

# TV Measurement Equipment FMS 100

The combination of TV measurement  
demodulator and a digital analyser  
for Video and Audio



# TV Measurement Equipment FMS 100

FMS 100 sets new standards in the field of measurement and quality assessment of telecast and transmission systems.

The combination of TV measurement demodulator and a digital analyser unit makes the FMS 100 a model for future technology and predestines it to carry out extensive measurements of linear and non-linear transmission characteristics in time and frequency domain.

Due to its wide spectrum of application, FMS 100 is used in laboratories, service sector, automatic measurement and supervision systems as well as production and quality control.



The FMS 100 along with VFIRF measurement signal generator VRM 100.

The measurement receiver of the FMS 100 has projecting demodulation characteristics in the frequency domain of 44 ... 860 MHz (without gap) and is available for a variety of TV standards like B, G, D, K, I, and NICAM etc.

The important transmission characteristics, e. g. input level of the vision and sound carrier, FM deviation, zero keying and bit error rate of the video text are measured and displayed on an LC-display.

The RF-receiver unit characterises itself through its high selectivity, saturation stability, and a wide dynamic range of 32  $\mu$ V to 2,2 V.

The precision measuring demodulator with Q-output has a low level of tolerance in frequency and group delay time response and surpasses many specifications. Sound traps and pre-emphasis can be switched off.

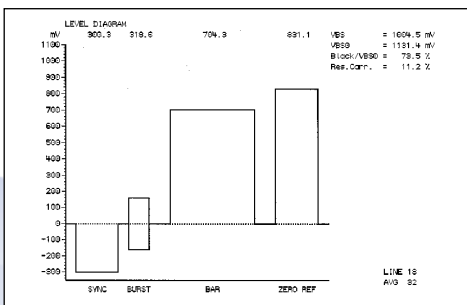
The digital video and audio analyser makes it possible to evaluate a number of test lines and to carry out AF-measurements with graphic representation on a high-resolution 10" colour screen.

The measurement receiver and the analyser work independently of each other; for e. g. the receiving component of FMS 100 can work as a direct-pick-up-receiver while the analyser carries out any measurements for a previously fed-in VF/AF signal. Furthermore, the software of the analyser offers easy functions which simplify the application of the routine measurement practice or the supervision of the signal quality significantly. This includes reference productions for relative measurements, tolerance masks, extensive cursor functions and a "default" function for a basic adjustment. An average value can be evaluated for all measurements.

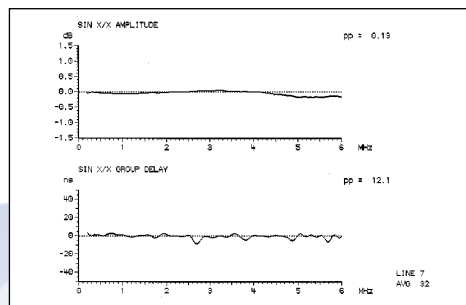
The results of the measuring routines differential gain, differential phase, ICPM and luminance non-linearity can be displayed simultaneously which is a big help especially for transmission equalisation.

The analyser can unite many measurements in an automatic measurement process for a cyclic supervision of transmission systems.

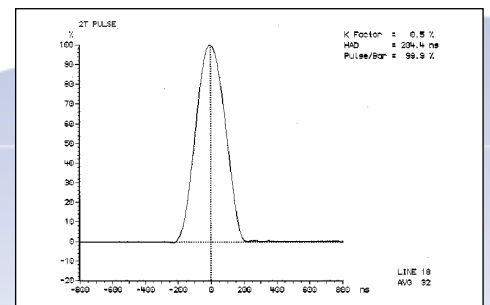
## Examples of measurements with the analyser:



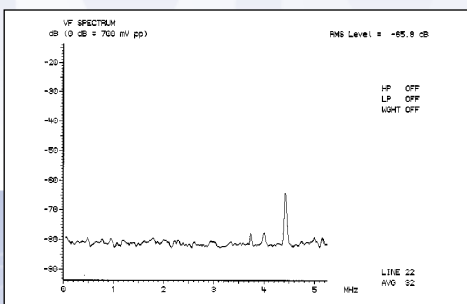
Measurement of all important VF-levels like H-synchronous pulse, auxiliary colour carrier, white level pulse, clamping pulse, BAS, BASO, black-level/BASO and residual carrier.



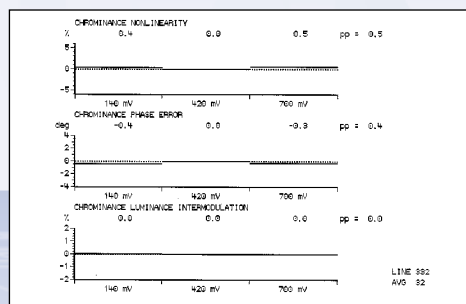
Measurement of amplitude and group delay in the VF field 0 ... 8 MHz with the help of sin x/x pulse.



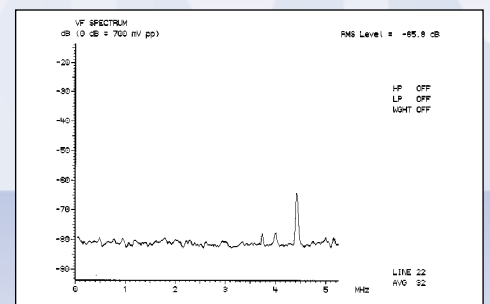
Graphic, normed representation of the 2T-pulse and numerical indication of the K-factor, half intensity width and 2T-pulse/white pulse-amplitude relationship.



Graphic representation of rising and falling flanks of 250 KHz rectangular pulse and numerical display of the rise/fall duration and Short Time Distortion.



Chrominance non-linearity, chrominance-phase-error and chrominance-luminance-intermodulation measured with the help of the level chrominance carrier of the line CCIR331.



Representation of the VF-spectrum of the chosen line.

The Auto-measurement performs automatically and continuously measurements and displays the results in form of a list. Therefore the measurement routine combines a meaningful combination of measurements to measuring groups. Only the selected measurement groups and the measurements which are part of it are taken into account i.e. the measurements of the not selected measurement groups are not measured and do not appear in the list of measurements.

The display of the list shows the measurement group with test line which is used for the individual measurements, the results for the individual measurements and if applicable the status of error of the measurement group (e.g. if no sync pulse is present) as well as the limits which are determined for the measurements.

A supervision of limit values for each measurement is provided and an alarm or warning is triggered if a limit value is exceeded. Limits are basically defined as inner or outer limits. The exceeding of the inner limits is indicated as a warning the exceeding of the outer limits is indicated as an alarm.

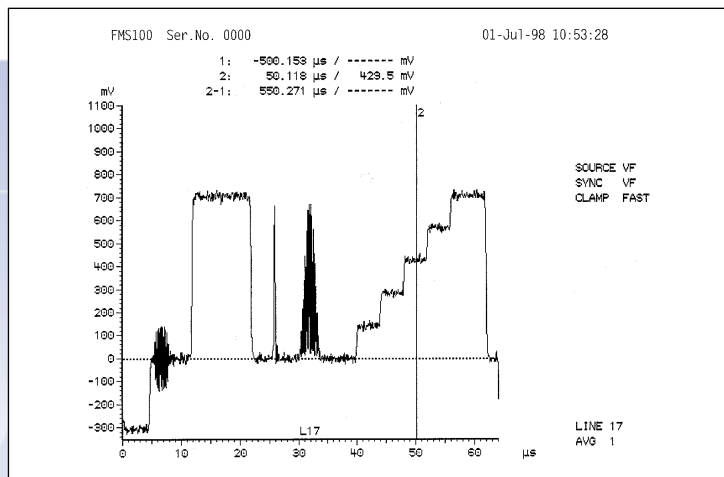
The definition of the limits can be defined by the user itself or by the standard limits on base of the definition of the specifications for transmitters, transposers or demodulators.

The lines which shall be used for the individual measurements can be adjusted by manual or automatic selection.

The Auto-measurement supports the effective use of lines with variable (with time) testline contents which are called sequential test lines. Up to two sequential test lines are supported.

It is not necessary to determine sequence and duration as the changes are recognised automatically together with the line content. The contents of the sequential test lines are analyzed before every measurement cycle. All measurements which are feasible with the detected testlines are carried out if selected before.

The Waveform representation enables the oscillographic reading of test-lines. Various characteristics like selectable scaling, cursor functions and the simple switching over to the corresponding line of the other frame make the Waveform mode of operation very comfortable to work with.



Waveform-representation of the line CCIR 17

The RF spectrum analyzer of the FMS 100 was specially designed for use in TV transmitter and transmission techniques. Very efficient and comfortable measurements are feasible for this reason.

The measurements are carried out with highest accuracy which is not achieved by standard spectrum analyzers. Basically the two measurement modi SPURIOUS and PANORAMA are distinguished.

The measurement mode SPURIOUS is used for the display and measurement of unwanted transmissions within a TV channel. Channel and offset are selected directly, the input of the start and stop frequency as for conventional spectrum analyzers is not necessary.

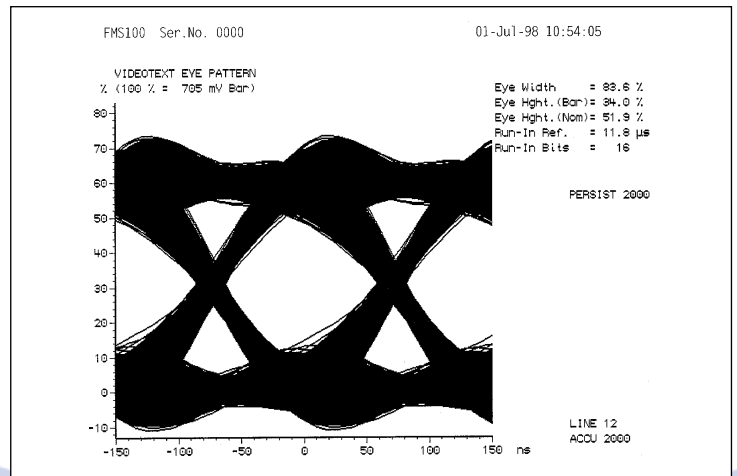
The complete spectrum is not displayed. Only the relevant parts of the spectrum for unwanted emissions (e.g. the frequencies 2x sound carrier minus 1x vision carrier, 3x sound carrier minus 2x vision carrier etc.). This way the finding and the measurement of the unwanted emissions is simplified very much.

Apart from the graphical display the levels of the carriers and the levels of the spurious emissions are displayed numerically relative to the vision carrier.

The measurement mode PANORAMA permits the display of the channel occupancy in the ranges VHF, UHF and VHF & UHF. The vision carrier levels of all channels of the selected range are measured and displayed as diagram over the frequency. Only the channels of the selected channel table are taken into account. Three cursors are available in this mode the position of which (channel and frequency) as well as the level are indicated numerically.

The video text option of the FMS 100 enables the evaluation of the corresponding data lines in the input signal as well as in VF, intermediate frequency, or RF field.

The chosen video text page is displayed on the monitor. In addition to this, the bit error rate is measured and indicated during the whole transmission of the video text information. A graphic evaluation is possible with the help of an eye pattern diagram.



Eye pattern diagram for evaluation of the transmission quality of the video text data

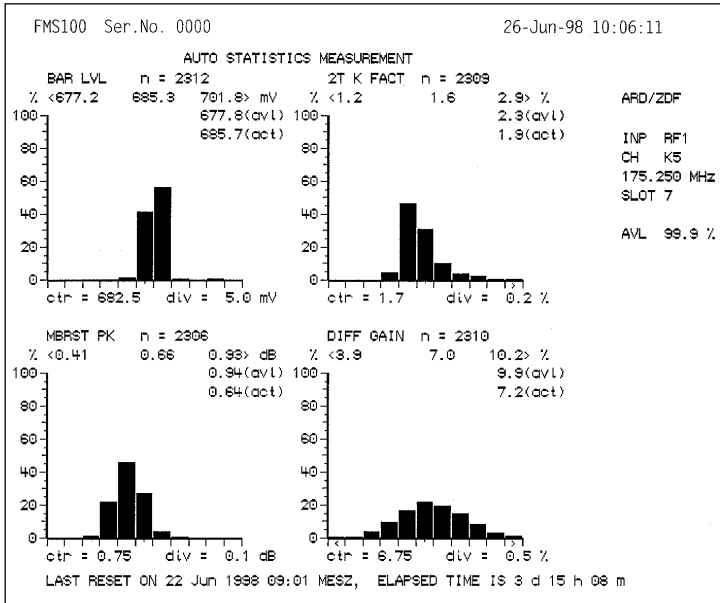
The statistic function of the FMS 100 facilitates the statistical evaluation of all important measurement parameters by means of a graphical/numerical display or hard copy protocolling. As the comparison of statistical data of various channels can be very helpful the statistical evaluation of the FMS100 permits to assign up to 30 slots (test channels). One slot defines the input signal (RF, IF or VF) and the input of the equipment (e.g. RF 1, RF2, IF or VF).

In case of RF input signals, the corresponding TV channel either within the channel grid or a frequency outside the grid may be entered.

The reading of the measurement values and the statistical processing are carried out automatically. During this procedure the slots are read out in a cyclic way whereby all selected parameters are registered for each slot. The results are displayed as diagram as well as numerical values. The graphical display of a parameter shows a diagram of the frequency. The percental distribution of the measured values of one class determines the height of the bar which is displayed w.r.t. this class. In addition the maximum and the minimum measurement for a defined

## TV Measurement Equipment FMS 100

availability are shown. The availability can determine the probability of all measurement values being within a certain range around the average value. Following values can be preselected as probability: 95 %, 98 %, 99,0 %, 99,5 % and 99,9 %. After the measurement the value is displayed which represents the maximum limits of the range which contains all measurement values complying with the preselected probability. For the hard copy protocol of the result of the statistical evaluation it is possible to choose either the diagram as displayed on the screen or to have a printout in form of a table. If the table is preferred the printout of the average values or of the available values can be selected.



Example for statistic Evaluation with the FMS100

With a few additional gadgets, the FMS100 can be transformed into a monitoring system for the purpose of measurement and supervision in TV-monitoring and transmission systems with a flexibility and quality of measurements that has never been achieved before.

Besides continuous, automatic quality control, the Monitoring System can also be used for high value measurements and equalisations at the site.

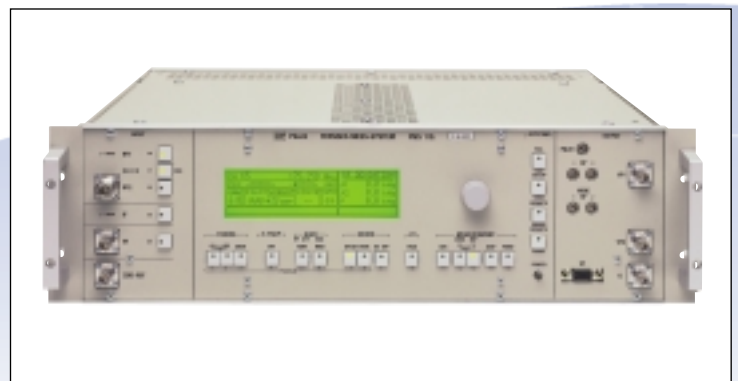
All measurement results can be filed, statistically evaluated, clearly represented by a computer and then printed by a protocol printer. For example, a master computer can dial the Monitoring System over an integrated Modem.



The FMS100 in the Monitoring System MON100 of the company Plisch

Furthermore, the computer can check all measurements for values exceeding the limiting value (inner and outer range of tolerance) which can be defined as required.

In this way, alerts can be produced in case of values exceeding the limiting value and can be displayed either on the monitor or protocol printer or transmitted via interfaces.



The FMS110, without monitor and all the analyser functions described before.

# TV Measurement Equipment FMS 100

## Technical Data

### Inputs

<b>RF inputs</b>	
Frequency range	44 ... 860 MHz (without gap)
Input level (selective input)	30 dB $\mu$ V ... 127 dB $\mu$ V (32 $\mu$ V ... 2,2 V)
Input level (broadband input)	100 dB $\mu$ V ... 127 dBmV (100 $\mu$ V ... 2,2 V)
Impedance	50 $\Omega$
Image frequency rejection	$\geq 100$ dB
<b>IF input</b>	
Frequency range	33 ... 40 MHz
Input level	70 mV ... 350 mV
Impedance	50 $\Omega$
<b>Video input</b>	
Frequency range	10 Hz ... 8,0 MHz
Nominal level	1 V <sub>pp</sub>
Impedance	75 $\Omega$
<b>Q input</b>	
Frequency range	10 Hz ... 300 kHz
Nominal level	1 V <sub>pp</sub>
Impedance	75 $\Omega$
<b>Zero keying input</b>	
Input level	TTL
<b>Audio inputs</b>	
Frequency range	20 Hz ... 20 kHz
Nominal level	6 dBu
Impedance	2 x 10 k $\Omega$ sym.

### Outputs

<b>IF Output</b>	
Frequency range	33 ... 40 MHz
Output level	- 7 dBm or - 4 dBm $\pm$ 0,5 dB
<b>Video outputs</b>	
Output level	1 V <sub>pp</sub> $\pm$ 1 %
Impedance	75 $\Omega$
<b>Q output</b>	
Output level	1 V <sub>pp</sub> $\pm$ 1 %
Impedance	75 $\Omega$
<b>Audio outputs</b>	
Output level	
(selective and sym. outputs)	6 dBu or 9 dBu $\pm$ 0,2 dB
Output level (broadband outputs)	6 dBu $\pm$ 0,2 dB
Impedance	$\leq 30 \Omega$
Deemphasis (disconnectable)	50 $\mu$ s $\pm$ 2 %
<b>Pilot output</b>	
Output level	- 15,6 dBu $\pm$ 0,5 dB
Impedance	$\leq 80 \Omega$

### Non-linear distortions

Luminance	$\geq 0,99$
Chrominance	$\leq \pm 0,7 \%$
Differential phase	$\leq \pm 0,7^\circ$
Signal-to-intermodulation ratio (equivalent to static meas. - 6/ - 10/ - 14 dB)	$\geq 55$ dB ref. to VB

### Video signal-to-noise ratio (broadband)

weighted noise	$\geq 67$ dB
unweighted noise	$\geq 60$ dB

### Periodic interference (selective and broadband)

Hum level	$\geq 55$ dB
Other periodic interference	$\geq 60$ dB

### Audio Demodulator

<b>Amplitude response</b>	
20 Hz ... 15 kHz	$\leq \pm 0,3$ dB
15 kHz ... 60 kHz	$\leq + 0/- 6$ dB

<b>Non-linear distortions</b>	
For 50 kHz Deviation	$\leq 0,35 \%$
For 70 kHz Deviation	$\leq 0,7 \%$

<b>Signal-to-noise-voltage ratios</b> according to DIN 45 405 and CCIR 468-2	
Direct sound demodulation	$\geq 66$ dB
Intercarrier demodulation	$\geq 50$ dB (typical $\geq 56$ dB)

<b>Crosstalk</b>	
Dual sound operation	$\geq 80$ dB
Stereo	$\geq 40$ dB

### Measurement functions

<b>Level display (vision carrier, sound carrier 1 + 2)</b>	
Accuracy	$\leq \pm 1$ dB
<b>Deviation display</b>	
Display accuracy sound 1/2	$\pm 500$ Hz
Display accuracy pilot	$\pm 100$ Hz
<b>Videotext error display</b>	
Display accuracy	$\pm 100$ ppm
<b>Zero keying</b>	
Zero keying time	5 $\mu$ s
Zero keying position, line period	13/64 H ... 58/64 H in lines 7 ... 309 and 320 ... 621
Zero keying position, field period	lines 7/320 ... 22/335 at 36/64 H

### General data

Operational temperature range	+ 10 ... + 45 $^\circ$ C
Supply voltage	230 V $\pm 15 \%$ , 40 ... 63 Hz
Power consumption	max. 200 VA
Dimensions w x h x d	19" x 5 HE x 444 mm
Weight	approx. 23 kg
Version	19"-drawer or table top model

Detailed technical data and data of the VF/AF-Analyser on request.

Edition 09/01. Changes due to modifications without notice.  
Copyright by Plisch Nachrichtentechnik.



## Plisch Nachrichtentechnik

P.O. Box 17 80 · D-68507 Viernheim  
Großer Stellweg 13 · D-68519 Viernheim  
Phone +49 62 04 70 70 · Fax +49 62 04 70 72 00  
<http://www.plisch.com>

**PLISCH**  
NACHRICHTENTECHNIK