

# Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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FMB  
50 kHz to 5.2 GHz

FMA  
50 kHz to 1360 MHz

Version  
02.00

December  
2003

## Modulation Analyzer R&S® FMAB

The specialist for sound broadcast signals from 50 kHz to 1360 MHz

- ◆ Built-in precision stereo decoder both for internal FM stereo decoding and for decoding of an external stereo multiplex signal
- ◆ External stereo decoder input
- ◆ Demodulation of RDS and traffic program signals
- ◆ ITU-R detector and standard weighted/unweighted ITU-R filters
- ◆ Distortion meter from 10 Hz to 100 kHz
- ◆ RF frequency measurement with 10-digit readout, maximum resolution 0.1 Hz
- ◆ High-precision AM, FM and  $\phi$ M measurement over a wide modulation frequency range
- ◆ Complete AF analysis in the L, R, M and S channels including distortion measurement and S/N ratio measurement to ITU-R standard
- ◆ Selective measurement of pilot tone deviation and deviation of 57 kHz traffic program carrier
- ◆ Built-in RDS demodulator with clock and data output for external decoding
- ◆ Measurement of modulation depth of 57 kHz traffic program carrier
- ◆ High-accuracy power measurement (typ. error <0.5 dB)



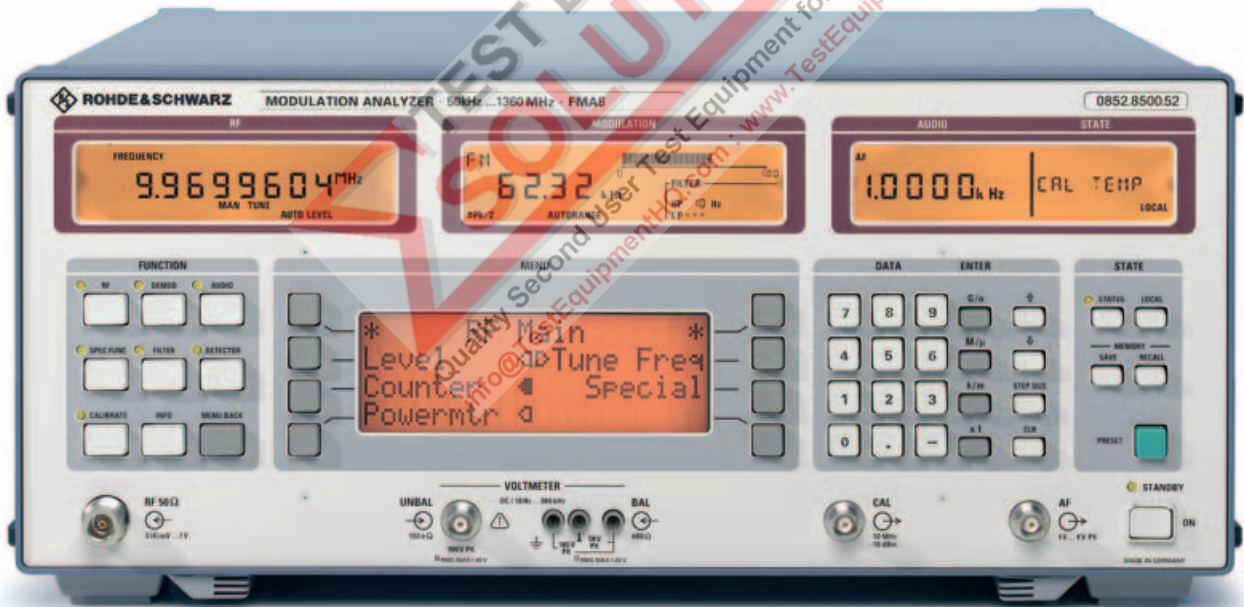
**ROHDE & SCHWARZ**

The Modulation Analyzer R&S®FMAB has been especially designed for the analysis of FM stereo broadcast signals. It combines the universal features of the R&S®FMA basic model and the additional measurement capabilities of the built-in stereo decoder.

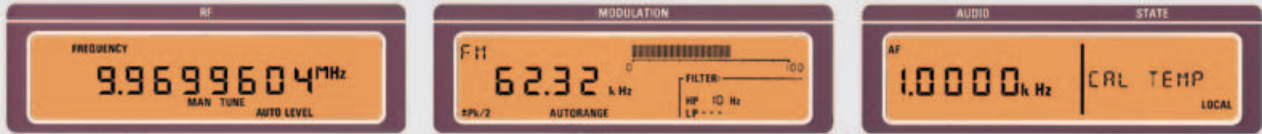
The measurement tasks of the R&S®FMAB mainly cover the field of sound broadcasting and include comprehensive analysis of VHF transmitters, channel transposers and VHF/baseband converters. Since the stereo decoder with all its analysis functions can be

separately used via the rear-panel input, measurements on FM receivers and stereo coders are also possible.

Three large illuminated LCD displays simultaneously read out the measured carrier frequency, modulation and modulation frequency, plus additional information about device status and settings. The clear front-panel layout, with softkeys and a few main function keys, makes for user-friendly operation. Previously complex measurements on FM stereo signals thus become very simple.



Front view of R&S® FMAB



All essential test parameters can be read at a glance on clearly arranged LCD displays

## Characteristics

Owing to the clear layout of the R&S® FMAB, all essential test parameters can be read at a glance on the LCD displays. Superimposed additional information, such as the test channel, deemphasis switched on, affords high measurement reliability.

### Precision stereo decoder

The precision stereo decoder has been especially designed for wide dynamic range and flat amplitude and phase response that are required in FM stereo measurements. The weighted stereo S/N ratio of  $\geq 80$  dB and the channel crosstalk attenuation of  $\geq 60$  dB in the range 30 Hz to 15 kHz are top-class.

The special characteristics of the built-in FM demodulator regarding frequency and phase response as well as low distortion are ideally matched to the stereo decoder. The values achieved meet the relevant specifications of broadcasting corporations and are even better in many cases.

### Dynamic range

An extremely low-noise local oscillator (typ.  $-130$  dBc at 1 GHz, 20 kHz carrier offset) ensures a sufficient S/N ratio for FM stereo decoding even far above the VHF band, e.g. for measurements on channel transposers in the UHF range. A weighted FM stereo S/N ratio of typically 78 dB for carrier frequencies up to 170 MHz allows precise S/N ratio measurements on FM broadcast transmitters, channel transposers and VHF/baseband converters.

### Result display

Frequency or level, deviation or modulation depth as well as frequency or distortion are read out independently of one another on three LCD displays. All essential device settings, such as operating

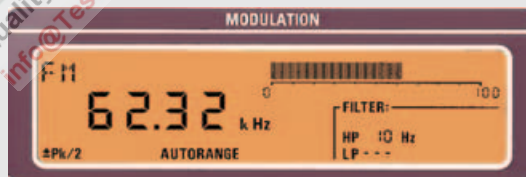
mode, test channel, type of detector, weighting filter, are superimposed on the relevant display.

A scaled bargraph indicator with a high resolution (one hundred divisions) is provided especially for the alignment of DUTs followed by modulation and voltage measurements.

When relative measurement (% or dB) is selected, the bargraph indicator automatically switches to plus/minus indication in the measurement of small deviations.

This ensures fast and easy adjustment to a defined reference value.

A special min/max hold mode allows simultaneous analog display of the current result and the defined minimum and maximum values.



The analog bargraph indicator is ideally suited for adjustments, e.g. to a defined reference value

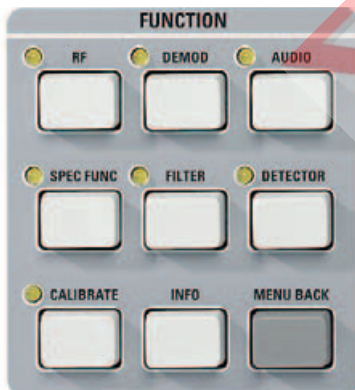
## Operation

Due to its versatile measurement functions, the R&S® FMAB is menu-controlled so that there is no need for a great number of individual keys.

The minimal number of main function keys as well as an alphanumeric menu display with four softkeys arranged at both sides make for clear front-panel layout and fast access to the desired measurement functions. Important functions are at a high menu level, the number of submenu levels being limited to a maximum of three so that finding one's way in the menu is easy.

Parameters, like for instance a reference value for relative display, can be entered via the numeric keypad and are terminated with one of the ENTER keys (unit/multiplier keys). The fact that up to 20 complete setups can be stored considerably enhances the measurement reliability in complex applications.

*The few main function keys make the R&S® FMAB user-friendly:*



### RF

All RF settings such as tuning frequency, input level and RF frequency counter

### DEMOD

Selecting the demodulation modes and access to the FM stereo decoder functions

### AUDIO

Setting the audio frequency counter or the DIST/SINAD meter

### SPEC FUNC

Special functions such as voltmeter mode, IEC/IEEE bus address, bargraph indicator control, etc

### FILTER

Selecting the audio filters

### DETECTOR

Selecting the detector for the modulation display

### CALIBRATE

Calibrating functions

### INFO

Readout of all internal settings on the menu display

### MENU BACK

Going back a level in the menu tree



*Softkeys enable fast access to desired measurement functions*

## Remote control

The Modulation Analyzer R&S® FMAB features full remote-control capability. The FM stereo measurement facilities are system-compatible. The IEC/IEEE bus interface fully complies with the IEEE 488.2 standard and enables plain-text programming, which greatly facilitates program writing. For setting an FM deemphasis of 50  $\mu$ s, for instance, with FM stereo decoding switched on, the following entry is made:

STEREODECODER:DEEMPHASIS 50 US

## Measurement functions

The R&S® FMAB features standard measurement functions in modulation analysis and a wide variety of additional capabilities owing to the built-in stereo decoder:

- ◆ Fast, fully automatic ranging to input frequencies from 50 kHz to 1360 MHz at levels from 3 mV to 7 V
- ◆ RF frequency measurement with 10-digit readout and resolution down to 0.1 Hz
- ◆ AM modulation depth, FM and  $\phi$ M deviation with error of less than 0.5%, wide dynamic range and 3 dB bandwidth of >300 kHz; FM and  $\phi$ M deviation measurement range 700 kHz (rad); AM, FM and  $\phi$ M demodulation from 50 kHz carrier frequency upwards
- ◆ Audio frequency measurements with 5-digit readout and resolution down to 1 mHz
- ◆ Distortion and SINAD measurement continuously from 10 Hz to 100 kHz with a dynamic range of >80 dB
- ◆ Psophometric weighting filters
  - Highpass filters 10/20/300 Hz
  - Lowpass filters 3/23/100 kHz
  - ITU-R filters (468-4) weighted and unweighted
  - ITU-T and other special weighting filters

- ◆ Precision detectors: separate +PK and –PK detector with extremely short response time, MAX PEAK function; true RMS detector; quasi-peak detector to ITU-R 468-4
- ◆ AC and DC voltage measurements
- ◆ Power measurement (error typ.  $\leq 0.5$  dB, overload protection circuit for up to 5 W input power)

## Options

The R&S®FMAB can be expanded by the optional highly stable 10 MHz Reference Oscillator R&S®FMA-B10 with aging of  $<1 \times 10^{-9}$ /day. The frequency measurement error at 100 MHz of maximally 200 Hz is thus reduced down to 10 Hz within a calibration interval of one year.

The AM/FM Calibrator R&S®FMA-B4 including an AF generator from 10 Hz to 100 kHz with two external, separately switchable outputs is also available as an option. The error of the calibration source is less than 0.1%.

The 5.2 GHz Frequency Extension R&S®FMA-B12 is provided for special applications at higher frequencies, e.g. outside-broadcast links in the GHz range.

## Applications

A phase-compensated noise suppression filter with a bandwidth of 95 kHz ( $-3$  dB) can be switched into circuit between FM demodulator and stereo decoder especially for internal stereo decoding. High-frequency spurious components can thus be efficiently kept away from the stereo decoder, with negligible effect on the phase linearity and channel crosstalk from L to R and R to L. In conjunction with the option R&S®FMA-B4 (calibrator and audio generator), the R&S®FMAB can be expanded to form a complete test set especially for FM broadcast transmitters. All quality-relevant parameters of VHF sound broadcast transmitters can thus be measured without the need for additional measuring instruments.

Separate +PK and –PK detectors featuring very short response time and high precision are ideally suited for simultaneous detection of positive and negative peak deviation of FM stereo program signals. In conjunction with the PK HOLD function, peak deviations can be monitored for periods ranging from very short to a duration of any length. If the MAX PEAK function is selected on the R&S®FMAB, the maximum deviation will be indicated on the display.

## Peak deviation monitoring

In conjunction with a process controller, e.g. the R&S®PSA, the R&S®FMAB is ideal for monitoring the peak deviation of VHF broadcast transmitters. In the PK HOLD mode, +PK and –PK detectors operating in parallel and featuring a very short response time ensure precise measurement of all, even the narrowest of modulation peaks. The monitoring intervals can be from  $\leq 100$  ms up to any duration. The values measured by all detectors such as +PK, –PK, RMS and quasi-peak can be read out per unit time.



Rear view of the R&S®FMAB

The R&S®FMAB is designed for high measurement speed:

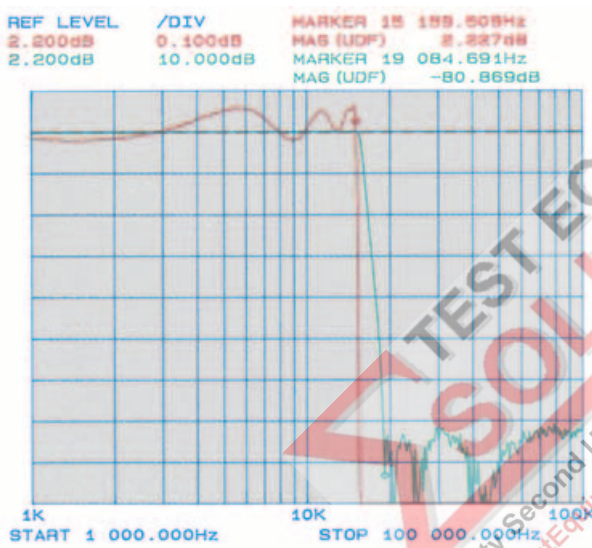
- ◆ Fast, automatic frequency adjustment by direct frequency measurement up to 1.36 GHz
- ◆ Correct frequency measurement even at large AM depth due to state-of-the-art technologies
- ◆ Two independent frequency counters for simultaneous RF and AF measurement

- ◆ All measurement times can be adapted to the specific measurement problem, e.g. lowest measurement frequency or required counter resolution

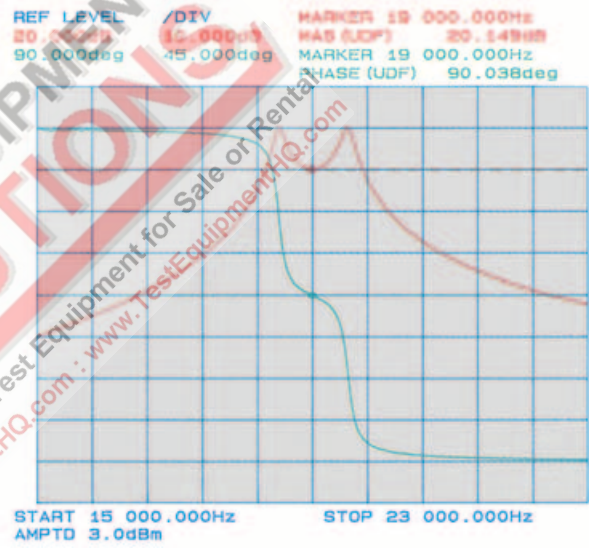
Measurement functions that are not required can be switched off, e.g. for extremely fast modulation measurement with preset RF level and preset RF frequency. In this way, 10 modulation values can be measured per second.

### Future-oriented design

The frequency range can be extended up to 5.2 GHz, thus allowing measurements on special broadcasting and program distribution systems. The built-in firmware can easily be updated via a serial interface using a PC compatible with the industry standard.



*Frequency response in L channel;  
 Selected components ensure minimum frequency response and high spurious suppression in the L, R, M, S channels*



*Frequency response of pilot filter;  
 A high-selectivity pilot tone filter allows unimpaired measurement of the pilot tone deviation; the phase error of the pilot tone filter can be automatically eliminated with the aid of a method specially developed by Rohde & Schwarz; new standards are thus set in the measurement of stereo channel crosstalk*

## Specifications

<b>Frequency</b>	
Frequency range	50 kHz to 1360 MHz
Frequency tuning	automatic <sup>1)</sup> or manual
Display	10-digit readout
Resolution	0.1/1/10/100 Hz selectable
Frequency error and drift	±1 digit + error of reference frequency
Reference oscillator	<b>standard</b> <b>option R&amp;S® FMA-B10</b>
Aging	2 x 10 <sup>-6</sup> /year    1 x 10 <sup>-7</sup> /year
After 30 days of operation	—                  1 x 10 <sup>-9</sup> /day
Temperature effect	2.5 x 10 <sup>-6</sup> 2 x 10 <sup>-9</sup> /°C (0°C to 55°C)
Warmup time	15 min    15 min
External reference input/output	manual or remote-controlled switch-over
Output level	12 dBm ±2 dB
Input level range	-10 dBm to +15 dBm
RF input	Z <sub>in</sub> = 50 Ω, N connector, VSWR <1.4 with 10 dB attenuation
Overload protection	up to 5 W (15 V RMS)
Maximum peak voltage	25 V (including DC)
<b>RF power measurement</b>	
Frequency range	50 kHz to 1360 MHz
Power measurement range	0.18 μW to 1 W (-37.5 dBm to +30 dBm)
Measurement error	
0.18 μW ≤ P < 0.1 mW	≤±1.5 dB ±0.05 μW
P ≥ 0.1 mW	≤1 dB (typ. 0.5 dB)
<b>Amplitude modulation measurement</b>	
Modulation frequency range	10 Hz to 200 kHz
Resolution	0.1% of reading; max. 0.001% AM
Measurement error <sup>2)</sup> with peak detection (% of reading, plus peak residual AM)	
f <sub>in</sub> 50 to 300 kHz    >300 kHz to 10 MHz    ≥10 MHz	<b>measurement error</b>
m ≤80%    30 Hz to 3 kHz    30 Hz to 10 kHz    30 Hz to 20 kHz	≤0.8%
m ≤95%    —    30 Hz to 20 kHz    30 Hz to 100 kHz	≤1%
10 Hz to 8 kHz    10 Hz to 20 kHz    10 Hz to 100 kHz	≤2%
—    10 Hz to 50 kHz    10 Hz to 200 kHz	≤5%
Residual AM <sup>3)</sup>	
To ITU-T	≤0.01%
20 Hz to 23 kHz, RMS	≤0.03%
To ITU-R	≤0.05%
Incidental AM in FM mode (f <sub>mod</sub> = 1 kHz, meas. bandwidth 20 Hz to 3 kHz)	
f <sub>in</sub> = 50 kHz to 10 MHz, deviation = 5 kHz	≤0.2%
f <sub>in</sub> ≥10 MHz, deviation = 50 kHz	≤0.1%
AF distortion for f <sub>mod</sub> = 10 Hz to 20 kHz (for f <sub>in</sub> <300 kHz: f <sub>mod</sub> = 10 Hz to 5 kHz)	
m = 40%	≤0.2%
40% ≤ m ≤ 80%	≤0.4%

<b>Frequency modulation measurement</b>	
Modulation frequency range	10 Hz to 200 kHz
Max. measurable deviation for	f <sub>in</sub> /10
f <sub>in</sub> : 50 kHz to 300 kHz	150 kHz
f <sub>in</sub> : 300 kHz to 10 MHz	700 kHz
f <sub>in</sub> : ≥10 MHz	
Meas. error <sup>2)</sup> with peak detection (plus peak residual FM)	
f <sub>in</sub> : 50 kHz to 300 kHz	f <sub>mod</sub> error
	30 Hz to 5 kHz    ≤0.5%
	10 Hz to 8 kHz    ≤2%
f <sub>in</sub> : 300 kHz to 10 MHz	f <sub>mod</sub> error
	30 Hz to 10 kHz    ≤0.5%
	30 Hz to 20 kHz    ≤1%
	10 Hz to 50 kHz    ≤2%
f <sub>in</sub> : ≤10 MHz	f <sub>mod</sub> error
	30 Hz to 20 kHz    ≤0.5%
	30 Hz to 100 kHz    ≤1%
	10 Hz to 200 kHz    ≤2%
Resolution	better than 0.1% of reading (min. 0.1 Hz)
Residual FM <sup>3)</sup> for f <sub>in</sub>	≤340 MHz    ≤680 MHz    ≤1360 MHz
To ITU-T, RMS	≤0.5 Hz    ≤0.7 Hz    ≤1 Hz
20 Hz to 23 kHz, RMS	≤2 Hz    ≤3 Hz    ≤5 Hz
ITU-R, quasi-peak +50 μs deemphasis	≤3 Hz    ≤4 Hz    ≤6 Hz
Stereo S/N ratio <sup>3)</sup> weighted to ITU-R, 40 kHz deviation, at FM output (with noise filter)	
f <sub>in</sub> : 10 MHz to ≤170 MHz	≥76 dB
f <sub>in</sub> : 170 MHz to ≤340 MHz	≥73 dB
f <sub>in</sub> : 340 MHz to 680 MHz	≥68 dB
Stereo crosstalk (f <sub>in</sub> ≥10 MHz, without noise filter)	
f <sub>mod</sub> = 1 kHz	≥56 dB down
30 Hz ≤ f <sub>mod</sub> ≤15 kHz	≥50 dB down
AF distortion for deviation of f <sub>in</sub> ≥10 MHz	75 kHz                  500 kHz
f <sub>mod</sub> = 30 Hz to 20 kHz <sup>4)</sup>	≤0.05%                  ≤0.2%
f <sub>mod</sub> = 20 kHz to 100 kHz	≤0.15%                  ≤0.5%
f <sub>in</sub> > 500 kHz	
f <sub>mod</sub> = 30 Hz to 20 kHz	≤0.1%                  —
Incidental FM (m = 50%, f <sub>mod</sub> = 1 kHz, B = 20 Hz to 3 kHz, plus peak residual FM)	≤10 Hz
Deemphasis	50/75/750 μs selectable, effective at AF output and, if selected, for readout of results
<b>Phase modulation measurement</b>	
Modulation frequency range	200 Hz to 200 kHz
With special φM filter	10 Hz to 20 kHz
Max. measurable deviation (up to max. 1 kHz AF, -6 dB/octave for f >1 kHz)	
f <sub>in</sub> : 50 kHz to 300 kHz	1/10 x f <sub>in</sub> /kHz x 1 rad
f <sub>in</sub> : 300 kHz to 10 MHz	150 rad
f <sub>in</sub> : ≥10 MHz	700 rad



Error <sup>2)</sup> of peak detection (plus peak residual $\phi M$ ) $f_{mod}$ : 300 Hz to 5 kHz $f_{mod}$ : 300 Hz to 10 kHz $f_{mod}$ : 300 Hz to 100 kHz With special $\phi M$ filter: $f_{mod}$ : 10 Hz to 5 kHz $f_{mod}$ : 10 Hz to 10 kHz	$\leq 2\%$ $\leq 2\%$ $\leq 2\%$ $\leq 2\%$ $\leq 2\%$
Resolution	$< 0.1\%$ (minimum 0.0001 rad)
Residual $\phi M$ <sup>3)</sup> for $f_{in}$ ITU-T weighting 300 Hz to 23 kHz	$\leq 680$ MHz    680 MHz $\leq 0.002$ rad $\leq 0.004$ rad $\leq 0.005$ rad $\leq 0.01$ rad
AF distortion (at AF output) ( $f_{mod}$ 200 Hz to 20 kHz, $\Delta\phi = 4$ rad, $f_{in} \geq 500$ kHz)	$\leq 0.1\%$
<b>AF voltmeter</b>	
DC voltage measurement Range	$\pm 10 \mu V$ to 20 V
Offset voltage <sup>5)</sup> Unbalanced input Balanced input	$\leq 1$ mV } can be corrected to $\leq 30 \mu V$ $\leq 3$ mV } using offset calibration
Resolution	$< 0.1\%$
Error	$\pm 0.5\% \pm 10 \mu V \pm$ offset voltage
AC voltage measurement Frequency range Measurement range Resolution	10 Hz to 300 kHz 30 $\mu V$ to 20 V 0.1% of reading
Error (RMS detector) 30 Hz to 20 kHz 10 Hz to 100 kHz 10 Hz to 200 kHz	$\leq 1\% \pm 30 \mu V$ (100 kHz lowpass filter) $\leq 2\% \pm 100 \mu V$ (without lowpass filter) $\leq 3\% \pm 100 \mu V$ (without lowpass filter)
Weighting facilities	all AF measuring facilities, such as detector, filter, frequency counter and distortion meter, can also be used in voltage measurements
Inputs Unbalanced  Balanced	input impedance 100 k $\Omega$    $< 50$ pF, BNC connector input impedance 600 $\Omega$ , 3-contact connectors to DIN 41628
<b>AF detector</b>	
Peak detector	positive or negative peak of AF or their arithmetic mean
RMS detector	true RMS-responding rectifier, readout as RMS value or converted to peak for sinewave
Quasi-peak detector	detector to ITU-R Rec. 468-4
<b>Weighting filters</b>	
Highpass filters	10 Hz (2nd order) 20 Hz (3rd order) 300 Hz (2nd order)
Lowpass filters	3 kHz (4th order) 23 kHz (4th order) 100 kHz (4th order) 5 Hz lowpass (for DC measurement) 30 kHz Bessel lowpass (4th order) 120 kHz Bessel lowpass (4th order) 4.2 kHz Cauer lowpass

Standard filters	ITU-R 468-4 weighted ITU-R 468-4 unweighted ITU-T P53; plus external filters
<b>AF frequency display</b>	
Frequency range	5 digits
Resolution	10 Hz to 300 kHz
Error	1 mHz to 10 Hz
	$\pm 0.005\% \pm 3$ mHz $\pm 1$ digit
<b>Distortion measurement</b>	
Readout either in % or SINAD in dB, automatic adjustment for S/N $\geq 20$ dB	
Measurement range	10 Hz to 100 kHz
Display range THD SINAD	0.005% to 50% 6 dB to 86 dB
Maximum error 10 Hz to 100 kHz (harmonics up to 300 kHz) 20 Hz to 20 kHz (with 100 kHz lowpass filter)	$\pm 2$ dB $\pm 0.15\%$ THD $\pm 1$ dB $\pm 0.03\%$ THD
<b>Stereo decoder</b>	
Crosstalk 30 Hz to 15 kHz, RMS or ITU-R detector L to R, R to L M to S, S to M	$\geq 60$ dB down $\geq 50$ dB down
Frequency response L, R, M, S 30 Hz to 15 kHz	max. $\pm 0.1$ dB
Level difference between L and R	$\leq 0.1$ dB
Measurement errors L, R, M, S 19 kHz pilot tone Level, deviation 57 kHz carrier (level) AM of 57 kHz carrier ( $f_{mod} = 10$ Hz to 125 Hz)	$\leq 2\%$ $\leq 5\%$ $\leq 2\%$ of reading +0.1% AM
Nonlinear distortion (with input level 6 dBm and 12.5 dBm, L, R, M, S outputs) THD (30 Hz to 15 kHz) Intermodulation distortion to DIN 45403	$\leq 0.1\%$ $d_2 \leq 0.05\%$ , $d_3 \leq 0.1\%$
S/N ratio, referred to +6 dBm at 500 Hz, deemphasis 50 $\mu s$ ITU-R unweighted ITU-R weighted	$\geq 80$ dB $\geq 80$ dB
Auxiliary carrier suppression, referred to +6 dBm Pilot tone (19 kHz) RDS/ARI (57 kHz)	$\geq 90$ dB $\geq 80$ dB
Deemphasis	50 $\mu s$ or 75 $\mu s$ , switch-selectable
<b>External decoder input</b>	
Common-mode rejection $f \leq 1$ kHz 1 kHz $< f \leq 15$ kHz 15 kHz $< f \leq 100$ kHz	$\geq 60$ dB $\geq 50$ dB $\geq 36$ dB
Input impedance	$\geq 40$ k $\Omega$

Input level range	-12 dBm to +12.5 dBm (600 Ω) (nominal +6 dBm/40 kHz)
Resolution of level setting	≤0.2 dB
<b>Stereo decoder outputs</b>	
L, R, M	balanced, 3-contact connectors on rear panel, to DIN 41628, +6 dBm, $Z_{out} \leq 30 \Omega$ , $Z_i \geq 300 \Omega$
S (L-R/2)	unbalanced, BNC connector, $Z_i \geq 600 \Omega$
<b>RDS demodulator outputs</b>	
Signals available	9-contact Cannon connector on rear panel data, clock, quality signal, TP information, 57 kHz carrier (TTL)
<b>Measuring time</b>	
Automatic tuning; RF, modulation and modulation frequency measurement with 10 Hz RF resolution (HP filter and PK detector switched on)	typ. 1 s
Fast modulation measurement (RF, modulation range and level already programmed)	≤120 ms
DIST measurement $f_{mod} \geq 30$ Hz $f_{mod} \geq 300$ Hz	typ. 2.5 s typ. 1 s
<b>Outputs</b>	
IF output	max. 200 mV into 50 Ω
AM output	max. 1 V into 600 Ω (can be DC-coupled)
FM/φM output For FM	6 dBm (1.545 V) into 600 Ω, 40 kHz deviation (DC-coupled)
For φM	1.545 V into 600 Ω, 40 rad

Distortion output	max. 1 V into 600 Ω
AF output	1 V to 4 V peak into 600 Ω with autoranging
<b>Remote control</b>	
Interface	IEC 625-1/625-2 (IEEE 488.1/488.2), connector: 24-contact Amphenol; controlling all device functions including Serial Poll and Parallel Poll
Interface functions	SHI, AH1, L4, T5, SR1, RL1, DC1, DT1, PP1, CO
<b>General data</b>	
Temperature	
Operating temperature range	0 °C to +55 °C
Permissible temperature range	0 °C to +55 °C
Storage temperature range	-40 °C to +70 °C
Humidity	+40 °C, non-condensing, 80% relative humidity, meets EN 60068-2-3
RFI suppression	meets EN 55011 class B and EN 61326 (EMC Directive 89/336/EEC)
Safety	meets EN 61010-1 : 1991
Power supply	100/120/220/240 V ±10%, 47 Hz to 440 Hz (170 VA)
Dimensions, weight	435 mm x 192 mm x 460 mm, 25 kg

- <sup>1)</sup> For amplitude-modulated signals:  $P_{in} \geq -27$  dBm,  $m \leq 80\%$ .
- <sup>2)</sup> In temperature range 20 °C to 30 °C, additional error of ±0.5% over entire temperature range; error of RMS detection may be up to twice as high as of peak detection.
- <sup>3)</sup> For input level ≥20 dB above specified minimum input level.
- <sup>4)</sup> 100 kHz lowpass filter switched in.
- <sup>5)</sup> Input attenuator switched on: value x 10.

## Ordering information

<b>Modulation Analyzer</b>	R&S®FMAB	856.4750.52
<b>Accessories supplied</b>		
Special cable for firmware updating, manual, power cable, spare fuses		
<b>Options</b>		
Reference Oscillator	R&S®FMA-B10	856.3502.52
AM/FM Calibrator	R&S®FMA-B4	855.6008.52
5.2 GHz Frequency Extension	R&S®FMA-B12	855.8500.52
<b>Recommended extras</b>		
High-Power Attenuator 20 dB, 50 W	R&S®RDL	1035.1716.00
Service Kit	R&S®FMA-Z1	856.4009.52
19" Adapter	R&S®ZZA-94	396.4905.00



**ROHDE&SCHWARZ**