ROHDE & SCHWARZ

ESVP

TEST RECEIVER ESVP

20 to 1300 MHz/–20 to +137 dBµV

IEC 625 Bus IEEE 488

Data sheet
354 300
E–1

SPECIAL FEATURES

ESVP

Test Receiver ESVP ♦ 20 to 1300 MHz
–20 to +137 dBµV

- Programmable test receiver for selective voltage measurements and twoport measurements in laboratories and test departments
- Field-strength measurements with test antennas
- RFI measurements to CISPR, VDE and FCC
- Interference measurements to MIL and VG standards
- Radiomonitoring
- AC supply and battery operation

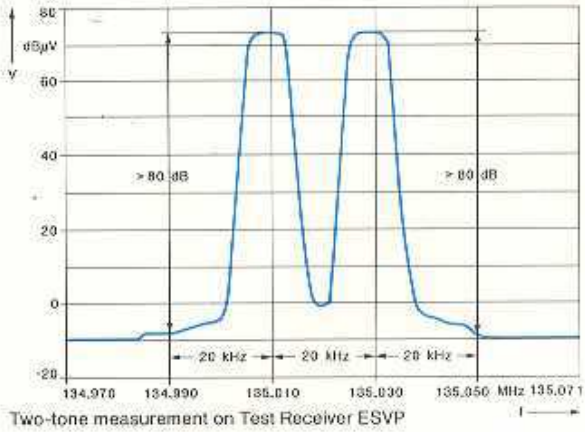
IEC 625 Bus
IEEE 488

The **Test Receiver ESVP** measures and demodulates AM double-sideband, single-sideband, pulse-modulated and FM signals as well as narrowband and broadband interference. High overload capacity, a wide dynamic range and numerous evaluation capabilities make the ESVP suitable for

selective voltage and twoport measurements – in automatic test systems too –

and all applications in the field of radiomonitoring and EMC measurements.

In its frequency-related characteristics and application capabilities the ESVP is very similar to the ESV (data sheet 342 402), in measurement convenience, intelligence and system compatibility to the ESH 3 (data sheet 335 801). Its frequency range overlaps and extends that of the ESH 3.



Two-tone measurement on Test Receiver ESVP

Special features of ESVP

- Synthesizer; frequency resolution 1 kHz, with SSB 100 Hz
- High measurement accuracy (error <1 dB)
- Wide dynamic range:
  noise figure typically 8 dB (preamplifier on)
  3rd-order IP typically +20 dBm (preamplifier off)
- Automatic frequency scanning with constant and frequency-proportional step sizes; automatic scanning with up to 50 preset fixed frequencies
- Automatic gain correction in the whole frequency range after calibration (sinewave calibration as well as pulse calibration for broadband interference measurements)
- Measurement of voltage, field strength, current, spectral pulse density and twoport attenuation with display of physical units; automatic consideration of probe and bandwidth correction factors; input of any frequency-dependent correction factors (current probes, antennas) as well as of frequency-dependent attenuation or gain possible
- Additional evaluation capabilities for radiomonitoring: modulation-depth and frequency-deviation measurements, remote frequency and frequency-offset measurements with the aid of built-in IF counter, recording of band occupancy, SSB demodulator, AF filter and squelch with programmable response threshold, built-in loudspeaker, indication of date and time of day
- Fast automatic field-strength recording in moving vehicle (field-strength statistics)
- Facilities for connection of XY, YT recorders and up to 5 Radiomonitoring Recorders ZSG 3 from Rohde & Schwarz
- IEC-bus interface with listener and talker function; talk-only mode for data recording without controller
- Non-volatile storage of 10 complete device settings, 5 data sets for automatic frequency scanning, one data set with 50 fixed frequencies and two data sets for correction factors
- Full compatibility with Test Receiver ESH 3 (9 kHz to 30 MHz) with respect to operational concept and IEC-bus commands
- Connectors for AC supply and 24-V battery

Selective voltmeter With its measurement range from −20 to +137 dBμV the ESVP does not need any add-ons to operate as an automatic high-precision selective voltmeter for laboratory, testing and servicing applications. RF currents in the frequency range 20 to 300 MHz can be measured in conjunction with the VHF Current Probe ESV-Z1. Excellent receiver selectivity permits the measurement of adjacent-channel power, harmonics, non-harmonic spurious signals of generators, intermodulation and cross-modulation, as well as the determination of noise figures. The ESVP is capable of performing low-noise and low-distortion measurements both with and without RF preamplifier (10 dB) and of distinguishing any inherent non-linearity from that of the test item by means of an automatic linearity test.

Calibration generator The output of the calibration generator (90 dBμV ±0.3 dB into 50 Ω) is ideally suited for frequency-response measurements on amplifiers and filters; attenuation can be measured up to 110 dB and gain up to 47 dB. The VHF Current Probe ESV-Z1 and the Absorbing Clamp MDS-21 facilitate measurement of screening effectiveness of cables and connectors and the VSWR Bridge ZRB 2 can be used for measuring the return loss of two-terminal networks (e.g. antennas) and twoports.

Thanks to the reconversion method internally used in the REM. FREQ. measurement mode, the generator output is suitable for connection of a frequency counter for accurate (remote) frequency measurement of the signal received. With this kind of frequency measurement, the measuring accuracy depends on the accuracy of the external frequency counter, whereas when the built-in IF counter is used the accuracy is determined by the internal ESVP reference oscillator.

Remote control The IEC/IEEE-bus interface possesses all standard listener and talker capabilities. Commercial controllers without parallel poll capability can be used.

Signal evaluation capabilities

Four switch-selected IF bandwidths: 7.5/12/120/1000 kHz

Average and peak indication, pulse weighting to CISPR 16 and VDE 0876, Part 1, with programmable measuring times

Demodulation of classes of emission N0N (A0), A1A (A1), A3E (A3), J3E (A3J, USB and LSB) and F3E (F3); built-in loudspeaker and headphones connector; switch-selectable AF filters for A3A and F3E; squelch with programmable threshold level

Analog indication of level and frequency offset in addition to digital readout

Indication of overload in essential stages and switch-selectable linearity test

Broadband 10.7-MHz IF output for panoramic display and spectrum analyzer

Narrowband 10.7-MHz IF output for oscilloscope

AM and FM demodulator outputs

Recorder outputs for level and frequency offset

Generator output for signal frequency measurement

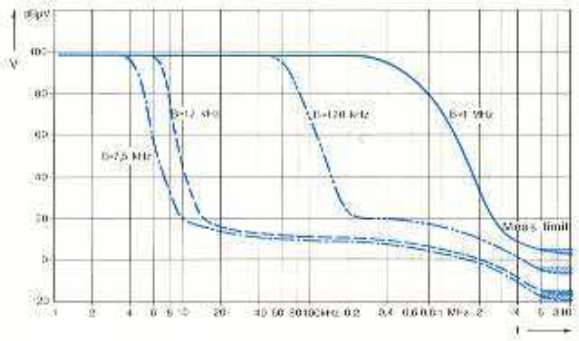
Digital measurement of modulation depth, frequency, frequency offset and frequency deviation

Trigger input for level and frequency measurement of short-time signals

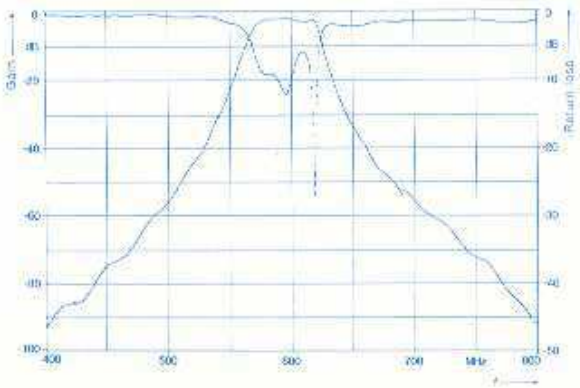
Recording Harmonic and non-harmonic spectra as well as gain and attenuation characteristics can readily be plotted on an XY recorder. The recorder writing area is defined by entering the start/stop frequency and the maximum/minimum level. The frequency axis can be linear or logarithmic. Chart paper complying with VDE/FCC/MIL/VG can be used.

Oven-controlled Crystal Oscillator Option ESVP-B1 The oven-controlled crystal oscillator reduces the setting error and the frequency measurement error of the ESVP down to $<2 \times 10^{-7}$. This is mainly important when the ESVP is used for frequency measurements in radiomonitoring. A 10-MHz output of this option can be brought out on the rear panel of the ESVP and used for connection of a second receiver, e.g. ESH 3.

Typical dynamic selectivity of ESVP

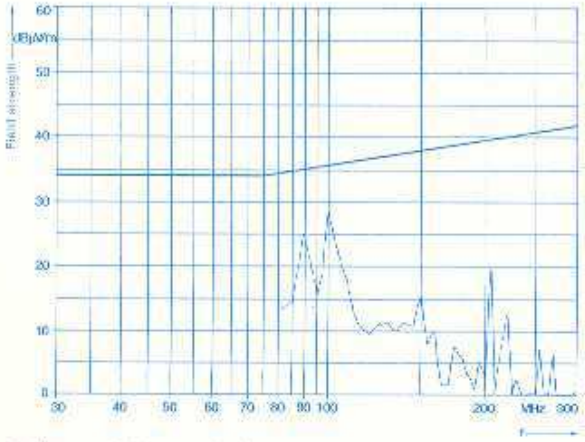


Insertion and return loss of a bandpass filter



TYPICAL APPLICATIONS

Interference measurements Thanks to the programmable automatic frequency scanning with direct control of printer and XY recorder for data logging, the ESVP features considerable advantages over conventional test receivers in this field of application. For measurement of interference power, currents and field strengths to the relevant standards (CISPR, VDE, FCC, MIL, VG) the following accessories are available (see also data sheet 342403):
Absorbing Clamp MDS-21 (30 to 1000 MHz)
VHF Current Probe ESV-Z1 (20 to 300 MHz)
Broadband Dipole HUF-Z1 (20 to 80 MHz)
Log-periodic Broadband Antenna HL 023 A1 (80 to 1300 MHz)



Interference field strength of a motor vehicle: automatic frequency scanning of ESVP with 50 fixed frequencies

Further advantages of ESVP in interference measurements:

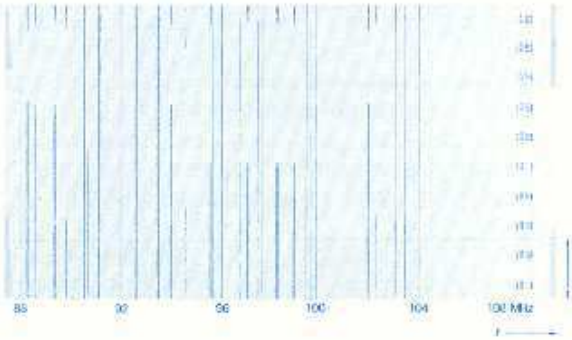
Automatic consideration of correction factors of any probes and indication of physical unit (e.g. dBµA, dBµV, dBµV/m, dBpW)

- Bandwidth correction factors considered in measurement of spectral pulse density to MIL and VG: readout of measured data in dBµV/MHz, dBµA/MHz, dBµV/m MHz
- Programmable measuring times for optimum adaptation of automatic measurements to time-dependent variations of the interference:
  Peak indication with program mable hold time for narrowband and broadband interference measurements to MIL and VG standards
  Average indication with programmable integration time for narrowband interference measurements
  Indication conforming to CISPR with determination of maximum within the programmed measuring time
- 60-dB operating range ideally suited for measurements to MIL and VG standards
- 10-dB operating range for measurements to CISPR; autoranging with consideration of settling times for error-free results, CISPR standards being fully complied with even for single pulses
- Logarithmic frequency axis for data logging on XY recorder permitting direct recording of measured data on tolerance charts

Since pure broadband noise spectra exhibit a continuous characteristic, frequency scanning in constant or frequency-proportional steps which are greater than the IF bandwidth, is possible and recommendable. Automatic frequency scanning of the ESVP with 50 programmed fixed frequencies is ideal in free-field measurements, e.g. measurement of ignition interference from motor vehicles to VDE 0879 and SAE J551. For this purpose the frequencies are selected so that they do not fall within the channels occupied by radio services.

Radiomonitoring, propagation and coverage measurements Thanks to its outstanding RF characteristics, such as high setting accuracy, high overload capacity and overall selectivity, its switch-selected IF bandwidths and types of demodulation, the wide range of available test antennas and its programmability, the ESVP is ideal for use in radiomonitoring with remote frequency measurement, modulation-depth and frequency-deviation measurements, recording of band and channel occupancy, as well as for propagation and coverage measurements. It offers the following capabilities:

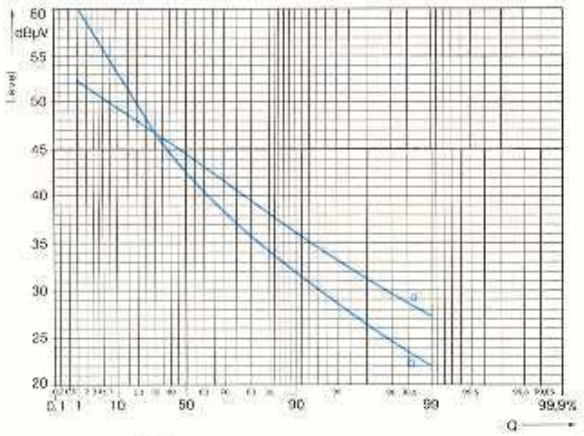
- Graphical representation of field-strength results in particular frequency bands, in the form of line spectra or continuous curves, on an XY recorder, with additional output of field-strength levels and, for instance, frequency offset on a printer
- Measurement of the range of field-strength variations within a preset time (1 to 1000 s)
- Recording of field strength as a function of time for plotting antenna radiation patterns, e.g. in helicopters and for channel occupancy measurement
- IF panoramic display in conjunction with Panoramic Adapter EZP (data sheet 254001)
- Recording of band occupancy as a function of time, using the Radiomonitoring Recorder ZSG 3
- Reduction of data volume in automatic scanning mode: only signal levels above the preset threshold are transferred to the computer
- Trigger functions:
  1. "internal" for automatic monitoring of intermittent carriers;
  2. "at time x" and
  3. every x seconds, minutes, hours for exact observation of the occupancy and of level fluctuations
- Use in automatic field-strength test sets (see next page).



Recording of band occupancy in VHF range

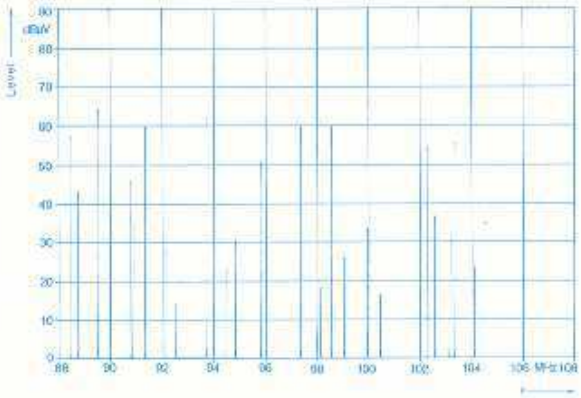
TYPICAL APPLICATIONS

The ESVP offers the following possibilities for optimum system operation: The controller instructs each ESVP to permanently scan a particular frequency range and to issue a Service Request when the programmed level is exceeded – whereupon the controller identifies the calling receiver by a Serial Poll and accepts the measured data, or to answer a Parallel Poll of the controller. Thus the controller and two test receivers form together a multiprocessor system for diversified tasks.

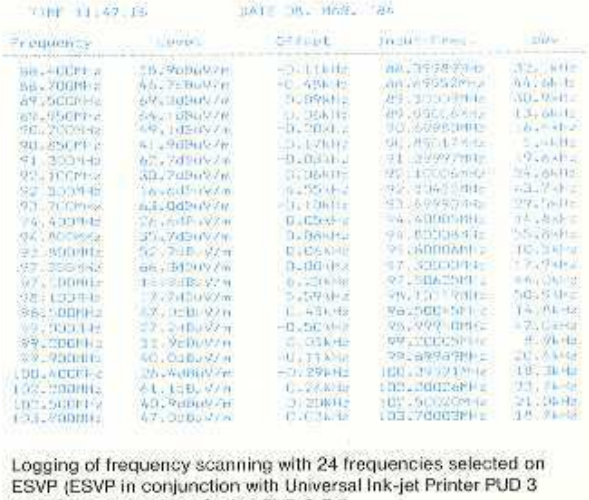


Results of fast field-strength measurement in moving vehicle with internal ESVP classification; printed out on Printer PUD 3 and represented in a Rayleigh network

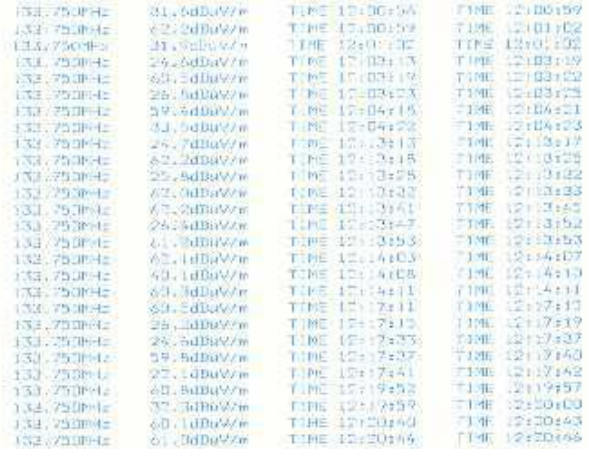
Automatic field-strength test sets furnish the data for statistical evaluation of spatial and time-dependent field-strength variations thus providing **fundamental data for transmitter planning**. In an industrial environment it is necessary to permanently **check the coverage** by all radio communication services (sound and TV broadcasting, car telephone, European radiopaging and non-public services). The **fast field-strength measurement in moving vehicles** with statistical evaluation (ESVP with special function Fast A/D, with or without internal classification) is particularly important for mobile radio networks in the VHF-UHF range, where strong spatial field-strength variations may occur due to scattering, diffraction and reflection. A pulse displacement generator triggers each individual measurement in the ESVP (trigger rate up to 1 kHz), whereupon the measurement rate is independent of the speed of the vehicle. In computer-controlled **in-flight measurements on transmitting antennas** (usually from helicopter) the high measurement speed of the ESVP is a great advantage: it takes only 0.2 s for one measurement at three different frequencies. Vertical patterns are determined in an ascending flight, horizontal patterns in a circular flight. The graphical representation of the results – circular diagram, standardization of the field strength in the direction of maximum radiation etc. – is carried out by the computer immediately on completion of the measurements, the time-consuming point-by-point evaluation of YT recordings being no longer required.

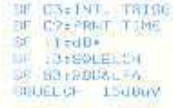


Recording of field-strength spectrum in VHF range from 88 to 108 MHz



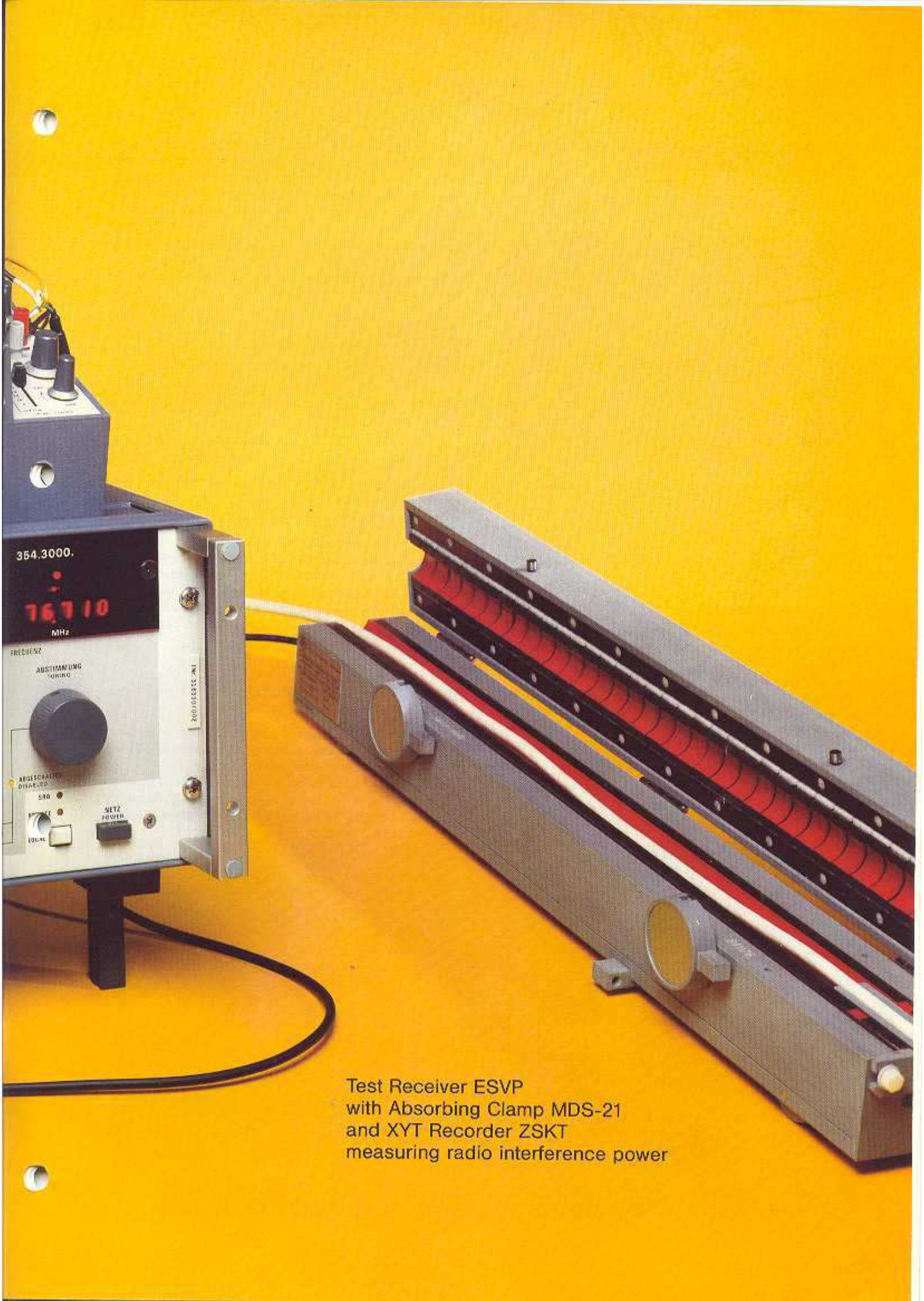
Logging of frequency scanning with 24 frequencies selected on ESVP (ESVP in conjunction with Universal Ink-jet Printer PUD 3 and IEC-bus Interface Option PUD 2-B4)





Channel occupancy: automatic monitoring at one frequency with intermittent carriers; channel occupancy documented by time information

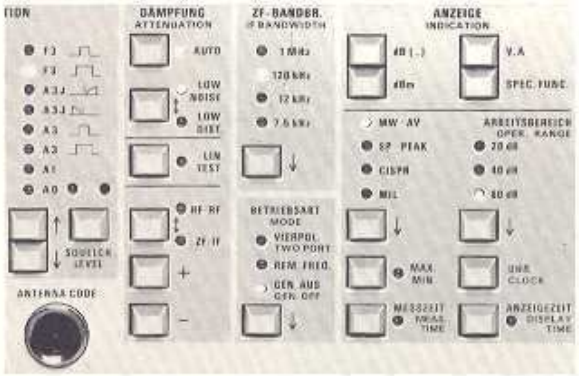

ROHDE & SCHWARZ · MESSEMPFÄNGER · TEST RECEIVER · 20 – 1300 MHz · ESVP
PREAMP. ON
OVERLOADER
BUSY
18.1 dBpW
DEMODULATION
DÄMPFUNG ATTENUATION
ZF-BANDBR. IF BANDWIDTH
ANZEIGE INDICATION
ANTENNA CODE



Test Receiver ESVP
with Absorbing Clamp MDS-21
and XYT Recorder ZSKT
measuring radio interference power

OPERATION

The **front-panel controls** are clearly arranged in functional groups; all settings are indicated by LEDs.



Front-panel detail with operating controls for demodulation, attenuation, IF bandwidth and indication

Operation is backed up by the following indicators and responses of the ESVP: when a logically inhibited key is pressed, the LED of the inhibiting function blinks; when the demodulator operating range is exceeded or essential stages are overloaded (even with pulses), the display blinks; when illegal data is input or an essential module fails, a coded error message appears together with an acoustic signal. The end of lengthy, time-consuming measurements is also indicated audibly.

The 15-digit **alphanumeric display** of the ESVP outputs the measured data complete with physical unit and is also used for checking the formatted input of setting data.

Non-volatile memory A battery-buffered memory in the ESVP can store the last and another nine complete device settings. It also stores all correction values obtained from an automatic calibration process for frequency response, IF bandwidths and demodulator characteristic and thus ensures maximum accuracy at all times.

Frequency setting is facilitated by a tuning aid (offset indication with centre calibration) and is possible in various ways:

- quasi-continuous in steps of 1 kHz or 100 kHz (switch-selected) and of 100 Hz or 100 kHz in SSB mode, using rotary knob
- in steps of any preset size, e.g. corresponding to channel spacing, or in steps of the fundamental frequency for measurement of harmonics
- by digital entry via the keyboard
- by automatic frequency scanning over a maximum of five subranges with programmable start/stop frequencies and step sizes.

The **level measurement range** is selected either manually by separate setting of RF and IF attenuation or by automatic setting of the RF attenuation with the IF attenuation setting being determined by the selected IF bandwidth and indication mode. A 1-dB and a 4-dB attenuator is provided for additional linearity testing. The use of probes with the ESVP does not cause any extra work in the performance of measurements, since the physical unit is selected automatically and correction factors are taken into account. Reading errors are practically done away with.

The frequency-dependent correction factors of the Test Antennas HUF-Z1 and HL 023 A1 are also automatically taken into account when a special function is selected. Furthermore, the correction factors of another two probes or correction values of test setups can be entered into the battery-buffered CMOS RAM of the ESVP for permanent storage and called up via a special function.

Demodulator operating ranges Depending on the measurement task, one of three demodulator operating ranges can be selected: 20/40/60 dB. Accordingly, the automatic attenuation setting is in steps of 10, 20 or 30 dB.

Like the Test Receiver ESV, the ESVP also fulfills the CISPR linearity requirements with a valid operating range of 10 dB, which considerably speeds up CISPR interference measurements. The operating range also determines the range of the analog level indication which consists of a row of 31 LEDs. The range limits and RF attenuation are digitally displayed.

Calibration By a short or long push of the calibration key, two different processes can be triggered:

1. Adjustment of IF gain and frequency offset to the rated value of 100 MHz, with subsequent checking of the level measurement at the original frequency.
2. Measurement and storage of all calibration correction values that are constant over a long time: frequency response, gain differences between IF bandwidths and demodulator linearity.

During operation the IF gain is adjusted whenever a new frequency and IF bandwidth is set, so that the rated levels are also obtained at the IF and recorder outputs.

Thanks to this method, calibration of individual functions is very seldom necessary, and automatic measurements take much **less time** than would be required if a calibration were performed at each new frequency.

Operating principle The Test Receiver ESVP provides for double conversion of the test signal. It features the following characteristics:

RF attenuator switchable in steps of 10 dB from 0 to 140 dB; a 1-dB and a 4-dB attenuator being provided for linearity testing.

Low-noise preamplifier with high linearity can be switched on to increase the measurement sensitivity.

High-linearity diode mixer following 10 tracking bandpass filters, providing extremely wide dynamic range.

Test IF bandwidth can be switched from 7.5 kHz to 12/120/1000 kHz; additional 2.4-kHz filter for SSB demodulation.

Signal evaluation with average and peak indication as well as pulse weighting to CISPR Publ. 16 and VDE 0876, Part 1.

Programmable measuring times (5 ms to 100 s) to suit the test requirements.

MIL display mode, peak indication with automatic consideration of IF bandwidth correction values for the measurement of broadband interference.

MAX-MIN display mode for measuring the input signal variation range in a sequence of single measurements of 100 ms duration each.

Display time separately programmable; to ensure sufficiently long indication and monitoring of signals exceeding a programmed threshold in automatic frequency scanning mode.

All oscillators using synthesizer technique
1st IF 810.7 MHz or 310.7 MHz
2nd IF 10.7 MHz

Active, high-linearity demodulator with subsequent average- and peak-value derivation and CISPR weighting.

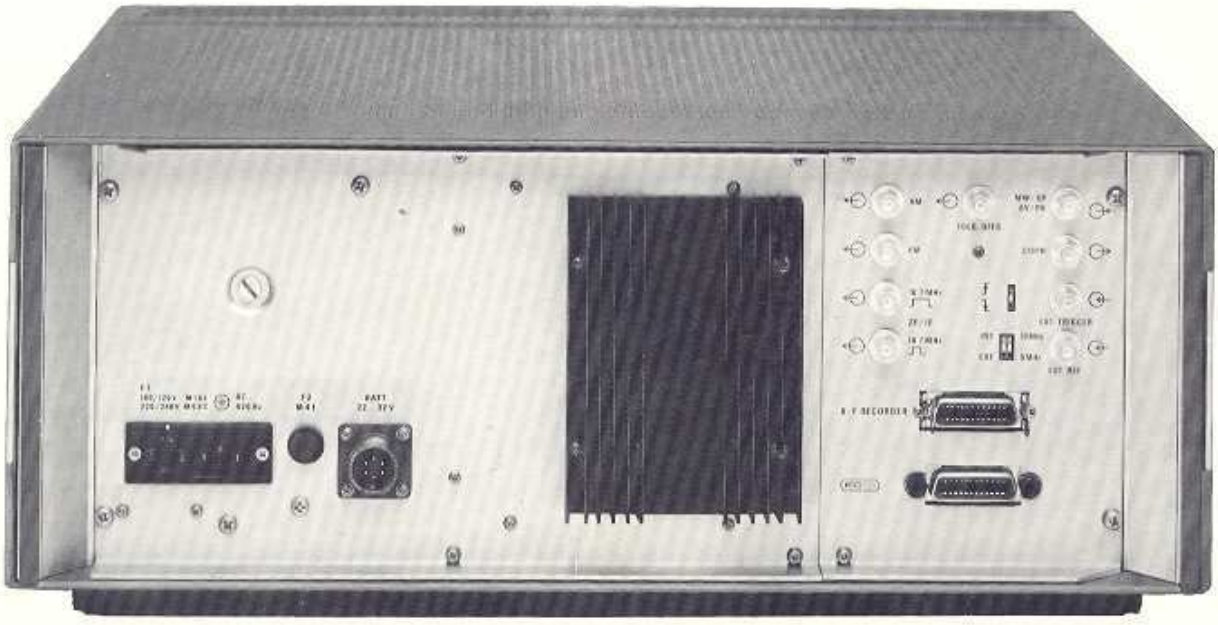
Demodulator circuits for FM and AM and with BFO for N0N (A0) ad A1A (A1); 2.4-kHz filter in SSB demodulator for upper and lower sideband; automatic IF gain control for all AM demodulators; built-in loudspeaker; switch-selected squelch with threshold programmable in terms of the RF input level; FM demodulators are also used as signal sources for frequency deviation measurement.

Calibration generator with highly stable sinewave source (tracking generator) and pulse generator for CISPR and spectral pulse density calibrations.

12-bit A/D converter with extremely short conversion time; digital averaging and fast-acting RF level switch ensure rapid autoranging.

Design The modular design, signature analysis capability and self-test routines afford great ease of servicing. All modules are independently exchangeable; all RF and μP modules are of state-of-the-art cassette design ensuring excellent RF screening and minimum EMI.

Rear view of ESVP



SPECIFICATIONS

Frequency range . . . . . 20 to 1300 (1000) MHz
Frequency setting . . . . . 1. with tuning knob in 1-kHz or 100-kHz steps (switch-selected); least increment in SSB mode: 100 Hz
2. keyboard entry
3. in steps of any preset size
4. automatic scanning
Indication . . . . . 8-digit LED display
Resolution . . . . . 1 kHz/100 Hz (SSB)
Setting error (freq.-prop.) . . . . . $<5 \times 10^{-6}$ (max. 5 kHz at 1 GHz)
With Oven-controlled Crystal Oscillator Option ESVP-B1
Setting error in temperature range +5 to +45 °C $<1 \times 10^{-8}$/°C
Warmup time . . . . . <10 min at 5 °C
<5 min at 25 °C
Aging . . . . . $\leq 1 \times 10^{-9}$/day
Pulling range of oven-controlled crystal oscillator (with built-in potentiometer) . . . . $\geq 1 \times 10^{-6}$

RF input . . . . . Z_{in} = 50 Ω, N female connector
VSWR . . . . . <1.2 with RF attenuation ≥10 dB
<2 with RF attenuation 0 dB, typ. 1.3
<2.5 with RF attenuation 0 dB, and preamplification, typ. 1.5
Oscillator reradiation at RF input without preamplifier and with 0 dB RF attenuation . . . . . <10 dBµV for f_n = 20 to <520 MHz, <20 dBµV for f_n = 520 to <1020 MHz, typ. 40 dBµV (f_{o1}) } for f_n = typ. 50 dBµV ($2 \times f_{o1}$) } 1.02 to 1.3 GHz (with preamplifier approx. 15 dB less)
Preamplifier . . . . . can be switched into circuit between RF attenuator and input filter; gain = +10 dB
Input filters . . . . . 10 tracking filters

Maximum input level (with and without preamplifier)
RF attenuation 0 dB
DC voltage . . . . . 7 V
Sinewave AC voltage . . . . . 130 dBµV
Spectral pulse density . . . . . 96 dBµV/MHz (100 V x 0.5 ns)
RF attenuation ≥10 dB (no DC isolation)
DC voltage . . . . . 7 V = 1 W
Sinewave AC voltage . . . . . 137 dBµV = 1 W
Max. pulse voltage . . . . . 150 V
Max. pulse energy (10 µs) . . . . . 1 mWs

Interference rejection, non-linearities

	preamplifier off	preamplifier on
Image frequency rejection		
20 to <520 MHz	>80 dB, typ. 100 dB	
520 to <1020 MHz	>80 dB, typ. 100 dB	
1.02 to 1.3 GHz	typ. 75 to 60 dB	
Rejection of spurious responses in range 1020 to 1300 MHz for frequencies $2xf_n$-932.1 MHz	typ. 30 to 80 dB (increasing with receiver frequency)	
IF rejection	>80 dB, typ. 100 dB	
Intercept point d_3	>13 dBm, typ. +20 dBm	>1 dBm, typ. +8 dBm
Intercept point k_2	>40 dBm, typ. +50 dBm	>20 dBm, typ. +40 dBm
Desensitization: An interfering signal spaced >2 MHz from the receive frequency varies the indication of the measured signal by <1 dB (RF attenuation 0 dB) at a level of	typ. 110 dBµV	typ. 100 dBµV
RF screening: Voltage indication at a field strength of 3 V/m	<0 dBµV	

Radio interference from internal microcomputer etc. . . . . below the limits specified in VDE 0876, Part 1a and MIL-Std. 461 A and B

IF frequencies
1st IF f_{in} < 520 MHz . . . . . 810.7 MHz
f_{in} > 520 MHz . . . . . 310.7 MHz
2nd IF . . . . . 10.7 MHz

IF bandwidths (for average and peak values)

Nominal bandwidth	–3 dB (±20%)	–6 dB (±10%)	typ. ratio 6 : 60 dB
7.5 kHz	7.5 kHz	8.3 kHz	1 : 1.8
12 kHz	12 kHz	13.4 kHz	1 : 1.8
120 kHz	110 kHz	120 kHz	1 : 2.1
1 MHz	0.8 MHz	1 MHz	1 : 3.5

IF bandwidth (–6 dB) for radio interference measurements to CISPR Publ. 2 and 4 and VDE 0876, Part 1 . . . . . 120 kHz
IF bandwidth (–3 dB) for SSB demodulation (aural monitoring only) . . . . . 2.4 kHz

AF bandwidths (–3 dB; aural monitoring for A3E (A3) and F3E (F3))
narrow . . . . . 300 Hz to 3.3 kHz
broad . . . . . 50 Hz to > 15 kHz

Noise indication

	preamplifier off	preamplifier on
Average value, B = 7.5 kHz		
20 to <520 MHz	<–10 dBµV, typ. –14 dBµV	<–16 dBµV, typ. –22 dBµV
520 to 1300 MHz	<–8 dBµV, typ. –12 dBµV	<–14 dBµV, typ. –20 dBµV
Peak value (typ. increase as against average value)	+11 dB	
CISPR	typ. +4 dBµV	typ. –4 dBµV
MIL (B_{IF} = 1 MHz)	typ. +20 dBµV/MHz	typ. 14 dBµV/MHz

Voltage measurement range (with preamplifier)
Lower limit . . . . . 3 dB above noise level (see noise indication)
Upper limit . . . . . 137 dBµV (RF attenuation ≥10 dB)
Inherent spurious responses . . . . . <–5 dBµV (equivalent input voltage)
Readout
digital in dBµV, dBm . . . . . 4 digits, max., resolution 0.1 dB
in µV, mV, V . . . . . 3 digits
analog . . . . . LED row (31 LEDs) over operating range of IF rectifier and with digital display of range limits
Operating ranges of IF rectifier . . . . . 20, 40, 60 dB

Display modes . . . . . average value (programmable averaging time), peak value (programmable hold time), spectral pulse density measurements to MIL (programmable hold time), CISPR (Publ. 16, programmable measuring time), programmable averaging, hold and measuring times: 5 ms to 100 s
Max. and min. level measurement . . . . . the maximum and minimum levels are determined from individual measurements of 0.1 s duration each; programmable measuring time: 1 to 1000 s

Measuring error (level indication)
Error of average indication for unmodulated sinewave signal ≥16 dB above noise indication (AV) . . . . . <1 dB
Additional error in operating ranges 40 and 60 dB . . . . . typ. <0.5 dB
Level calibration facility
Average/peak . . . . . tracking generator (sinewave)
CISPR, MIL in addition . . . . . pulse generator (for compensation of bandwidth tolerance)
Error of analog level indication
Operating range 20 dB . . . . . typ. <2 dB
40, 60 dB . . . . . typ. <4 dB

Frequency offset
Indication
digital in kHz (with built-in IF counter) . . . . . resolution 0.1 to 100 Hz (depending on measuring time)
analog . . . . . LED row (16 LEDs)
Measurement range . . . . . depending on IF bandwidth
Measuring times . . . . . 10 ms to 10 s
Measuring error (relative to f_{in}) . . . . . depending on int./ext. reference; internal: 5×10^{-6}; with option ESVP-B1: see setting error (left column top)

Frequency deviation (positive, negative and average peak deviation, mod. meas. filter switched in)
Indication . . . . . digital in kHz, 4 digits
Resolution . . . . . 0.1/0.01 kHz
Measurement range (deviation + $f_{mod} \leq B_{IF\ 3\ dB}/2$) . . . . 1 to 400 kHz
Measuring error for S/N = 40 dB
at B_{IF} = 7.5/12 kHz, deviation $<B_{IF}/2$, $f_{mod} \leq 1$ kHz . . . . . <0.5 kHz (typ.)
at B_{IF} = 120 kHz, deviation <60 kHz, $f_{mod} \leq 1$ kHz . . . . . <2 kHz (typ.)
at B_{IF} = 1 MHz, deviation < 400 kHz, $f_{mod} \leq 1$ kHz . . . . . <5 kHz + 0.02 x deviation (typ.)

Modulation depth (positive and negative peak, average AM, mod. meas. filter switched in)
Indication . . . . . digital in %, 3 digits max.
Resolution 0.1%
Measurement range . . . . . = 1 to 99% (150% pos. peak)
Measuring error for S/N = 40 dB (f_{mod} = 1 kHz) . . . . . <5% (typ.)

Gain measurement
Indication . . . . . digital in dB, 4 digits max.
Resolution . . . . . 0.1 dB
Measurement range . . . . . –110 to +47 dB
Error . . . . . <1 dB, typ. <0.5 dB

Demodulation modes . . . . . A0 (zero beat)
A1 (1-kHz beat note)
A3 for A3E emissions
A3J (LSB, USB) for R3E and J3E
F3 for F3E emissions

Squelch	carrier squelch, programmable response threshold compared with indicated voltage
Setting range of response threshold	−20 to +137 dBµV
Date, time of day	internal clock module, permanently in operation from internal battery
Error of internal clock reference	typ. $<1 \times 10^{-4}$
Remote control	interface to IEC 625-1 (IEEE 488)
Interface functions	AH1, L4, SH1, T5, SR1, PP1, DC1, DT1, RL1, C0
Max. data rate in	
Talker mode	approx. 25 Kbyte/s
Listener mode	approx. 20 Kbyte/s
Setting times	
Internal frequency (e.g. scan mode)	
in steps <100 MHz	typ. 20 to 40 ms
exceeding a 100-MHz digit	typ. 70 ms
Internal RF level switch	25 ms/step
Max. measuring rate with Process Controller PUC, measuring time 5 ms	
with autom. frequency scanning	16 measurements/s
with pseudo frequency scanning (measurement at one frequency)	30 measurements/s
with special function Fast A/D	1000 measurements/s
Remote-control connector	24-way Amphenol female
Front-panel outputs	
Generator output (switch-selected)	Z_{out} = 50 Ω, N female connector
EMF	96 dBµV ±0.3 dB
Connector for supply and coding of test antennas etc.	12-way Tuchel female
AF output	Z_{out} = 10 Ω, telephone jack JK34
EMF, undistorted	adjustable up to 3.5 V
Rear-panel outputs	
IF 10.7 MHz	
wide (B ≈ 2 MHz)	Z_{out} = 50 Ω, BNC female connector
gain ref. to RF input (RF attenuation 0 dB)	typ. 7.5 dB (without preamplifier) typ. 17.5 dB (with preamplifier)
narrow (B = IF bandwidth)	Z_{out} = 50 Ω, BNC female connector
EMF (rms values) in range of analog level indication	
Operating range 20 dB	10 to 100 mV
40 dB	10 to 1000 mV
60 dB	1 to 1000 mV
AM demodulator	Z_{out} = 330 Ω, BNC female connector
EMF	1 V_{pp} at m = 50%
$B_{-3\,dB\,max.}$	≥0.3 MHz
FM demodulator	Z_{out} = 330 Ω, BNC female connector
EMF at IF bandwidth	
7.5 kHz and 12 kHz	±1 V/±1 kHz offset
120 kHz and 1 MHz	±1 V/±100 kHz offset
$B_{-3\,dB\,max.}$	≥0.3 MHz
Analog recording outputs	
Frequency offset	Z_{out} = 10 kΩ, BNC female connector
EMF at IF bandwidth	
7.5 kHz and 12 kHz	±1 V/±1 kHz offset
120 kHz	±1 V/±10 kHz offset
1 MHz	±1 V/±100 kHz offset
Level 1	Z_{out} = 10 kΩ, BNC female connector
in AV, PEAK, CISPR, MIL display modes	+4 V for max. indication in operating range
Level 2	Z_{out} = 10 kΩ, BNC female connector
in CISPR display mode	+2 V for max. indication in operating range (contains a lowpass filter for simulating meter response to CISPR 2/4)
Recorder ouput (via D/A converter)	24-way Amphenol female connector (contains D/A-converted X and Y analog outputs for recording the scanning process)
	X = 0 V: start frequency
	= +10 V: stop frequency
	Y = 0 V: min. level
	= +10 V: max. level
	pen lift control: low level = pen up; form feed for ZSKT: high pulse, 10 ms duration, connection of 5 Radiomonitoring Recorders ZSG3 possible
Rear-panel inputs	
Ext. trigger	Z_{in} ≥3 kΩ, BNC female connector
Trigger threshold	TTL (H ≥2 V, L ≤0.8 V hysteresis) switch-selected positive or negative slope
Ext. reference frequency	BNC female connector
Required level	EMF = 1 V from 50 Ω, sinewave
Frequency	5/10 MHz (switch-selected)

General data

Rated temperature range	+5 to +45 °C
Storage temperature range[1]	−25 to +70 °C
Power supply	
AC supply	100/120/220/240 V ±10%, 47 to 440 Hz (100 VA) safety class I to VDE 0411 (IEC 348)
Battery	22 to 32 V, 3 A at 24 V
Dimensions (WxHxD), weight	492 mm x 205 mm x 514 mm, 29 kg

Ordering information

Order designation		▶Test Receiver ESVP
20 to 1300 MHz		354.3000.52
20 to 1000 MHz		354.3000.54
Option: Oven-controlled Crystal Oscillator ESVP-B1		358.1119.02
Accessories supplied		
Power cable		025.8017.52
Battery cable		252.0084.00
Manual		
Recommended extras		
VHF Current Probe (20 to 300 MHz)	ESV-Z1	353.7019.02
Absorbing Clamp (30 to 1000 MHz)	MDS-21	194.0100.50
Adapter BNC/N		118.2812.00
Broadband Dipole (20 to 80 MHz)	HUF-Z1	358.0512.52
Log-periodic Broad-band Antenna (50 to 1300 MHz)	HL 023 A1	577.8017.02
Tripod	HFU-Z	100.1114.02
Mast (for tripod)	HFU-Z	100.1120.02
RF connecting cable (7 m)	HFU 2-Z5	252.0055.55
Probe (BNC connector)	HFV-Z	204.1010.02
Adapter BNC/N		118.2812.00
Headphones		110.2959.00
Service Kit	ESVP-Z1	358.1019.02
Recommended add-on units		
XYT Recorder	ZSKT	301.9010.02
Connecting Cable ESVP-ZSKT	ESH3-Z1	349.6011.02
Radiomonitoring Recorder	ZSG 3	242.6015.92
Universal Impact Printer (220 V)	PUD 2	359.5018.02
Universal Ink-jet Printer (220 V)	PUD 3	359.5501.02
Universal Ink-jet Printer (117 V)	PUD 3	359.5501.03
IEC-625 Interface Option (for PUD 2 and PUD 3)	PUD 2-B4	359.5418.02
Panoramic Adapter (19" bench model)	EZP	254.0017.04
Panoramic Adapter (19" rackmount)	EZP	254.0017.05
Connecting Cable ESVP-EZP		254.2684.00
VSWR Bridge (50 Ω, 5 to 2500 MHz)	ZRB 2	373.9017.53

1) The ESVP contains a Li battery for buffering the CMOS-RAMs. Storage at high temperatures over extended periods curtails the lifetime of this battery.