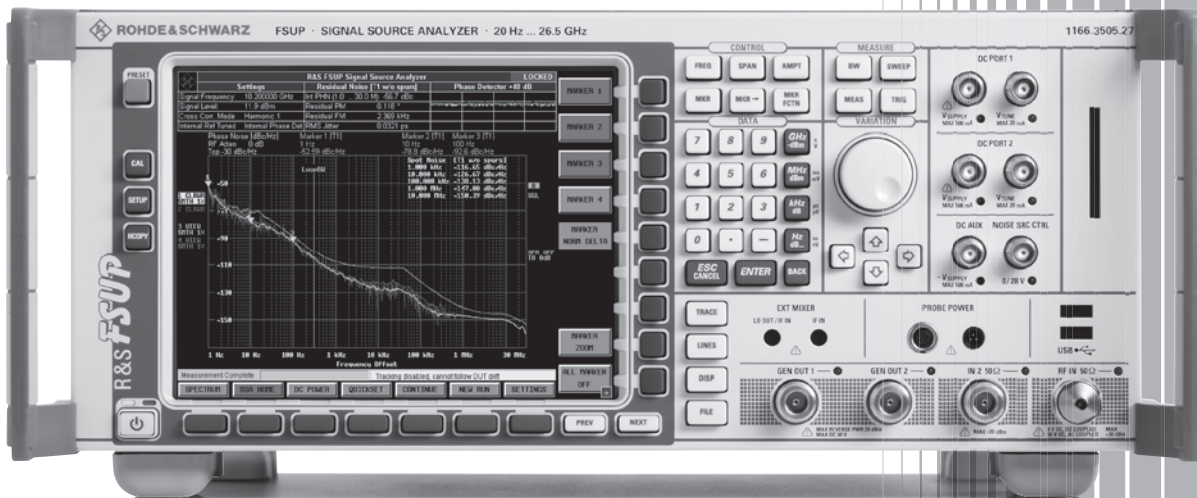


# R&S® FSUP

## Signal Source Analyzer

### Specifications



**75** Years of  
Driving  
Innovation



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# Specifications

Specifications apply 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 unless otherwise stated. Data designated 'nominal' applies to design parameters and is not tested.

<b>Operating modes</b>	
	signal source analyzer spectrum analyzer
<b>Signal source analyzer</b>	
	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 residual phase noise measurement AM noise measurement <sup>1</sup> baseband noise measurement transient measurements VCO parameter characterization

## All operating modes

Internal reference frequency

<b>Reference frequency, internal, nominal</b>	standard OCXO	
Aging per day	after 30 days of continuous operation	$1 \times 10^{-9}$
Aging per year	after 30 days of continuous operation	$1 \times 10^{-7}$
Temperature drift	+5 °C to +40 °C	$8 \times 10^{-8}$
Total frequency error	per year	$1.8 \times 10^{-7}$
<b>Reference frequency, internal, nominal</b>	R&S <sup>®</sup> FSU-B4 option	
Aging per day	after 30 days of continuous operation	$2 \times 10^{-10}$
Aging per year	after 30 days of continuous operation	$3 \times 10^{-8}$
Temperature drift	+5 °C to +40 °C	$1 \times 10^{-9}$
Total frequency error	per year	$5 \times 10^{-8}$
<b>External reference frequency</b>		1 MHz to 20 MHz, 1 Hz steps <sup>2</sup>

## Signal source analyzer mode

### Phase noise measurement with PLL method

(internal reference oscillator, internal phase detector)

<b>Frequency range</b>	R&S <sup>®</sup> FSUP8	1 MHz to 8 GHz
	R&S <sup>®</sup> FSUP26	1 MHz to 26.5 GHz
	R&S <sup>®</sup> FSUP50	1 MHz to 50 GHz
<b>Frequency resolution</b>		0.01 Hz
<b>Offset frequency range</b>		1 Hz to 30 MHz
<b>RF level range</b>	Input frequency < 46 GHz	>-10 dBm to +30 dBm -20 dBm to +30 dBm (typ.)
	Input frequency ≥ 46 GHz	> 0 dBm to +30 dBm -5 dBm to +30 dBm (typ.)
<b>Loop bandwidth</b>	PLL control of internal reference	1 Hz to 10 kHz <sup>3</sup>
	PLL control of DUT	1 Hz to 10 kHz <sup>3</sup>

<sup>1</sup> External AM noise detector required.

<sup>2</sup> With the R&S<sup>®</sup>FSUP-B60 option, only 10 MHz can be used as an external reference frequency.

<sup>3</sup> Limits may vary depending on DUT tuning slope and resulting loop stability.

## Phase noise measurement, PLL method without cross-correlation

(internal reference oscillator, internal phase detector)

<b>Spurious level, internal reference</b>	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
<b>Measurement uncertainty</b>	signal harmonics < -30 dBc	
	100 Hz to 10 MHz offset	typ. <1 dB
	1 Hz to 100 Hz or 10 MHz to 30 MHz offset	typ. <3 dB
<b>Spectral purity, SSB phase noise (1 Hz)</b>	f = 640 MHz internal reference oscillator and phase detector, input level = +10 dBm, input signal harmonics and spurs < -30 dBc, +20 °C to +30 °C, LNA gain = 40 dB, loop bandwidth = 10 Hz, cross-correlation OFF	
	frequency offset	SSB phase noise
	1 Hz	<-60 dBc (1 Hz), nominal
	10 Hz	<-90 dBc (1 Hz), nominal
	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), nominal
	30 MHz	<-165 dBc (1 Hz), nominal
	<b>Measurement modes</b>	internal reference, internal phase detector

Phase noise sensitivity specification with internal reference oscillator and internal phase detector

Input level &gt; +5 dBm (with R&amp;S®FSUP-B60 option &gt; +10 dBm), input signal harmonics and spurs &lt;-30 dBc, operating mode "averaged", +20 °C to +30 °C

LNA gain 40 dB, loop bandwidth ≤ 10 × frequency offset, max. 1 kHz

Frequency offset	input frequency, values in dBc (1 Hz) R&S®FSUP8/26/50						R&S®FSUP26/50		R&S®FSUP50
	5 MHz	10 MHz	100 MHz	1 GHz	3 GHz	7 GHz	10 GHz	20 GHz	40 GHz
1 kHz	-150	-150	-145	-124	-114	-108	-102	-96	-90
10 kHz	-158	-155	-150	-129	-120	-113	-107	-101	-95
100 kHz	-160	-160	-160	-142	-131	-124	-117	-111	-105
1 MHz	-	-165	-165	-159	-145	-145	-138	-132	-126
10 MHz	-	-	-165	-160	-155	-154	-150	-148	-142
30 MHz	-	-	-	-160	-155	-155	-150	-148	-142

Phase noise sensitivity (typical values)

Frequency offset	input frequency, values in dBc (1 Hz) R&S®FSUP8/26/50						R&S®FSUP26/50		R&S®FSUP50
	5 MHz	10 MHz	100 MHz	1 GHz	3 GHz	7 GHz	10 GHz	20 GHz	40 GHz
1 Hz	-113	-113	-90	-70	-61	-52	-50	-44	-38
10 Hz	-132	-131	-107	-90	-83	-67	-70	-66	-60
100 Hz	-141	-144	-129	-112	-101	-87	-90	-84	-78
1 kHz	-154	-154	-149	-127	-117	-111	-107	-101	-95
10 kHz	-162	-159	-154	-133	-123	-116	-112	-106	-100
100 kHz	-171	-164	-165	-145	-134	-127	-122	-116	-110
1 MHz	-	-170	-170	-162	-149	-148	-142	-136	-130
10 MHz	-	-	-170	-167	-159	-157	-155	-153	-147
30 MHz	-	-	-170	-167	-159	-160	-155	-153	-147

## Phase noise measurement, PLL method with cross-correlation

R&S®FSUP-B60 low phase noise option installed, R&S®FSUP-B61 correlation extension option not installed

Frequency range	R&S®FSUP8	1 MHz to 8 GHz
	R&S®FSUP26	1 MHz to 26.5 GHz
	R&S®FSUP50	1 MHz to 50 GHz
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	signal harmonics ≤ -30 dBc	
	100 Hz to 10 MHz offset	typ. <1 dB
	1 Hz to 100 Hz or 10 MHz to 30 MHz offset	typ. <3 dB

Phase noise sensitivity specification with internal reference oscillator and internal phase detector

Input level > +10 dBm, input signal harmonics and spurs < -30 dBc, operating mode "averaged", +20 °C to +30 °C

LNA gain 40 dB, loop bandwidth ≤ 10 × frequency offset, max. 1 kHz

Frequency offset	input frequency, values in dBc (1 Hz) R&S®FSUP8/26/50						R&S®FSUP26/50		R&S®FSUP50
	5 MHz	10 MHz	100 MHz	1 GHz	3 GHz	7 GHz	10 GHz	20 GHz	40 GHz
1 kHz	-151	-151	-150	-130	-118	-113	-102	-96	-90
10 kHz	-159	-159	-158	-139	-125	-124	-107	-101	-95
100 kHz	-160	-166	-163	-150	-135	-134	-117	-111	-105
1 MHz	-	-168	-165	-160	-152	-150	-138	-132	-126
10 MHz	-	-	-170	-165	-165	-160	-150	-148	-142
30 MHz	-	-	-	-165	-165	-160	-150	-148	-142

Phase noise sensitivity (typical values)

Frequency offset	input frequency, values in dBc (1 Hz) R&S®FSUP8/26/50						R&S®FSUP26/50		R&S®FSUP50
	5 MHz	10 MHz	100 MHz	1 GHz	3 GHz	7 GHz	10 GHz	20 GHz	40 GHz
1 Hz	-114	-116	-87	-75	-62	-55	-50	-44	-38
10 Hz	-136	-135	-110	-91	-87	-80	-70	-66	-60
100 Hz	-143	-146	-134	-115	-106	-97	-90	-84	-78
1 kHz	-157	-161	-160	-134	-123	-118	-107	-101	-95
10 kHz	-165	-168	-168	-143	-131	-129	-112	-106	-100
100 kHz	-171	-170	-176	-158	-139	-140	-122	-116	-110
1 MHz	-	-175	-177	-165	-160	-155	-142	-136	-130
10 MHz	-	-	-179	-172	-170	-170	-155	-153	-147
30 MHz	-	-	-179	-172	-170	-170	-155	-153	-147

**R&S® FSUP-B60 low phase noise option and R&S® FSUP-B61 correlation extension option installed**

<b>Frequency range</b>	R&S®FSUP26	1 MHz to 26.5 GHz
	R&S®FSUP50	1 MHz to 50 GHz
<b>Spurious level, internal reference</b>	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
<b>Measurement uncertainty</b>	signal harmonics < -30 dBc	
	100 Hz to 10 MHz offset	typ. <1 dB
	1 Hz to 100 Hz or 10 MHz to 30 MHz offset	typ. <3 dB

Phase noise sensitivity specification with internal reference oscillator and internal phase detector  
 Input level > +10 dBm, input signal harmonics and spurs < -30 dBc, operating mode "averaged", +20 °C to +30 °C  
 LNA gain 40 dB, loop bandwidth ≤ 10 x frequency offset, max. 1 kHz

Frequency offset	input frequency, values in dBc (1 Hz) R&S®FSUP8/26/50						R&S®FSUP26/50		R&S®FSUP50
	5 MHz	10 MHz	100 MHz	1 GHz	3 GHz	7 GHz	10 GHz	20 GHz	40 GHz
1 kHz	-151	-151	-150	-130	-118	-113	-110	-106	-100
10 kHz	-159	-159	-158	-139	-125	-124	-120	-116	-110
100 kHz	-160	-166	-163	-150	-135	-134	-132	-126	-120
1 MHz	-	-168	-165	-160	-152	-150	-144	-138	-132
10 MHz	-	-	-170	-165	-165	-160	-160	-154	-148
30 MHz	-	-	-	-165	-165	-160	-160	-154	-148

Phase noise sensitivity (typical values)

Frequency offset	input frequency, values in dBc (1 Hz) R&S®FSUP8/26/50						R&S®FSUP26/50		R&S®FSUP50
	5 MHz	10 MHz	100 MHz	1 GHz	3 GHz	7 GHz	10 GHz	20 GHz	40 GHz
1 Hz	-114	-116	-87	-75	-62	-55	-52	-48	-42
10 Hz	-136	-135	-110	-91	-87	-80	-77	-71	-65
100 Hz	-143	-146	-134	-115	-106	-97	-95	-89	-83
1 kHz	-157	-161	-160	-134	-123	-118	-116	-112	-106
10 kHz	-165	-168	-168	-143	-131	-129	-126	-120	-114
100 kHz	-171	-170	-176	-158	-139	-140	-138	-132	-126
1 MHz	-	-175	-177	-165	-160	-155	-150	-146	-140
10 MHz	-	-	-179	-172	-170	-170	-167	-161	-155
30 MHz	-	-	-179	-172	-170	-170	-170	-165	-159

## Phase noise sensitivity improvement by correlation

Nominal phase noise sensitivity improvement by correlation measurements				
Number of correlations	10	100	1000	10000
Phase noise sensitivity improvement by up to	5 dB	10 dB	15 dB	20 dB

Predefined correlation modes Offset frequency range	mode "fast"		mode "normal"		mode "averaged"	
	number of correlations	improvement by up to (nominal values, in dB)	number of correlations	improvement by up to (nominal values, in dB)	number of correlations	improvement by up to (nominal values, in dB)
1 Hz to 3 Hz	1	0	1	0	3	2
3 Hz to 10 Hz	1	0	3	2	10	5
10 Hz to 30 Hz	1	0	10	5	30	7
30 Hz to 100 Hz	1	0	30	7	100	10
100 Hz to 300 Hz	1	0	100	10	100	10
300 Hz to 1 kHz	3	2	100	10	300	12
1 kHz to 3 kHz	10	5	100	10	300	12
3 kHz to 10 kHz	30	7	100	10	1000	15
10 kHz to 30 kHz	100	10	100	10	1000	15
30 kHz to 100 kHz	100	10	100	10	1000	15
100 kHz to 300 kHz	100	10	300	12	1000	15
300 kHz to 1 MHz	100	10	300	12	1000	15
1 MHz to 3 MHz	100	10	300	12	1000	15
3 MHz to 10 MHz	100	10	300	12	1000	15
10 MHz to 30 MHz	100	10	1000	15	3000	17

## Phase noise measurement, spectrum analyzer mode

Frequency range	R&S®FSUP8	1 MHz to 8 GHz
	R&S®FSUP26	1 MHz to 26.5 GHz
	R&S®FSUP50	1 MHz to 50 GHz
Displayed average noise level	specifications under "Displayed average noise level" in section "Spectrum analyzer mode" apply	
Phase noise sensitivity	specifications under "Spectral purity, SSB phase noise" in section "Spectrum analyzer mode" apply	

## Amplitude noise measurement

Frequency range	R&S®FSUP8, R&S®FSUP26, R&S®FSUP50	frequency range depends on external AM noise detector range
Input voltage at <i>Input 2</i> connector		max. $\pm 1$ V ( $V_{rms}$ )
Input impedance at <i>Input 2</i> connector		400 $\Omega$    50 pF (nominal)
Measurement uncertainty	offset range 1 kHz to 3 MHz	typ. <3 dB

**Amplitude noise sensitivity normalized to an external AM noise detector, conversion factor  $\geq -4$  dB<sup>4</sup>**  
**Input level > +15 dBm, input signal harmonics and spurs < -30 dBc, operating mode "averaged", +20 °C to +30 °C**  
**LNA gain 50 dB, Input 2 terminated with 50  $\Omega$**

Frequency offset <sup>5</sup>	noise floor in dBc (1 Hz) (nominal)
1 kHz	-150
10 kHz	-160
100 kHz	-160
1 MHz	-160

<sup>4</sup> The noise floor may increase for an AM detector gain lower than -4 dB.

<sup>5</sup> The AM detector source impedance may define the maximum offset frequency of the measurement (lowpass).

## Residual phase noise measurement with external phase detector (added phase noise measurement)

Frequency range	R&S®FSUP8, R&S®FSUP26, R&S®FSUP50	frequency range depends on external phase noise detector range
Input level at <i>Input 2</i> connector		max. $\pm 1$ V ( $V_{rms}$ )
Input impedance at <i>Input 2</i> connector		400 $\Omega$    50 pF (nominal)
Measurement uncertainty	offset range 1 kHz to 1 MHz	typ. <3 dB

**Phase noise floor with external phase detector, phase detector slope  $\geq 500$  mV/rad<sup>6</sup>**  
**Phase detector input level > +10 dBm, input signal harmonics and spurs < -30 dBc, sweep mode “averaged”, +20 °C to +30 °C, LNA gain = 50 dB, input resistance = 400  $\Omega$**

Frequency offset	noise floor values in dBc (1 Hz) (nominal)
1 kHz	-140
10 kHz	-150
100 kHz	-160
1 MHz	-160

## Residual phase noise measurement with internal phase detector (added phase noise measurement)

Frequency range	R&S®FSUP8, R&S®FSUP26, R&S®FSUP50	100 MHz to 8 GHz
RF level input		+10 dBm (same level at both inputs)
Measurement uncertainty	offset range 1 kHz to 1 MHz	typ. <3 dB

**Phase noise floor with internal phase detector**  
**Input level<sup>7</sup> > +10 dBm, input signal harmonics and spurs < -30 dBc, sweep mode “averaged”, +20 °C to +30 °C, LNA gain 50 dB, signal**

Frequency offset	noise floor values in dBc (1 Hz) (nominal)
	1 GHz
1 kHz	-120
10 kHz	-130
100 kHz	-140
1 MHz	-150

## Baseband noise measurement

Frequency range	R&S®FSUP8, R&S®FSUP26, R&S®FSUP50	1 Hz to 30 MHz
Input level at <i>Input 2</i> connector		max. 1 V ( $V_{rms}$ )
Input impedance at <i>Input 2</i> connector		400 $\Omega$    50 pf (nominal)
Measurement uncertainty	range 1 kHz to 1 MHz	typ. <3 dB

**Noise floor**  
**Input 2 terminated with 50  $\Omega$ , AC-coupled, sweep mode “averaged”, +20 °C to +30 °C, LNA gain = 50 dB**

Range	noise floor
1 kHz to 1 MHz	-160 dBV (1 Hz) (nominal)

<sup>6</sup> The noise floor may increase for lower slopes. Signal harmonics may affect the noise display.

<sup>7</sup> Signal harmonics may affect the noise display.



## 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 s
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
<b>Transient carrier power measurement</b>		
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
<b>Transient frequency measurement</b>		
Measurement range		0 Hz to 14 MHz
Frequency deviation uncertainty		<3 % of measured value + residual FM
Residual FM	demodulation bandwidth $\leq$ 200 kHz, RMS	
	RF $\leq$ 1 GHz	15 Hz
	RF = 3 GHz	65 Hz
Distortion	deviation < 400 kHz	0.3 %
<b>Transient phase measurement</b>		
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	10 MHz to 8 GHz
	R&S®FSUP26	10 MHz to 26.5 GHz
	R&S®FSUP50	10 MHz to 50 GHz
<b>Power supplies</b>		
Tuning ports		2 tuning ports
DC ports		2 DC ports
AUX ports		1 auxiliary port
<b>VCO tuning characteristics</b>		
Display		automatic scaling numeric values of key parameters
Pushing		display of 3 traces for 3 different voltages in parallel
<b>VCO tuning sensitivity</b>		
Display		automatic scaling numeric values of key parameters
Pushing		display of 3 traces for 3 different voltages in parallel
<b>RF power</b>		
Display		automatic scaling numeric values of key parameters
		combined display of tuning and power characteristic
Pushing		display of 3 traces for 3 different voltages in parallel
Pulling <sup>8</sup>	R&S®FSP-B28 option TTL-switching signals for user pulling unit (external) supported	display of 3 traces in parallel for 3 different external termination impedances
<b>Measurement of harmonics</b>		
Display		automatic scaling numeric values of key parameters
	number of displayed harmonics	display of 3 traces for 3 harmonics
Order of harmonics	user-selectable	0 to 10
<b>VCO DC characteristics</b>		
Display		automatic scaling numeric values of key parameters
Additional features		switching sequence for power and tuning ports

<sup>8</sup> The R&S®FSP-B28 option must be 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 reading + 5 mV)
	noise voltage (1 Hz) at 10 kHz offset	<10 nV, nominal
Current	maximum current	500 mA <sup>9</sup>
	measurement accuracy (+20 °C to +30 °C)	±(2 % of reading + 5 mA)
Additional settings		minimum and maximum voltage limit setting
		maximum current limit
	pushing	settable pushing voltage

**Parameters of AUX port**

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

**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) <sup>10</sup>
	noise voltage (1 Hz) at 10 kHz offset	1 nV, nominal
Current	maximum current (source impedance 1 kΩ)	20 mA <sup>10</sup>
	measurement accuracy (+20 °C to +30 °C)	±(2 % of reading + 2 mA)
Source impedance		500 Ω nominal

<sup>9</sup> If both DC ports are active, the maximum current of 500 mA is the sum current of both ports.

<sup>10</sup> If current is drawn from the tuning port, the tuning voltage may decrease due to a voltage drop over the source impedance.

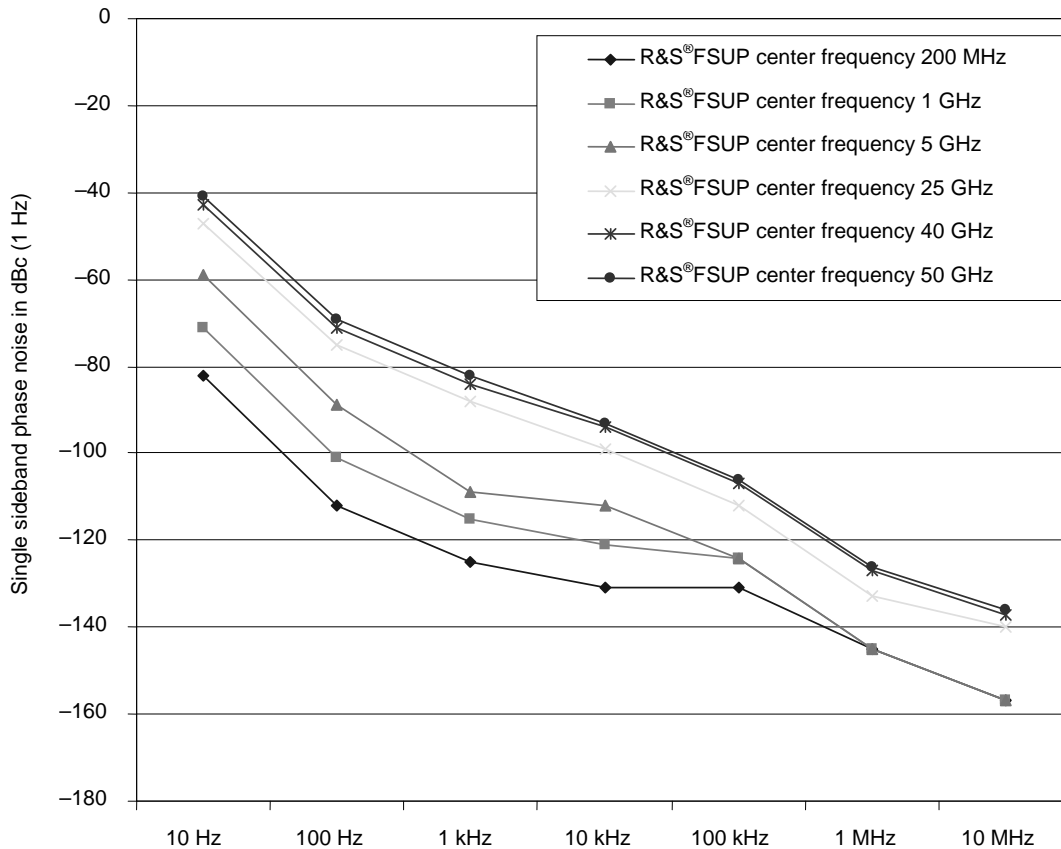
# Spectrum analyzer mode

## 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
Frequency resolution	R&S®FSUP50	DC-coupled	20 Hz to 50 GHz
			0.01 Hz

<b>Frequency display</b>		with marker or frequency counter
Marker resolution		1 Hz
Uncertainty		$\pm(\text{marker frequency} \times \text{reference uncertainty} + 10\% \times \text{resolution bandwidth} + \frac{1}{2} (\text{span}/(\text{sweep points} - 1)) + 1 \text{ Hz})$
Marker tuning frequency step size	default	span/624
	marker step size = sweep points	span/(sweep points - 1)
Frequency counter resolution	selectable	0.1 Hz to 10 kHz
Count accuracy	S/N > 25 dB	$\pm(\text{frequency} \times \text{reference error} + \frac{1}{2} (\text{last digit}))$
Display range for frequency axis		0 Hz, 10 Hz to max. frequency
Resolution		0.1 Hz
Max. span deviation		1 %

<b>Spectral purity, SSB phase noise (1 Hz)</b>	f = 640 MHz, +20 °C to +30 °C	
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. -133 dBc
	1 MHz	<-140 dBc, typ. -146 dBc
	10 MHz	typ. -160 dBc



## Sweep

Sweep time	time sweep, span = 0 Hz	1 $\mu$ s to 16000 s in 5 % steps
	frequency sweep, span $\geq$ 10 Hz	2.5 ms to 16000 s in steps of $\leq$ 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, $f \leq$ 3.6 GHz	-20 % to +20 %
Shape factor 60 dB : 3 dB	50 MHz, $f >$ 3.6 GHz	-30 % to +100 %
	$\leq$ 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

<b>EMI filters</b>		
6 dB bandwidths		200 Hz, 9 kHz, 120 kHz
Bandwidth uncertainty		3 %, nominal
Shape factor 60 dB : 3 dB		<6, nominal
<b>Channel filters</b>		
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
<b>Video bandwidths</b>		
		1 Hz to 10 MHz in 1/2/3/5 sequence

## Level

Display range		displayed noise floor to +30 dBm
<b>Maximum input level</b>		
DC voltage	RF input, AC-coupled	50 V
	RF input, DC-coupled	0 V
CW RF power	RF attenuation 0 dB	20 dBm (= 0.1 W)
	RF attenuation $\geq 10$ dB	30 dBm (= 1 W)
Pulse spectral density		97 dB $\mu$ V/MHz
Max. pulse voltage	RF attenuation $\geq 10$ dB	150 V
Max. pulse energy	RF attenuation $\geq 10$ dB, 10 $\mu$ s	1 mWs

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

Displayed average noise level		
0 dB RF attenuation, termination 50 $\Omega$ , logarithmic scaling, normalized to 1 Hz RBW $f < 10$ kHz: 10 Hz FFT filter, trace average, sweep count = 20 $f \geq 10$ kHz: RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time 50 ms, sample detector, trace average, sweep count = 20, mean marker		
20 Hz		<-90 dBm
100 Hz		<-110 dBm
1 kHz		<-120 dBm
10 kHz		<-130 dBm
100 kHz		<-130 dBm
1 MHz		<-140 dBm
10 MHz		<-153 dBm
R&S <sup>®</sup> FSUP8		
20 MHz $\leq f < 2.0$ GHz		<-154 dBm, typ. -157 dBm
2.0 GHz $\leq f < 3.0$ GHz		<-152 dBm, typ. -156 dBm
3.0 GHz $\leq f < 3.6$ GHz		<-150 dBm, typ. -152 dBm
3.6 GHz $\leq f < 7$ GHz		<-152 dBm, typ. -154 dBm
7 GHz $\leq f \leq 8$ GHz		<-150 dBm, typ. -152 dBm
R&S <sup>®</sup> FSUP26 without R&S <sup>®</sup> FSUP-B61 option		
20 MHz $\leq f < 2$ GHz		<-151 dBm, typ. -155 dBm
2 GHz $\leq f < 3.6$ GHz		<-148 dBm, typ. -152 dBm
3.6 GHz $\leq f < 8$ GHz		<-152 dBm, typ. -156 dBm
8 GHz $\leq f < 13$ GHz		<-150 dBm, typ. -153 dBm
13 GHz $\leq f < 18$ GHz		<-148 dBm, typ. -151 dBm
18 GHz $\leq f < 22$ GHz		<-147 dBm, typ. -150 dBm
22 GHz $\leq f \leq 26.5$ GHz		<-145 dBm, typ. -148 dBm
R&S <sup>®</sup> FSUP26 with R&S <sup>®</sup> FSUP-B61 option installed		
20 MHz $\leq f < 2$ GHz		<-151 dBm, typ. -155 dBm
2 GHz $\leq f < 3.6$ GHz		<-148 dBm, typ. -152 dBm
3.6 GHz $\leq f < 8$ GHz		<-151 dBm, typ. -155 dBm
8 GHz $\leq f < 13$ GHz		<-149 dBm, typ. -153 dBm
13 GHz $\leq f < 18$ GHz		<-147 dBm, typ. -151 dBm
18 GHz $\leq f < 22$ GHz		<-145 dBm, typ. -148 dBm
22 GHz $\leq f \leq 26.5$ GHz		<-143 dBm, typ. -146 dBm
R&S <sup>®</sup> FSUP50 without R&S <sup>®</sup> FSUP-B61 option		
20 MHz $\leq f < 2$ GHz		<-151 dBm, typ. -155 dBm
2 GHz $\leq f < 3.6$ GHz		<-148 dBm, typ. -152 dBm
3.6 GHz $\leq f < 13$ GHz		<-150 dBm, typ. -153 dBm
13 GHz $\leq f < 18$ GHz		<-148 dBm, typ. -151 dBm
18 GHz $\leq f < 22$ GHz		<-147 dBm, typ. -150 dBm
22 GHz $\leq f < 26.5$ GHz		<-145 dBm, typ. -148 dBm
26.5 GHz $\leq f < 32$ GHz		<-138 dBm, typ. -141 dBm
32 GHz $\leq f < 46$ GHz		<-133 dBm, typ. -136 dBm
46 GHz $\leq f \leq 50$ GHz		<-128 dBm, typ. -131 dBm
R&S <sup>®</sup> FSUP50 with R&S <sup>®</sup> FSUP-B61 option installed		
20 MHz $\leq f < 2$ GHz		<-151 dBm, typ. -155 dBm
2 GHz $\leq f < 3.6$ GHz		<-148 dBm, typ. -152 dBm
3.6 GHz $\leq f < 13$ GHz		<-148 dBm, typ. -151 dBm
13 GHz $\leq f < 18$ GHz		<-146 dBm, typ. -150 dBm
18 GHz $\leq f < 22$ GHz		<-145 dBm, typ. -148 dBm
22 GHz $\leq f < 26.5$ GHz		<-143 dBm, typ. -145 dBm
26.5 GHz $\leq f < 32$ GHz		<-135 dBm, typ. -138 dBm
32 GHz $\leq f < 40$ GHz		<-130 dBm, typ. -133 dBm
40 GHz $\leq f < 46$ GHz		<-128 dBm, typ. -131 dBm
46 GHz $\leq f \leq 50$ GHz		<-125 dBm, typ. -128 dBm
<b>Maximum dynamic range</b>		
1 dB compression to DANL (1 Hz)		170 dB



<b>Immunity to interference</b>		
Image frequency	$f \leq 3.6$ GHz	>90 dB suppression, typ. >110 dB
	$3.6$ GHz < $f \leq 40$ GHz	>70 dB suppression, typ. >100 dB
	$f > 40$ GHz	70 dB suppression, nominal
	$f =$ receive frequency	
Intermediate frequency	$f \leq 3.6$ GHz	>90 dB suppression, typ. >110 dB
	$3.6$ GHz < $f \leq 4.2$ GHz	typ. 70 dB suppression
	$4.2$ GHz < $f \leq 50$ GHz	>70 dB suppression, typ. >90 dB
	$f =$ receive frequency	
Spurious response	$f > 1$ MHz, without input signal, 0 dB RF attenuation, RBW $\leq 20$ MHz	<-103 dBm
Other interfering signals	$\Delta f > 100$ kHz	
	mixer level < -10 dBm, $f_{in} \leq 2.3$ GHz	<-80 dBc
	mixer level < -35 dBm, $2.3$ GHz < $f_{in} < 4$ GHz	<-70 dBc
	mixer level < -10 dBm	
	$4$ GHz $\leq f < 8$ GHz	<-70 dBc
	$8$ GHz $\leq f < 16$ GHz	<-64 dBc
	$16$ GHz $\leq f < 26.5$ GHz	<-58 dBc
	$26.5$ GHz $\leq f < 40$ GHz	<-52 dBc
	$f \geq 40$ GHz	<-52 dBc, nominal
	$f =$ receive frequency	

<b>Level display</b>		
Screen		625 x 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	3
	2 measurement diagrams	6
Trace detector		Max Peak, Min Peak, Auto Peak (normal), Sample, RMS, Average, Quasi Peak
Number of measurement points	default value	625
	range	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	90/s
	remote measurement, display OFF: zero span/sweep time 1 ms	100/s
	span = 10 MHz, sweep time 2.5 ms	70/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	dBm, dB $\mu$ V, dBmV, dB $\mu$ A, dBpW
	linear level display	$\mu$ V, mV, $\mu$ A, mA, pW, nW

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

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

<b>Total measurement uncertainty</b>		
	signal level 0 dB to -70 dB below reference level, S/N > 20 dB, 10 dB $\leq$ RF attenuation $\leq 40$ dB, span/RBW < 100, 95 % confidence level, +20 °C to +30 °C, mixer level $\leq -10$ dBm	
	$f < 3.6$ GHz, RBW $\leq 100$ kHz	0.3 dB
	$f < 3.6$ GHz, RBW > 100 kHz	0.5 dB
	3.6 GHz $\leq f < 8$ GHz	1.2 dB
	8 GHz $\leq f < 22$ GHz	1.5 dB
	22 GHz $\leq f < 40$ GHz	1.8 dB
	40 GHz $\leq f < 50$ GHz	2.2 dB

## I/Q data

General		
Interface		GPIO or LAN interface
Sampling rate		programmable: 10 kHz to 81.6 MHz in 0.1 Hz steps
ADC resolution		14 bit
I/Q memory		16 Msample each for I and Q data
Max. equalized bandwidth		7 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 $\geq$ 10 Hz	125 ns to 100 s, resolution min. 125 ns (or 1 % of offset)
	span = 0 Hz	$\pm$ (125 ns to 100 s), resolution min. 125 ns, depending on sweep time
Max. deviation of trigger offset		$\pm$ (31.25 ns + (0.1 % $\times$ trigger offset))
Gated sweep		
Gate source		external, IF level, video
Gate delay		1 $\mu$ s to 100 s
Gate length		125 ns to 100 s, resolution min. 125 ns or 1 % of gate length
Max. deviation of gate length		$\pm$ (31.25 ns + (0.05 % $\times$ gate length))

## Inputs and outputs (front panel)

RF input			
Impedance		50 $\Omega$	
Connector	R&S <sup>®</sup> FSUP8	N female	
	R&S <sup>®</sup> FSUP26	test port adapter, APC 3.5 mm/N female	
	R&S <sup>®</sup> FSUP50	test port adapter, 2.4 mm/N female	
VSWR	RF attenuation $\geq$ 10 dB, DC-coupled		
	f < 3.6 GHz	<1.5	
	R&S <sup>®</sup> FSUP8	3.6 GHz $\leq$ f < 8 GHz	<2
		R&S <sup>®</sup> FSUP26, R&S <sup>®</sup> FSUP50	
	3.6 GHz $\leq$ f < 18 GHz	<1.8	
	18 GHz $\leq$ f < 26.5 GHz	<2.0	
	26.5 GHz $\leq$ f < 40 GHz	<2.5	
	40 GHz $\leq$ f $\leq$ 50 GHz	<3, nominal	
RF attenuation < 10 dB or AC-coupled	typ. 1.5		
Setting range of attenuator		0 dB to 75 dB, in 5 dB steps	

Input 2 (IN 2)		
Connector		N female
Input voltage at <i>Input 2</i> connector		max. $\pm$ 1 V ( $V_{rms}$ )

Generator output 1, 2 <sup>11</sup>		
Impedance		50 $\Omega$ , nominal
Connector		N female
Frequency range		10 MHz to 8 GHz
Level range		-15 to +3 dBm
Level uncertainty		1.5 dB
Level setting step size		0.5 dB

<sup>11</sup> Available only for "residual phase noise, external phase detector" mode.

<b>Probe power supply</b>		
Supply voltages		+15 V DC, -12.6 V DC and ground, max. 150 mA, nominal
<b>Power supply for antennas, etc.</b>		
Supply voltages		5-pin connector ±10 V and ground, max. 100 mA, nominal
<b>DC ports 1 and 2</b>		
Supply voltages		BNC connector 0 V to 12 V, max. 500 mA, nominal <sup>9</sup>
<b>Tuning ports 1 and 2</b>		
Supply voltages		BNC connector -10 V to 28 V, max. 20 mA, nominal <sup>10</sup>
<b>AUX port</b>		
Supply voltages		BNC connector -10 V to 0 V, max. 500 mA, nominal
<b>USB interface</b>		
	upper connector	type A plug, version 2.0
	lower connector	type A plug, version 2.0
<b>Power supply for noise source</b>		
Output voltage		BNC female 0 V and 28 V, switchable, nominal

## Inputs and outputs (rear panel)

<b>IF 20.4 MHz</b>		
Impedance		BNC female 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
<b>IF 404.4 MHz</b>		
Impedance	active only if RBW > 10 MHz	BNC female 50 Ω
Bandwidth	RBW > 10 MHz	equal to resolution bandwidth
Level	mixer level ≤ 0 dBm	typ. -10 dB
<b>Video output</b>		
Impedance		BNC female 50 Ω
Output voltage	RBW ≥ 200 kHz, logarithmic scaling, full scale	0 V to 1 V (EMF)
<b>Reference output</b>		
Impedance		BNC female 50 Ω
Output frequency		10 MHz
Level		>0 dBm, nominal
<b>Reference input</b>		
Impedance		BNC female 50 Ω
Input frequency range		1 MHz ≤ f <sub>in</sub> ≤ 20 MHz, in 1 Hz steps <sup>2</sup>
Required level		>0 dBm into 50 Ω
<b>Sweep output</b>		
Output voltage		BNC female 0 V to 5 V, proportional to displayed frequency

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

<b>IEC/IEEE bus control</b>		interface in line with IEC 625-2 (IEEE 488.2)
Command set		SCPI 1997.0 or HP85XX 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	upper connector	type A plug, version 1.1
	lower connector	type A plug, version 2.0
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 data

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

<b>Mass memory</b>		
Mass memory		hard disk, USB flash disk (not supplied)
Data storage		>500 instrument settings and traces

<b>Environmental conditions</b>		
Temperature	operating temperature range	+5 °C to +40 °C
	permissible temperature range	0 °C to +50 °C
Climatic loading		+40 °C at 85 % relative humidity (EN 600-2-30: 2000-02)

<b>Mechanical resistance</b>		
Vibration	sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; in line with EN 60068-2-6, EN 61010-1, MIL-T-28800D, class 5
	random	10 Hz to 100 Hz, acceleration 1 g (rms)
Shock		40 g shock spectrum, in line with MIL-STD-810D Method Nr.516.4, DIN EN 60068-2-27
	R&S®FSU-B20 option: random vibration	10 Hz to 300 Hz, acceleration 1.9 g (rms)
Recommended calibration interval	operation with external reference	2 years
	operation with internal reference	1 year
RFI suppression		in line with new EMC Directive 2004/108/EC, including: IEC/EN 61326 class B (emission) CISPR 11/EN 55011 group 1 class B (emission) IEC/EN 61326 table A.1 (immunity, industrial)

<b>Power supply</b>		
AC supply		100 V to 240 V, 3.1 A to 1.3 A, 50 Hz to 400 Hz, class of protection I in line with VDE 411
Power consumption	R&S®FSUP8	typ. 130 VA
	R&S®FSUP26, R&S®FSUP50	typ. 150 VA
Safety		in line with EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1, 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) <sup>12 13</sup>	R&S®FSUP8	17.6 kg (38.8 lb)
	R&S®FSUP26	18.1 kg (39.9 lb)
	R&S®FSUP50	18.6 kg (41 lb)

<sup>12</sup> If the instrument is equipped with the R&S®FSUP-B60 option, 1.2 kg have to be added.

<sup>13</sup> If the instrument is equipped with the R&S®FSUP-B61 option, 1.5 kg have to be added.

## R&S® FSUP-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 +40 °C	+15.5 dBm ±1 dB +15.5 dBm ±3 dB

IF input		
IF frequency		404.4 MHz
Full scale level	2-port mixer (LO output/IF input, front panel)	-20 dBm
	3-port mixer (IF input, front panel)	-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	<1 dB
	+5 °C to +40 °C	<3 dB
	3-port mixer, IF input (front panel)	
	+20 °C to +30 °C	<1 dB
	+5 °C to +40 °C	<3 dB

Inputs and outputs (front panel)		
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 R&S® FSU-B25 option)

Level measurement uncertainty		
Frequency response	preamplifier = ON	
	3.6 GHz to 8 GHz	<2.0 dB ( $\sigma = 0.7$ dB)
	8 GHz to 22 GHz	<2.5 dB ( $\sigma = 0.8$ dB)
	22 GHz to 26.5 GHz	<3.0 dB ( $\sigma = 1$ dB)

Displayed average noise level		
0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time 50 ms, sample detector, logarithmic scaling, trace average, sweep count = 20, mean marker, normalized to 1 Hz RBW		
preamplifier = OFF		
3.6 GHz to 8 GHz		R&S® FSUP26 specifications + 2 dB
8 GHz to 26.5 GHz		R&S® FSUP26 specifications + 3 dB
preamplifier = ON		
3.6 GHz to 8 GHz		<-162 dBm, typ. -165 dBm
8 GHz to 13 GHz		<-159 dBm, typ. -162 dBm
13 GHz to 18 GHz		<-157 dBm, typ. -160 dBm
18 GHz to 22 GHz		<-154 dBm, typ. -159 dBm
22 GHz to 26.5 GHz		<-150 dBm, typ. -155 dBm

## R&S® FSU-B25 electronic attenuator

Frequency		
Frequency range	R&S®FSUP8	100 kHz to 8 GHz
	R&S®FSUP26, 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 ( $\sigma = 0.34$ dB)
	50 MHz to 3.6 GHz	<0.6 dB ( $\sigma = 0.2$ dB)
	3.6 MHz to 8 GHz	<2 dB ( $\sigma = 0.7$ dB)
Reference error	at 128 MHz, RBW $\leq$ 100 kHz, reference level $-30$ dBm, RF attenuation 10 dB	
	electronic attenuator	<0.3 dB ( $\sigma = 0.1$ dB)
	preamplifier	<0.3 dB ( $\sigma = 0.1$ dB)

Displayed average noise level		
	0 dB RF attenuation, termination 50 $\Omega$ , logarithmic scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 3 kHz, zero span, sweep time 50 ms, sample detector, trace average, sweep count = 20, mean marker	
	preamplifier = ON	
	R&S®FSUP8, R&S®FSUP26	
	10 MHz to 2.0 GHz	<-162 dBm
	2.0 GHz to 3.6 GHz	<-160 dBm
	R&S®FSUP8	
	3.6 GHz to 8 GHz	<-157 dBm
	R&S®FSUP50	
	10 MHz to 40 MHz	<-160 dBm
	40 MHz to 2 GHz	<-162 dBm
	2 GHz to 3.6 GHz	<-160 dBm
	If the R&S®FSU-B25 option is built in, the average noise level values displayed by the base units degrade by:	
	preamplifier = OFF, electronic attenuator = 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, $\Delta f > 5 \times$ 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



## R&S® FSUP-Z1 AM noise detector

### Measurement range

Connectors	input	APC 3.5 mm (male)
	output	SMC 14
Input impedance		50 Ω, nominal
Frequency range		10 MHz to 26.5 GHz, typ.
Input level	10 MHz to 17 GHz	-10 dBm to +15 dBm
	17 GHz to 20 GHz	-10 dBm to +12 dBm
	20 GHz to 26.5 GHz	-10 dBm to +10 dBm

### Effective system data

The specified effective system data are achieved after performing the appropriate system error calibration.

The data are valid between +20 °C and +30 °C, with a power of ≥ +10 dBm at the detector input and a termination resistance of 400 Ω at the detector output.

Input frequency range	input frequency	AM noise conversion gain
	10 MHz	>-8 dB, typ.
	30 MHz	>-7 dB, typ.
	100 MHz	>-5 dB, typ.
	1 GHz	>-5 dB, typ.
	10 GHz	>-5 dB, typ.
	20 GHz	>-6 dB, typ.
	26 GHz	>-7 dB, typ.
AM noise frequency offset range (3 dB)		1 Hz to 3 MHz, nominal
Input VSWR	10 MHz to 18.5 GHz	1.5:1, nominal
	18.5 GHz to 26.5 GHz	2:1, nominal

### General data

The specified data are valid for the AM noise detector without the adapter cable.

Temperature loading	operating temperature range	+20 °C to +30 °C
	permissible temperature range	5 °C to +40 °C
	storage temperature range	-40 °C to +70 °C
		in line with IEC 60068-2-1 and IEC 60068-2-2
Maximum rated input power		200 mW
Calibration interval		2 years
Dimensions (length x diameter)		43 mm x 10 mm
		1.7 in x 0.38 in
Weight		17 g (0.04 lb)
Shipping weight		1 kg (2.2 lb)

<sup>14</sup> An adapter cable SMC to BNC is supplied with the AM noise detector.

## Ordering information

Designation	Type	Order No.
Signal Source Analyzer, 20 Hz to 8 GHz	R&S®FSUP8	1166.3505.09
Signal Source Analyzer, 20 Hz to 26.5 GHz	R&S®FSUP26	1166.3505.27
Signal Source Analyzer, 20 Hz to 50 GHz	R&S®FSUP50	1166.3505.51
<b>Accessories supplied</b>		
Power cable, printed quick start guide and CD-ROM (with operating manual and 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.	Retrofit	Remarks
<b>Options</b>				
Low-Aging OCXO	R&S®FSU-B4	1144.9000.02	yes	
External Generator Control	R&S®FSP-B10	1129.7246.03	yes	
Removable Hard Disk	R&S®FSUP-B18	1303.0400.05	no	
Second Hard Disk for R&S®FSP-B18	R&S®FSUP-B19	1303.0600.05	yes	requires R&S®FSUP-B18
LO/IF Ports for External Mixers	R&S®FSUP-B21	1157.1090.04	yes	for R&S®FSUP26 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	1144.9298.02	yes	
Trigger Port	R&S®FSP-B28	1162.9915.02	yes	
Low Phase Noise	R&S®FSUP-B60	1169.5544.03	yes	
Correlation Extension	R&S®FSUP-B61	1305.2500.26	no	for R&S®FSUP26 only, requires R&S®FSUP-B60
Correlation Extension (with 26.5 GHz preamplifier)	R&S®FSUP-B61	1305.2500.23	no	for R&S®FSUP26 only, requires R&S®FSUP-B60, R&S®FSU-B25, R&S®FSU-B23
Correlation Extension	R&S®FSUP-B61	1305.2500.50	no	for R&S®FSUP50 only, requires R&S®FSUP-B60
<b>Firmware/software</b>				
GSM/EDGE Application Firmware	R&S®FS-K5	1141.1496.02		
Bluetooth® Application Firmware	R&S®FS-K8	1157.2568.02		
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 recommended (e.g. R&S®FSU-B25)
Vector Signal Analysis	R&S®FSQ-K70	1161.8038.02		
3GPP BTS/Node B FDD Application Firmware	R&S®FS-K72	1154.7000.02		
3GPP UE FDD Application Firmware (including HSPA)	R&S®FS-K73	1154.7252.02		
3GPP HSDPA BTS Application Firmware	R&S®FS-K74	1300.7156.02		requires R&S®FS-K72
3GPP TD-SCDMA BTS Application Firmware	R&S®FS-K76	1300.7291.02		
3GPP TD-SCDMA UE Application Firmware	R&S®FS-K77	1300.8100.02		
CDMA2000® IS-95 (cdmaOne)/1xEV-DV BTS Application Firmware	R&S®FS-K82	1157.2316.02		
CDMA2000® 1xEV-DV MS Application Firmware	R&S®FS-K83	1157.2416.02		
CDMA2000® 1xEV-DO BTS Application Firmware (including Rev A)	R&S®FS-K84	1157.2851.02		
CDMA2000® 1xEV-DO MS Application Firmware	R&S®FS-K85	1300.6689.02		

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## Recommended extras

Designation	Type	Order No.
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 R&S®ZZA-411 adapter)	R&S®ZZA-T45	1109.3774.00
<b>Matching pads, 50/75 Ω</b>		
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
<b>SWR bridges, 50 Ω</b>		
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)
<b>High-power attenuators</b>		
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
<b>Connectors and cables</b>		
Probe power connector, 3-pin		1065.9480.02
<b>DC blocks</b>		
DC Block, 10 kHz to 18 GHz (type N)	R&S®FSE-Z4	1084.7443.02
<b>External harmonic mixers (for R&amp;S®FSUP26, R&amp;S®FSUP50 with R&amp;S®FSUP-B21 option)</b>		
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	1089.0947.04
<b>AM noise detector</b>		
AM noise detector	R&S®FSUP-Z1	1305.2700.02
<b>For R&amp;S®FSUP26 only</b>		
Test port adapter, N male		1021.0541.00
Test port adapter, 3.5 mm male		1021.0529.00
Microwave Measurement Cable with N male and 3.5 mm male test port adapter set	R&S®FSE-Z15	1046.2002.02
<b>For R&amp;S®FSUP50 only</b>		
Test port adapter, N male		1036.4783.00
Test port adapter, K male		1036.4802.00
Test port adapter, K female		1036.4802.00

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