



## Video Measurement System VSA

Five powerful instruments in one 19" cabinet

The Video Measurement System VSA from Rohde & Schwarz packs the following functions into a minimum of space:

- Video and FFT analyzer
- 3-channel oscilloscope
- Vectorscope
- Monitor
- System controller (486 PC)

Further features of VSA include:

- Four video-signal inputs with 9-MHz bandwidth
- High-contrast LCD (colour or monochrome)
- Convenient menu-driven user interface
- Future-oriented equipment design

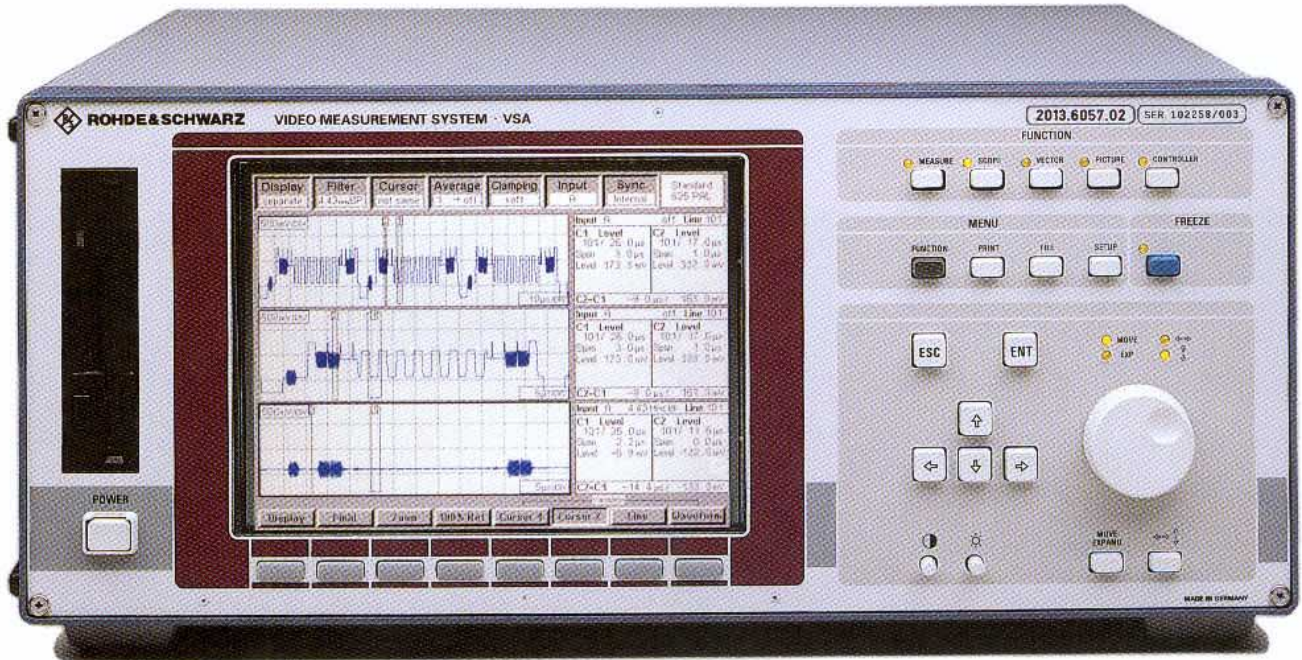
Thanks to its versatility, VSA is suitable for a wide field of applications:

- In labs and service centers
- In automated measuring and monitoring systems
- In production and quality assurance of video equipment



**ROHDE & SCHWARZ**





VSA for fast and highly accurate analysis of all kinds of video signals

## Versatile use

The great versatility of the Video Measurement System VSA makes it suitable for a wide range of applications.

Users in both **laboratory and service environments** will highly value the comprehensive measurement capabilities as well as the high operating convenience of the integrated instruments.

The integrated PC makes VSA ideal for use as an **automatic test and monitoring system**, eg for TV transmitter or cable networks. No external controller is required for system control.

An integrated hard disk allows a great number of measurement results and graphics to be stored for later evaluation. This is a great advantage especially for mobile applications.

In the **production** of video equipment the VSA cannot be beaten for its high measurement speed. Results are computed virtually in real time even if long

test reports are called for, and this considerably reduces time and costs.

## State-of-the-art technology

VSA carries out the various measurement tasks with the aid of a state-of-the-art multiprocessor system which performs digital and highly accurate signal processing and controls all system interfaces.

The main features are:

- Four loop-through video-signal inputs with analog 9-MHz bandwidth
- 486 DOS PC with 8-Mbyte RAM and IEC/IEEE-bus controller
- Multitasking operating system
- LCD graphics screen with 640 x 480 pixels (colour or monochrome)
- Connectors for external keyboard and colour monitor
- Two serial interfaces (RS-232)
- SCPI remote control via IEC/IEEE bus or serial interface
- Printer interface
- Hard disk for storing results and application programs

- 3.5" floppy-disk drive (DOS format) for the transfer of measurement data or for software options
- Modular concept with hardware and software options

## Convenient operation

Thanks to the clear front-panel layout and simple operation of the VSA, the user is able to safely employ the numerous functions of the measurement system without any previous knowledge of the instruments. Through the use of a high-resolution graphics display with windowing technique, pull-down menus and softkeys the front panel is simple and logically arranged. Only a few hard keys are provided for the most important functions which can be called up directly with one keystroke.

Softkeys, cursor keys and a rollkey are provided for the control of on-going measurements. A clear menu structure makes sure that the user is not overburdened when settings are to be made.



VSA can also be remote-controlled. In addition to the standard instrument functions, a convenient SCPI-compatible set of commands provides auxiliary functions such as reading curves, remote polling of data stored on the hard disk or reloading and starting automatic measurement programs. Remote control is possible simultaneously via the IEC/IEEE-bus or a serial interface (important for remote control via modem).

In the overall measurement mode a great variety of parameters can be measured and displayed in a tabular form (see list under Specifications)

Parameter	Value	Unit	Status	Ref	Test(signal)	Line
Diff Phase pos	0.4	deg			Mod Ramp	20
Diff Phase neg	-0.1	deg			Mod Ramp	20
Multiburst Flag abs	423.7	mV			CCIR18/6	18
Multiburst Flag bar	-0.6	%/bar			CCIR18/6	18
Multiburst 0.6 (%)	0.7	%/Flag			CCIR18/6	18
Multiburst 1.0 (%)	0.5	%/Flag			CCIR18/6	18
Multiburst 2.0 (%)	0.4	%/Flag			CCIR18/6	18
Multiburst 4.0 (%)	1.7	%/Flag			CCIR18/6	18
Multiburst 4.8 (%)	1.8	%/Flag			CCIR18/6	18
Multiburst 5.6 (%)	1.7	%/Flag			CCIR18/6	18
Sin x/x Amplitude pos	-0.7	dB/grat			Sin X/X	333
Sin x/x Amplitude neg	-0.9	dB/grat			Sin X/X	333
Sin x/x Group Delay pos	-10.0	ns/grat			Sin X/X	333
Sin x/x Group Delay neg	-8.5	ns/grat			Sin X/X	333
Spectrum pos	-2.8	dB/grat			CCIR17	17
Spectrum neg	4.6	dB/grat			CCIR17	17
Lum Noise Unw (nom)	66.8	dB/nom			Quiet	22
Lum Noise Unw (bar)	69.0	dB/bar			Quiet	22

Detailed analysis in the individual measurement mode

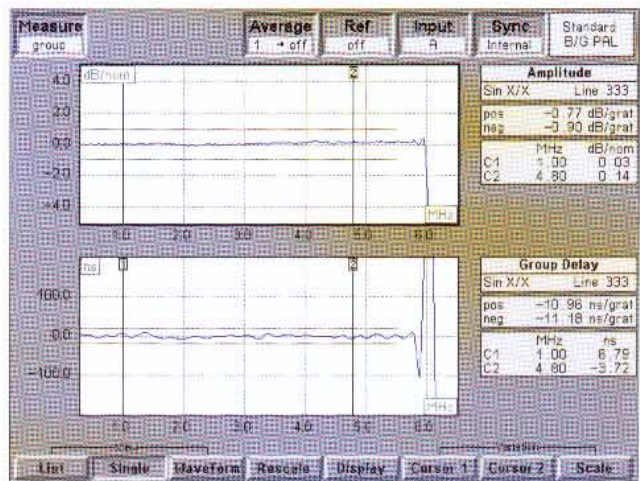
## Five instruments in one

### Video and FFT analyzer

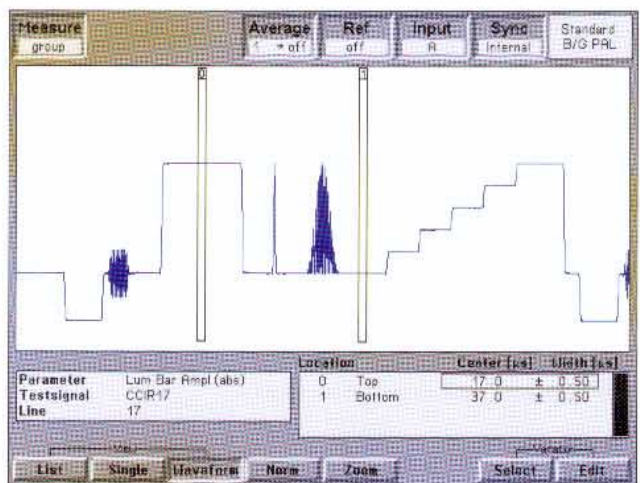
The VSA's analyzer function simultaneously computes a great variety of different input signal parameters and performs automatic limit monitoring. The user may choose between four operating modes:

- Automatic overall measurement of all parameters
- Individual measurement using extended capabilities
- Test-signal and test-location display
- Standard or reference measurement separately for every parameter

In the *overall measurement mode* all selected parameters are computed automatically and displayed in a tabular form (Fig. right, top). Since the main information such as reading, limit status and test signal can be directly read from this table, a rapid overview of a great number of measurement parameters can be obtained in this mode.



Waveform display with marked locations for visual check on evaluated test line



If required, the various video parameters can be examined in greater detail using the extended measurement and display capabilities of VSA in the *indi-*

*vidual measurement mode*. Individual measurements of the frequency and group-delay spectra of (sin x)/x signals using the Fast Fourier Transform (FFT)

(2nd Fig. from top), measurements of the 2T pulse and measurements of the SC/H phase jitter and line jitter over the full field are very straightforward.



If VSA detects out-of-tolerance conditions or other parameter errors, the *test-signal display* is a valuable tool for fast error diagnosis. The waveform of the evaluated test line is displayed with all locations used for the computation of a selected parameter (Fig. page 3, bottom). Thanks to this visual check, incorrect signal insertion or missing test signals are immediately detected.

Another advantage of the analyzer function is the *reference measurement*. In this mode the effect of the DUT on the signal can be directly displayed by simultaneously evaluating the video signal at the input and output of the DUT.

### 3-channel oscilloscope

The video oscilloscope of VSA combines a great variety of highly practical display and measurement functions.

For the display of video signals (Fig. right) the VSA screen may also be horizontally divided into two or three sections. A separate input may be assigned to each section (eg R, G, B components) or the same signal is displayed in all three sections with different timebases (Fig. right, bottom). The displayed signal section may be moved continuously in the X and Y direction using the rollkey. For better orientation, the waveform is displayed on a dynamic measurement graticule which is automatically adapted to the displayed signal section.

A great number of digital filters, eg all CCIR filters for ITS measurements, are available for simulating signal manipulations.

A special strength of the VSA oscilloscope is cursor measurements with two cursors being used for each partial dis-

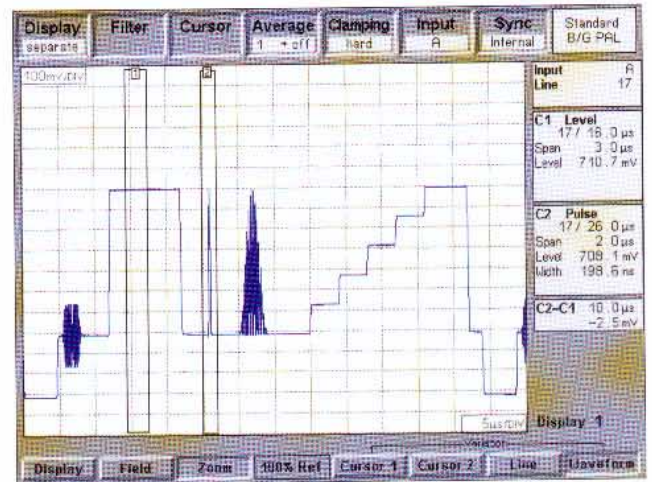
play. With the functions LEVEL, PEAK, SLOPE and PULSE complete signal elements can be analyzed.

### Vectorscope

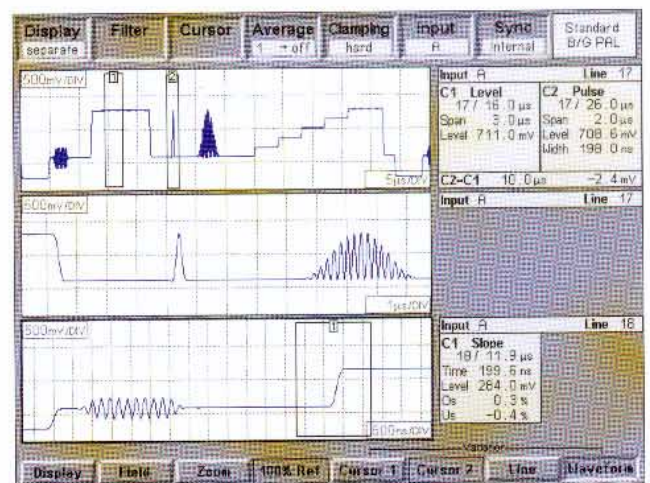
The vectorscope displays the magnitude and phase of the colour information of a video line. For a fast diagnosis the waveform of the selected line is also simultaneously displayed (Fig. page 5,

top). The most commonly used test signal for vector analysis is the standard colour bar. If this signal is available, all colour-subcarrier amplitudes and phases are automatically computed and displayed. The phase difference of two colour subcarriers can also be accurately measured by alternately using the colour-subcarrier reference frequency of the two measured signals.

The video oscilloscope of VSA combines a great variety of highly practical display and measurement functions.



For simultaneous display of several signals, the screen may be divided into several sections

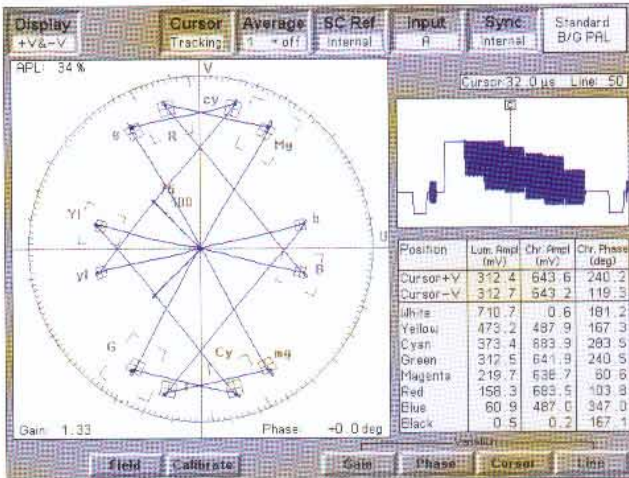


A unique feature is the measurement using a tracking cursor. A cursor line in the waveform window of the video line coincides with a marker in the vector diagram. Shifting the cursor line causes this marker to track the vector curve. This allows the colour parameter for each point of the measured line to be determined.

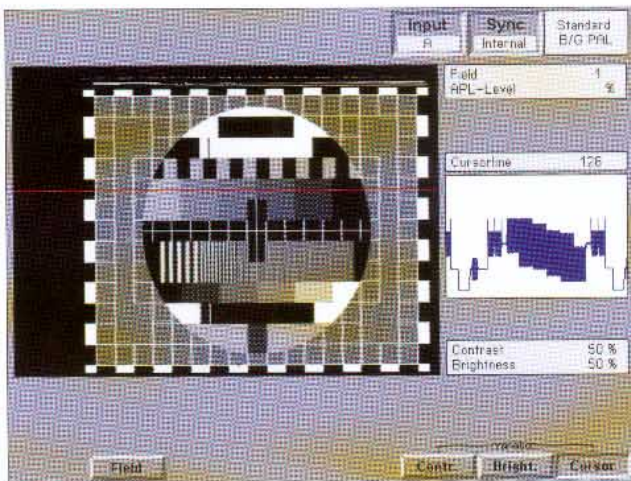
### Monitor

At sites where several different program signals are received (eg in cable networks) the individual program sources have to be reliably identified.

The VSA monitor function displays a video signal as a monochrome TV picture with eight grey levels. Any rollkey-selected video line of the TV picture can be displayed simultaneously in the waveform window (Fig. bottom).



The vectorscope function displays the magnitude and phase of the colour information of a video line

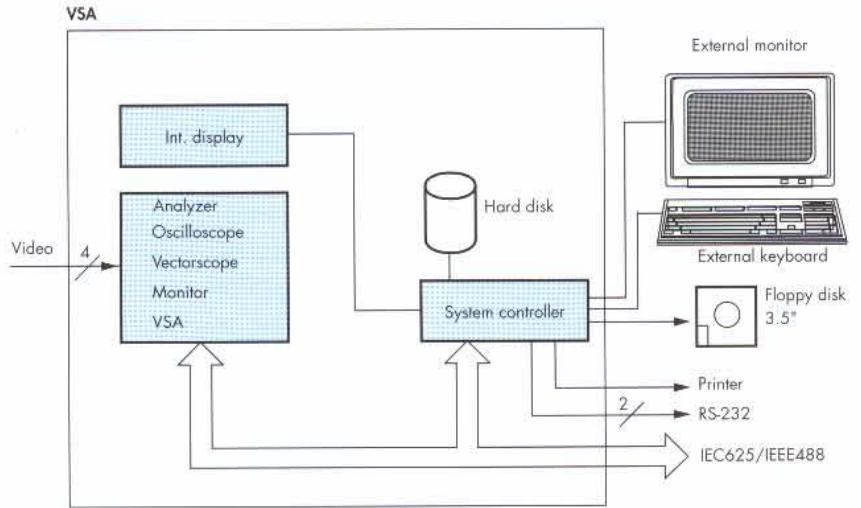


Any line of a monochrome TV picture with eight grey levels can be selected and displayed in a waveform window



### System controller

The system controller function provides the user with a complete DOS-compatible 486 PC with integrated IEC/IEEE-bus interface, printer interface and two serial interfaces. This makes VSA a complete automatic test system capable of controlling external devices via the interfaces provided. All measurement results may be stored in the built-in hard disk or on floppies for subsequent evaluation. Individual measurement programs may be started via the pull-down menus without any DOS knowledge being required.

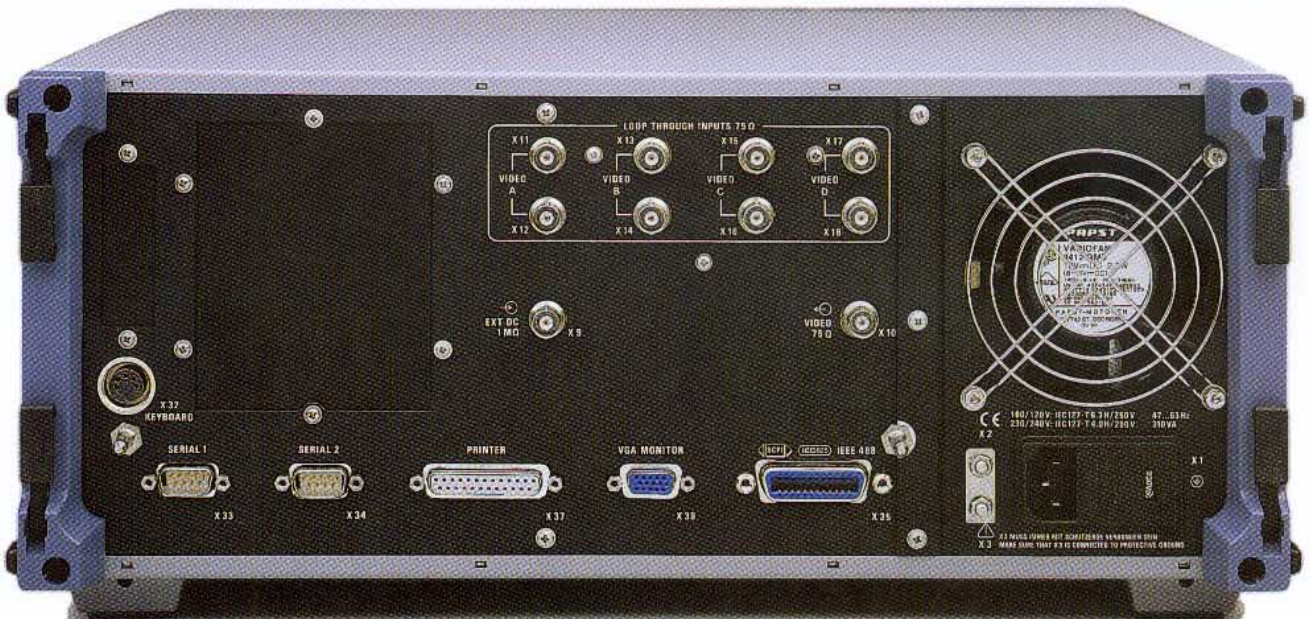


VSA with external monitor and keyboard

PC operation and measurement functions are independent of each other. To be able to make full use of the PC functions, interfaces are provided for a VGA colour monitor and a PC keyboard. The VSA display and the external monitor may be configured independently either for measurements or as PC display. Switchover requires just one keystroke. The external keyboard may also be used either for PC control or for operating the measurement functions.



Rear view of VSA





## Specifications

<b>Frequency range</b>	0 to 9 MHz
Standard	B/G, I, D/K, PAL
<b>Signal inputs</b>	
Video inputs	75-Ω loop-through filters
Level	1 V ±6 dB
Return loss up to 6 MHz	>40 dB
Return loss up to 10 MHz	>36 dB
Decoupling of inputs up to 10 MHz	>85 dB
DC input	1 MΩ
Level	±5 V
<b>Signal outputs</b>	
Zero-reference control pulse, 75 Ω	
Level	1.4 V
Line position and duration	adjustable
<b>Interfaces</b>	
Remote control	IEC 625-2/IEEE 448-2, 2 x RS-232-C (9-contact)
Printer	parallel interface (Centronics)
External monitor	VGA colour monitor, 640 x 480 pixels
External keyboard	PC AT keyboard
Display	640 x 480 pixels, colour or monochrome, max. pixel error 0.017%

## Measurement parameters

	Unit	Range	Res.	Max. error*)
<b>Amplitude &amp; delay</b>				
Luminance bar amplitude (abs)	mV	0 to 1400	0.1	±2.0
Luminance bar amplitude (nom)	%	-100 to +100	0.1	±0.3
Sync amplitude (abs)	mV	60 to 600	0.1	±2.0
Sync amplitude (nom)	%	-80 to +100	0.1	±0.5
Sync amplitude (bar)	%	-50 to +50	0.1	±0.5
Burst amplitude (abs)	mV	60 to 600	0.1	±3.0
Burst amplitude (nom)	%	-80 to +100	0.1	±1.0
Burst amplitude (bar)	%	-50 to +50	0.1	±1.0
C/L gain (modulated pulse)	%/bar	-50 to +50	0.1	±1.0
C/L delay (modulated pulse)	ns	-500 to +500	1	±5
C/L gain (modulated bar)	%/bar	-50 to +50	0.1	±1.0
Average picture level (bar)	%	0 to 200	0.1	±3.0
DC level	mV	-2000 to +2000	0.1	±3.0
Residual picture carrier	%	0 to +30	0.1	±0.3
Residual picture black level	%	50 to 90	0.1	±0.3
<b>Linear distortions</b>				
Baseline distortion (bar)	%	-40 to +40	0.1	±0.3
2T pulse amplitude (bar)	%	-50 to +50	0.1	±0.5
2T k factor	%	0 to 10	0.1	±0.5
2T half-amplitude duration	ns	100 to 400	1.0	±3
Tilt	%	-40 to +40	0.1	±0.3
Short/field-time distortion	%	-40 to +40	0.1	±0.3
<b>Non-linear distortions</b>				
C/L intermodulation (pulse)	%/bar	-50 to +50	0.1	±1.0
C/L intermod. (bar), step 1/2/3	%	-50 to +50	0.1	±0.3
C NL gain, pos/neg	%	0 to +50/-50	0.1	±0.7
C NL gain, pp	%	0 to 100	0.1	±1.0
C NL phase, pos/neg	deg	0 to +50/-50	0.1	±0.7
C NL phase, pp	deg	0 to 100	0.1	±1.0
Lum NL	%	0 to 50	0.1	±0.5
Lum NL, step 1/2/3/4/5	%	50 to 100	0.1	±0.5
Diff. gain, ref (bar)	%	-50 to +50	0.1	±0.3
Diff. gain, pos/neg	%	0 to +50/-50	0.1	±0.3
Diff. gain, pp	%	0 to 100	0.1	±0.5
Diff. gain, step 1/2/3/4/5	%	-50 to +50	0.1	±0.3
Diff. phase, pos/neg	deg	0 to +50/-50	0.1	±0.3
Diff. phase, pp	deg	0 to 100	0.1	±0.5
Diff. phase, step 1/2/3/4/5	deg	-50 to +50	0.1	±0.3
<b>Frequency response</b>				
Multiburst flag (abs)	mV	0 to 1000	0.1	±2.0
Multiburst flag (nom)	%	-100 to +50	0.1	±0.3
Multiburst flag (bar)	%	-100 to +50	0.1	±0.3
Multib 0.5/1/2/4/4.8/5.8	%	-100 to +50	0.1	±1.0
Multib 0.5/1/2/4/4.8/5.8	dB	-40 to +6	0.01	±0.1
Multib (national) flag (abs)	mV	0 to 1000	0.1	±2.0
Multib (nat) flag (nom/bar)	%	-100 to +50	0.1	±0.3
Multib nat 0.5/1.5/3.0/4.4	%	-100 to +50	0.1	±1.0
Multib nat 0.5/1.5/3.0/4.4	dB	-40 to +6	0.01	±0.1
Sin x/x amplitude, pos/neg	dB	-100 to +100	0.01	±0.3
Sin x/x group delay, pos/neg	ns	-1000 to +1000	1.0	±20
Spectrum, pos/neg	dB	-100 to +100	0.01	±0.3

	Unit	Range	Res.	Max. error*)
<b>Noise measurements</b>				
Lum noise, unw (abs)	mV	0 to 50	0.1	±1.0
Lum noise, unw (nom/bar)	dB	25 to 75	0.1	±1.0
Lum noise, lumw (abs)	mV	0 to 50	0.1	±1.0
Lum noise, lumw (nom/bar)	dB	25 to 80	0.1	±1.0
Lum noise, chrw (abs)	mV	0 to 50	0.1	±1.0
Lum noise, chrw (nom/bar)	dB	25 to 80	0.1	±1.0
Hum (abs)	mV	0 to 700	1	±5
Hum (nom/bar)	dB	0 to 55	0.1	±1.0
C/SND intermodulation (abs)	mV	0 to 50	0.1	±1.0
C/SND intermod (nom/bar)	dB	30 to 70	0.1	±1.0
SND/SND intermod (abs)	mV	0 to 50	0.1	±1.0
SND/SND intermod (nom/bar)	dB	30 to 70	0.1	±1.0

	Unit	Range	Res.	Max. error*)
<b>Timing measurements</b>				
Field period, first/sec. field	μs	20 000 ±30	0.001	±0.005
Equalizing pulse duration	μs	1.35 to 3.35	0.001	±0.005
Serration pulse duration	μs	2.70 to 6.70	0.001	±0.005
Line period	μs	60 to 68	0.001	±0.005
Line blanking (nom/bar)	μs	7 to 65	0.001	±0.05
Sync duration	μs	2.7 to 6.7	0.001	±0.005
Sync slope, neg/pos	μs	70 to 1000	1	±5
Burst position	μs	4.7 to 6.0	0.001	±0.01
Burst duration	μs	1.5 to 3.0	0.001	±0.01
SC/H, line/average	deg	-90 to +90	1	±4
SC/H, pos p/neg p/pp	deg	-90 to +90	1	±4
PAL phase, line/average	deg	0 to 180	1	±4
PAL phase, pos p/neg p/pp	deg	0 to 180	1	±4
SC frequency	Hz	4433618 ±100	0.05	±1

	Unit	Range	Res.	Max. error*)
<b>Jitter measurements</b>				
Field jitter, pos p/neg p/pp	μs	0 to 30	0.001	±0.005
Field jitter, std. deviation	μs	0 to 30	0.001	±0.005
Line jitter, pos p/neg p/pp	ns	0 to 4000	1	±5
Line jitter, std. deviation	ns	0 to 4000	1	±5

	Unit	Range	Res.	Max. error*)
<b>Video data measurements</b>				
Basic amplitude (abs)	mV	0 to 1400	1	±10
Basic amplitude (nom/bar)	%	-100 to +100	0.1	±2.0
Amplitude, pp (nom/bar)	%	-100 to +100	0.1	±2.0
Amplitude, pp (basic ampl)	%	-100 to +100	0.1	±2.0
Decoding/timing margin	%	0 to 100	0.1	±2.0
Run-in bits	-	6 to 24	-	-
Data timing	μs	10 to 14	0.001	±0.01

## General data

Nominal temperature range	0 to +50 °C
Power supply	100/230 V -10/+15%, 120/240 V -15/+10%, 47 to 63 Hz, 310 VA
<b>Mechanical stress</b>	
Sinusoidal vibrations	5 to 150 Hz, max. 2 g at 55 Hz, 0.5 g from 55 to 150 Hz, to IEC 68-2-6, IEC 1010-1, MIL-T-28800 D, class 5
Random vibrations	10 to 300 Hz, 1.2 grms
Shock	40 g shock spectrum to MIL-STD 810 C and MIL-T-28800 D, classes 3 and 5
<b>Climatic conditions</b>	
+25 °C/+40 °C cyclic at 95% rel. humidity, to IEC 68-2-30	
<b>EMC</b>	
to EMC directive of EU (89/336/EEC) and German EMC regulations to EN 61010-1	
Electrical safety	
Dimensions (W x H x D)	435 mm x 192 mm x 460 mm
Weight	17.7 kg

\*) Specified error limits apply to nominal parameter values with an averaging factor of ≥8.

## Ordering information

Video Measurement System		
with monochrome display	VSA	2013.6057.02
with colour display	VSA	2013.6057.03
Service manual		2013.7499.24



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