



AF Analyzer/DSP Unit FMA-B8

Option for use with modulation analyzers of the FMA family for in-depth AF analysis without requiring further instruments

- Selective modulation-depth and AF-level measurements
- Selective harmonic distortion measurement of d_2 , d_3 , d_n
- True THD measurement, largely unaffected by spurious and noise signals
- Universal measurement of intermodulation products to relevant standards; eg measurement of difference-frequency distortion to German ARD specifications
- Phase noise measurement capability, indication in dBc/Hz
- Scaled display of AF spectrum through direct connection of an oscilloscope
- With options AM-FM Calibrator/AF Generator FMA-B4 and FMA-B8, the analyzers of FMA family are upgraded to complete transmitter test system



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Highly integrated measuring instruments are more cost-effective than a series of single instruments

The optional AF Analyzer/DSP Unit FMA-B8 considerably enhances the AF analysis capabilities of FMA modulation analyzers, thus completely fulfilling user requirements. For the first time, an RF modulation analyzer is capable of AF analysis that goes far beyond the customary measurement of weighted spurious modulation, noise voltage and THD + N (total harmonic distortion + noise).

In-depth analysis without need for further instruments

The option enables

- selective modulation-depth and AF level measurement
- selective harmonic distortion measurement of d_2 , d_3 , d_n
- true THD measurement
- universal measurement of intermodulation products to relevant standards
- simple phase noise measurement capability by FFT-analysis of the FM demodulator output

The very low inherent noise of both the FMA local oscillator and the FM demodulator enables phase noise measurement down to <-130 dBc/Hz at $f_c = 500$ MHz and 20-kHz offset.

All these features above make a previously needed, separate AF (FFT) analyzer superfluous even for complex modulation analysis; moreover, measurements are greatly simplified.

Broadcast applications

Together with the optional AM-FM Calibrator/AF Generator FMA-B4 (data sheet PD 756.9951), the FMA-B8 turns the modulation analyzers of the FMA family into complete and universal modulation test systems for transmitters and transposers:

- AF Generator FMA-B4 provides precise stimuli signals (single-tone, two-tone, stereo multiplex signals)
- AF Analyzer FMA-B8 features universal analysis capabilities

For any frequency in the AF range 10 Hz to 100 kHz, a selective measurement of harmonic distortion products can be made as well as a correct THD measurement (largely unaffected by spurious signals such as noise or hum).

Furthermore, the 2nd and 3rd order intermodulation products can be measured to DIN 45403 and IEC 268-3 either as intermodulation distortion or as difference-frequency distortion. Measurement of the difference-frequency distortion is for instance prescribed by the German ARD specifications 5/3.1 for broadcast transmitters.

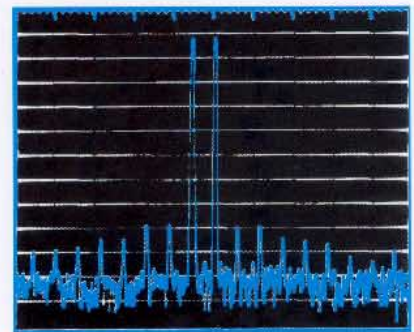
AF spectrum on oscilloscope connected to FMA outputs DSP1 and DSP2

Digital signal processing ensures highest measurement accuracy

The operating principle of the optional AF Analyzer/DSP Unit is based on digital signal processing. A precision 16-bit A/D converter samples the AF signal. A high-speed signal processor determines the spectrum of the AF signal by means of fast Fourier transform. Harmonic distortion, intermodulation distortion and difference-frequency distortion are read out in dB or percent on the audio display of the modulation analyzer.

Scaled display of AF spectrum on any ordinary oscilloscope

The AF spectrum can be displayed with scaling on an oscilloscope in X-Y mode, which can be directly connected to the rear FMA outputs DSP1 and DSP2. This provides the user with additional information about the indicated digital value at a glance.



Specifications

Selective distortion measurement

Readout	in % or dB
Display range	0.001 to 20%, -100 to -14 dB

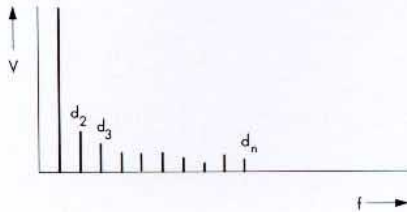
Measurement of individual distortion d_i ($i = 2, 3, \dots, 10$)

Measurement error	
$10 \text{ Hz} \leq f_1 \leq 14 \text{ kHz}$ $f_{di} \leq 42 \text{ kHz}$	$f_1 \leq 50 \text{ kHz}$ $f_{di} \leq 150 \text{ kHz}$
$\leq 5\%$ of rdg $\pm 0.02\%$ absolute	$\leq 5\%$ of rdg $\pm 0.05\%$ absolute

THD measurement

Measurement of harmonic $i = n$ ($n = 2$ to 10 selectable)

Measurement error	
$10 \text{ Hz} \leq f_1 \leq 14 \text{ kHz}$ $f_{dn} \leq 42 \text{ kHz}$	$f_1 \leq 50 \text{ kHz}$ $f_{dn} \leq 150 \text{ kHz}$
$\leq 5\%$ of rdg $\pm 0.03\%$ absolute	$\leq 5\%$ of rdg $\pm 0.1\%$ absolute

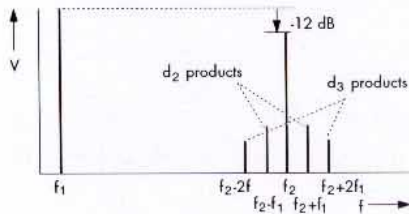


Intermodulation measurement

Intermodulation distortion d_2, d_3 to DIN 45403 and IEC 268-3

Readout	in % or dB
Display range	0.001 to 20%, -100 to -14 dB

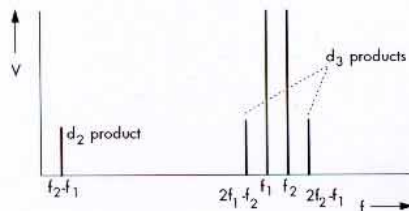
Measurement error	
$f_2 + 2 \times f_1 \leq 42 \text{ kHz}$ $f_1 \geq 10 \text{ Hz}$	$42 \text{ kHz} < f_2 + 2 \times f_1 \leq 150 \text{ kHz}$ $f_1 \geq 30 \text{ Hz}$
$\leq 5\%$ of rdg $\pm 0.1\%$ absolute	$\leq 5\%$ of rdg $\pm 0.2\%$ absolute



Difference-frequency distortion d_2, d_3 to DIN 45403 and IEC 268-3

Readout	in % or dB
Display range	0.001 to 20%, -100 to -14 dB

Measurement error ($f_2 - f_1 \geq 30 \text{ Hz}$)	
$2 \times f_2 - f_1 \leq 42 \text{ kHz}$	$42 \text{ kHz} < 2 \times f_2 - f_1 \leq 150 \text{ kHz}$
$\leq 5\%$ of rdg $\pm 0.02\%$ absolute	$\leq 5\%$ of rdg $\pm 0.05\%$ absolute



Selective modulation and voltage measurement

in voltmeter, AM, FM and ϕM mode, using special bandpass filter

Special bandpass filter

Center frequency f_c	Bandwidth (3 dB)
10 to $< 50 \text{ Hz}$	2.27 Hz
50 to $< 500 \text{ Hz}$	6.8 Hz
0.5 to $< 5 \text{ kHz}$	22.7 Hz
5 to $< 25 \text{ kHz}$	204 Hz
$> 25 \text{ kHz}$	816 Hz
Shape factor 3 dB/80 dB ¹⁾	< 4
Ultimate selectivity	80 dB (70 dB for $f_c \geq 25 \text{ kHz}$)
Display range	corresponding to display range of selected operating mode

Measurement error²⁾

with deviation of measurement frequency from center frequency	
$< BW_{-3dB}/4$	
at center frequency f_c	$10 \text{ Hz to } 100 \text{ kHz}$ $100 \text{ kHz to } 150 \text{ kHz}$
	$\leq 2\%$ $\leq 5\%$

Rear-panel outputs

Deflection for external oscilloscope

DSP1	Y deflection, 0 to 4 V, BNC female
DSP2	X deflection, 0 to 4 V, BNC female

Scale markers

Vertical	13 markers, 10 dB/div
Horizontal	10 markers

Scaling of horizontal markers can be called up via information menu

Ordering information

AF Analyzer/DSP Unit	FMA-B8	0855.9007.55
Model for retrofitting in instruments already supplied	FMA-B8	0855.9007.54



¹⁾ For $f_c < 25 \text{ kHz}$; for $f_c \geq 25 \text{ kHz}$: shape factor 3 dB/70 dB

²⁾ Error of selective measurement in addition to error specified for selected voltmeter, AM, FM or ϕM mode



ROHDE & SCHWARZ

ROHDE & SCHWARZ GmbH & Co. KG · Mühlendorfstraße 15 · D-81671 München
P.O.B. 801469 · D-81614 München · Telephone +4989 4129-0 · Fax +4989 4129-3567