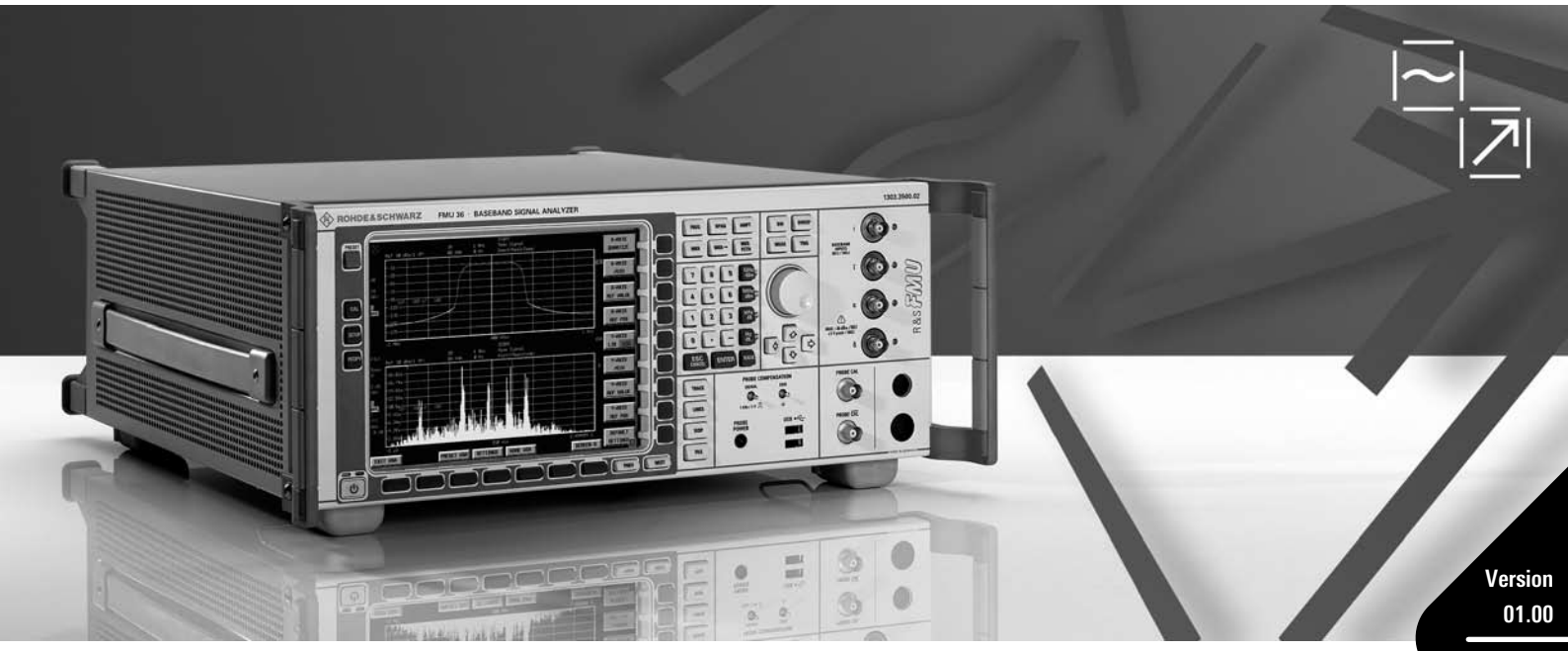

Version 01.00

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R&S®FMU36 Baseband Signal Analyzer

Specifications

ROHDE&SCHWARZ

Contents

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.

Frequency

Frequency range		DC to 36 MHz

Reference frequency, internal, nominal	**standard TCXO**	
Aging per year	after 30 days of continuous operation	1×10^{-6}
Temperature drift	+5 °C to +45 °C	1×10^{-6}
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 error	per year	5×10^{-8}
External reference frequency		1 MHz to 20 MHz, 1 Hz steps

Frequency display		with marker
Marker resolution		span/624
Maximum deviation of marker readout		±(marker frequency × reference error + 0.5 % × span +10 % × resolution bandwidth + ½ (last digit))
Display range for frequency axis (frequency span)	real signal	0 Hz, 10 Hz to 36 MHz
	complex signal	0 Hz, 10 Hz to 72 MHz
Resolution		0.1 Hz

Spectral purity, SSB phase noise (1 Hz)	f = 10 MHz	
Carrier offset	100 Hz	-115 dBc
	1 kHz	-135 dBc
	≥10 kHz	-143 dBc

Sweep

Sweep time	time domain, (span = 0 Hz)	1 µs to 16000 s in 5-% steps, max. 800000 / RBW
Max. deviation of sweep time		1 %
Measurement in time domain		with marker and cursor lines (resolution 24 ns)

Resolution bandwidths

FFT filters		
Equivalent noise bandwidths (ENBW)		0.5 Hz to 20 MHz stepped in 1/2/3/5 sequence or any value within this range by entering a bandwidth directly
Bandwidth uncertainty		<5 %
Window functions		Flattop, Gaussian, Hamming, Hanning, Chebyshev, rectangular
Shape factor 60 dB:3 dB	Flattop window	2.4 nominal
	Gaussian window	4.4 nominal
	Chebyshev window	3.84 nominal
3 dB bandwidth/ENBW	Flattop window	0.99 nominal
	Gaussian window	0.94 nominal
	Chebyshev window	0.96 nominal
	Hamming window	0.97 nominal
	Hanning window	0.97 nominal
	rectangular window	0.89 nominal

Level

Maximum save input level		
	input impedance 50 Ω, CW power	+30 dBm (1 Watt)
	input impedance 1 MΩ, peak voltage	±5 V

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
Number of measurement points	default value	625
	range	155 to 30001 in steps of about a factor of 2
Trace functions		Clear/Write, Max Hold, Min Hold, Average
Setting range of reference level	input impedance 50 Ω	–20 dBm (peak 31.6 mV) to +25 dBm (peak 5.62 V) in steps of 0.1 dB
	input impedance 1 MΩ	–20 dBm (peak 31.6 mV) to +15 dBm (peak 1.78 V) in steps of 0.1 dB
	with 10:1 Probe (R&S®FMU-Z1)	0 dBm (peak 316 mV) to +35 dBm (peak 17.8 V) in steps of 0.1 dB
Max. common mode input voltage	input impedance 50 Ω	±2 × reference level, max. ±5 V
	input impedance 1 MΩ	–2.5 V to +3.5 V
Units of level axis	logarithmic units	dBm, dBµV, dBmV, dBµA, dBpW
	linear units	V, A, W

Level uncertainty		
Level uncertainty	at 1 MHz (full scale)	<0.25 dB
	I/Q imbalance at 1 MHz	<0.1 dB
Frequency response	50 Ω	
	DC to 30 MHz,filter on	<0.3 dB
	DC to 36 MHz,filter off[1)]	<0.3 dB
	I/Q imbalance, DC to 30 MHz, filter on	<0.15 dB
	I/Q imbalance, DC to 36 MHz, filter off[1)]	<0.15 dB
Frequency response	1 MΩ	
	DC to 10 MHz	<0.30 dB
	I/Q imbalance, DC to 10 MHz	<0.15 dB
Amplitude linearity		
	0 dB to –90 dB with dither on	nominal 0.1 dB
I/Q offset		
	50 Ω balanced setting	<0.15 % of range ±0.2 mV
	50 Ω unbalanced setting	<2 mV
	1 MΩ	<2 mV

[1)] With filter switched off there is no anti-aliasing filter before the A/D converter.
Signals with spectral components above 45.6 MHz will be aliased into the displayed frequency range.

Dynamic range

Noise level		
Signal to noise ratio	reference level = +10 dBm, signal level equal to reference level	> 139 dBc (1 Hz)
Noise floor	reference level = –20 dBm RMS voltage in 1 Hz bandwidth	
	50 Ω, unbalanced setting	< -151.5 dBm (6 nV)
	50 Ω, balanced setting	< -148 dBm (9 nV)
	1 MΩ, unbalanced setting	< 25 nV
	1 MΩ, balanced setting	< 25 nV
Spurious & harmonics		
spurious with input signal equal to reference level	50 Ω: DC to 36 MHz	< -55 dBc
	1 MΩ: DC to 10 MHz, reference level ≤+10 dBm	< -55 dBc
spurious without input signal	>250 kHz	<–80 dBRef
	f < 250 kHz, reference level ≥0 dBm	<–80 dBRef
	f < 250 kHz, reference level <0 dBm	<–80 dBm
3rd order intermodulation distortion		
	Two signals, level equal to reference level –6 dB	
	50 Ω: DC to 20 MHz	< -70 dBc
	50 Ω: 20 MHz to 36 MHz	< -65 dBc
	1 MΩ: DC to 10 MHz, reference level ≤+10 dBm	< -65 dBc
Image rejection	aliasing into useful bandwidth from single out of band signal equal to reference level, aliasing filter on	–75 dB
I/Q crosstalk	DC to 36 MHz signal level equal to reference level	–70 dB

Phase

Group delay variation versus frequency		
	aliasing filter on, DC to 30 MHz	1 ns
	aliasing filter off, DC to 36 MHz	1 ns
Differential phase between I and Q		
	DC to 10 MHz	< 1.5°
	aliasing filter on, >10 MHz to 30 MHz	< 3°
	aliasing filter off, >10 MHz to 36 MHz	< 3°

Probe error correction

The level uncertainty of the baseband input is specified at the BNC connectors. The high accuracy is achieved by self-alignment using internally generated test signals.
The R&S®FMU36 allows to include the measuring cables or probes in the self-alignment. Therfore the test signals are available at the PROBE CAL BNC connectors. Probes (with BNC adapter) are connected to the PROBE CAL output and the self-alignment procedure is started by a keystroke.
Gain, offset and frequency response errors at the probe tip are measured automatically and compensated during subsequent measurements. The correction values can be stored on the hard disk.
The following specification applies to high impedance 10:1 probes. The frequency response is only achieved with proper probe compensation adjustment. The probe compensation test signal (square wave) is also available at the PROBE CAL output. If probe compensation is not adjusted, a slope in frequency response occurs at approx. 1 kHz to 3 kHz which cannot be eliminated.

DC offset		<1 mV nominal
Gain error	DC	<1 % nominal
	I/Q imbalance at DC	<0.2 % nominal
Frequency response	aliasing filter on, DC to 30 MHz	0.2 dB
	aliasing filter off, DC to 36 MHz	0.3 dB
	I/Q imbalance:	
	aliasing filter on, DC to 30 MHz	0.1 dB
	aliasing filter off, DC to 36 MHz	0.15 dB
Group delay variation versus frequency	aliasing filter on, DC to 30 MHz	1 ns
	aliasing filter off, DC to 36 MHz	1 ns

I/Q data

General		
Interface		GPIB or LAN interface
Sampling rate		programmable: 10 kHz to 81.6 MHz in 0.1-Hz steps
ADC sampling rate		81.6 MHz
ADC resolution		14 bits
I/Q memory	standard	16 Msample each for I and Q data
	option R&S®FSQ-B100	235 Msample each for I and Q data
	options R&S®FSQ-B100/-B102	705 Msample each for I and Q data

Frequency range		
Useful bandwidth with flat frequency response as specified	f_s = sampling rate	
	f_s = 40.8 MHz to 81.6 MHz	DC to 0.441 × f_s
	f_s > 20.4 MHz to < 40.8 MHz	DC to 0.34 × f_s
	f_s = 10 kHz to 20.4 MHz	DC to 0.40 × f_s

Trigger functions

Trigger		
Trigger source		free run, external, I/Q level, I level, Q level
Trigger offset		–100 ms to +50 s, resolution 1 % of offset, min. 125 ns
Max. deviation of trigger offset		±(31.25 ns + (0.1 % × trigger offset))
Trigger level	external trigger	+0.5 V to +3.5 V
	I/Q level	0 V to reference level +3 dB
	I level/Q level	0 V to ±(reference level +3 dB)

Inputs and outputs (front panel)

Baseband Inputs		
Connectors		4 × BNC female
Measuring mode		balanced/unbalanced
Input impedance	unbalanced setting	
	common mode imp.	50 Ω/1 MΩ nominal
	balanced setting	
	common mode imp.	50 Ω/1 MΩ nominal
	differential imp.	100 Ω/2 MΩ nominal
Return loss	50 Ω input impedance	
	DC to 10 MHz	30 dB
	>10 MHz to 36 MHz	20 dB
Input capacitance	with 1 MΩ input impedance setting, common mode	8 pF

Probe compensation		
Signal for adjusting passive high impedance probes	Square wave signal	1 kHz ±20 %, peak-peak 1 V ±10 % ground

Probe calibration output		
Comb spectrum for frequency response calibration	pulse width	8 ns
	pulse amplitude into 50 Ω load	500 mV
	repetition rate	10 kHz to 8 MHz
	frequency response 0 Hz to 30 MHz, referenced to 20 MHz	<±0.15 dB from sin(x)/x roll off with zero at 125 MHz
	comb line power at 1 MHz rate	–33 dBm
	polarity at CAL	positive
	polarity at CAL\	negative
DC voltage for gain calibration	setting range	0 V to 2 V
	uncertainty at 2 V, unloaded	<± 0.2 %
	source resistance	0.35 Ω
	offset at zero volt setting	<±1 mV
Polarity	CAL output	positive
	CAL\ output	negative

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

USB interface	upper connector	type A plug, version 2.0
	lower connector	type A plug, version 2.0

Inputs and outputs (rear panel)

Reference output		BNC female
Impedance		50 Ω
Output frequency		10 MHz
Level		+10 dBm

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

External trigger input		BNC female
Trigger voltage range		0.5 V to 3.5 V
Input impedance		10 kΩ

IEC/IEEE bus control		interface to IEC 625-2 (IEEE 488.2)
Command set		SCPI 1997.0
Connector		24-pin Amphenol female
Interface functions		SH1, AH1, T6, L4, SR1, RL1, PP1, DC1,DT1, C0
LAN interface		10/100BaseT, RJ45
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 specifications

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

Mass memory		
Type		hard disk
Data storage		>500 instrument settings and traces

Power supply		
AC supply		100 V/3.1 A to 240 V/1.3 A 50 Hz to 400 Hz class of protection I to VDE 411
Power consumption	R&S®FMU36 without options	100 W
Safety		meets EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1, IEC 1010-1
Test mark		VDE, GS, CSA, CSA-NRTL

Ambient conditions		
Temperature	operating temperature range	+5 °C to +45 °C
	permissible temperature range	0 °C to +50 °C
	storage temperature range	–40 °C to +70 °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; meets 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, meets MIL-STD-810C and MIL-T-28800D, classes 3 and 5
RFI suppression		meets EMC directive of EU (89/336/EEC) and German EMC legislation
Dimensions	W × H × D	435 mm × 192 mm × 460 mm
Weight	R&S®FMU36 without options	11.5 kg (25.4 lb)
Shipping weight	R&S®FMU36 without options	27 kg (59.5 lb)
Recommended calibration interval	operation with external reference	2 years
	operation with internal reference	1 year

Ordering information

Order designation	Type	Order No.
Baseband Signal Analyzer	R&S®FMU36	1303.3500.02
Accessories supplied		
Power cable, operating manual on CDROM, quick start guide (printed)		
Recommended extras		
High Impedance Probe (10 MΩ/10 pF/10:1 attenuation)	R&S®FMU-Z1	1409.7508.00
US Keyboard with trackball	R&S®PSP-Z2	1091.4100.02
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
Connectors and cables		
Probe power connector, 3 pin		1065.9480.02

Options

Order designation	Type	Order No.	Retrofittable	Remarks
Options				
OCXO, low aging	R&S®FSU-B4	1144.9000.02	yes	
I/Q Memory Extension 235 Msample	R&S®FSQ-B100	1169.5244.02	yes	
I/Q Memory Extension 705 Msample	R&S®FSQ-B102	1169.5444.04	yes	requires R&S®FSQ-B100
Firmware/Software				
GSM/EDGE Application Firmware	R&S®FS-K5	1141.1496.02		
FM Measurement Demodulator	R&S®FS-K7	1141.1796.02		
Bluetooth® Application Firmware	R&S®FS-K8	1157.2568.02		
3 GPP BTS/Node B FDD Application Firmware	R&S®FS-K72	1154.7000.02		
3 GPP UE FDD Application Firmware	R&S®FS-K73	1154.7252.02		
3 GPP HSDPA BTS Application Firmware	R&S®FS-K74	1300.7156.02		requires R&S®FS-K72
3 GPP TD-SCDMA BTS Application Firmware	R&S®FS-K76	1300.7291.02		
3 GPP 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	R&S®FS-K84	1157.2851.02		
CDMA2000® 1xEV-DO MS Application Firmware	R&S®FS-K85	1300.6689.02		
WLAN IEEE 802.11a Application Firmware	R&S®FSQ-K90	1157.3064.02		
WLAN IEEE 802.11a/b/g/j Application Firmware	R&S®FSQ-K91	1157.3129.02		
Upgrade from R&S®FSQ-K90 to R&S®FSQ-K91	R&S®FSQ-K90U	1300.8000.02		
WiMAX 802.16-2004 OFDM Application Firmware	R&S®FSQ-K92	1300.7410.02		
Upgrade from R&S FSQ-K92 to R&S FSQ-K93	R&S®FSQ-K92U	1300.8500.02		
WiMAX 802.16e-2005, WiBro Application Firmware	R&S®FSQ-K93	1300.8600.02		

The R&S®FMU36 is equipped as standard with the vector signal analysis application firmware.

For product brochure, see PD 5213.7025.12
and www.rohde-schwarz.com
(search term: FMU36)

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