EMI Test Receivers ESVS

20 MHz to 1000 MHz

- Comply with CISPR 16-1, VDE 0876 and ANSI C63.2
- Level measurement range –14 dBµV to +137 dBµV
- For measurements to European Standards 55011 to 55022, ETS, FCC, VCCI and VDE 0871 to 0879
- Frequency resolution 100 Hz
- Manual operation or automatic test
- Field-strength measurements using test antennas
- Battery (int./ext.) or AC supply

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Functions

The EMI Test Receivers ESVS 10 and 30 are triple-conversion heterodyne receivers covering the frequency range from 20 MHz to 1000 MHz. They can be manually operated, featuring high frequency resolution and accurate level indication, equally so in average and quasi-peak detection.

Thanks to the built-in intelligence of EMI Test Receivers ESVS, the time required for such measurements is reduced considerably. Being specialists for EMI measurements to CISPR, CENELEC, ETSI, FCC, VCCI and VDE standards, these test receivers furnish results at a speed and accuracy not possible previously.

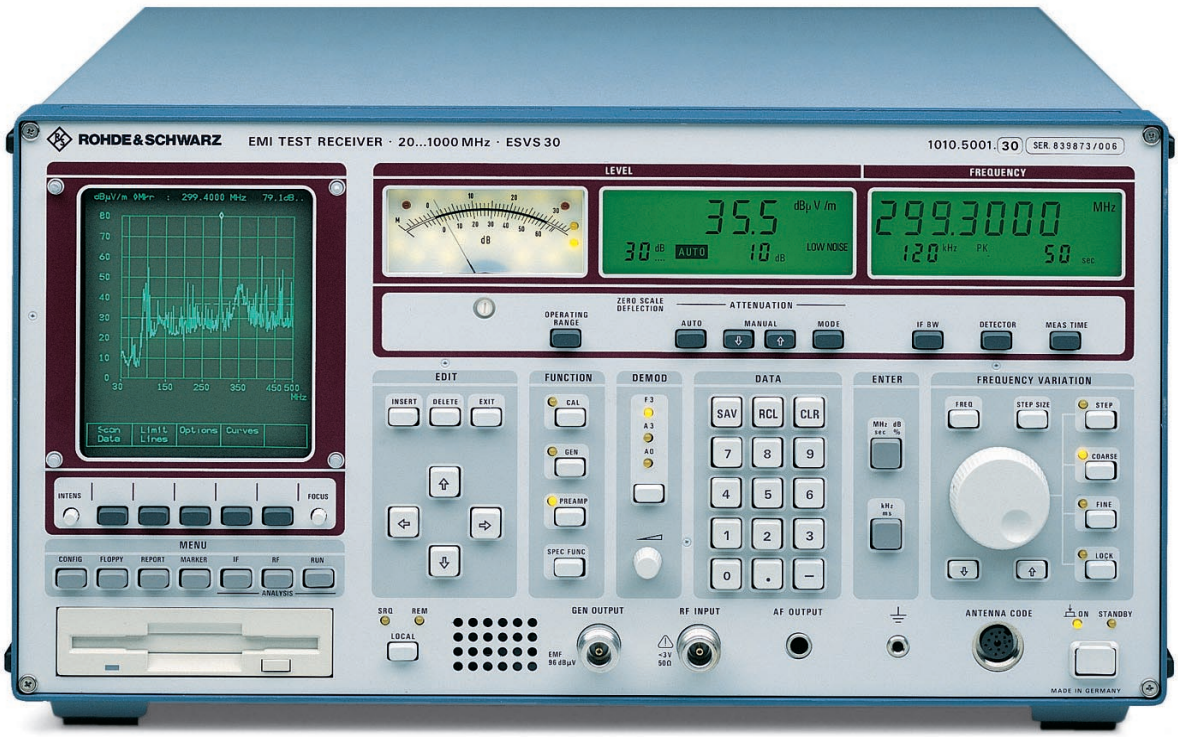
Their real strength, however, is the semi-automatic measurement of RFI power and field strength. After a fast prescan measurement, they compare the results with the permissible limits, display the interference spectrum on the screen and furnish a comprehensive test report with all the necessary information.

Both receiver models combine three classes of instruments in one:

– a compact, manually tunable and battery-operated test receiver
– an automatic test receiver which automatically performs measurements and reports the results
– a system-compatible test receiver

Features

- RF attenuator switchable in 10-dB steps in range 0 dB to 120 dB; optional pulse-resistant 10-dB attenuator (ESVS-B1)
- One preselection filter with fixed tuning and five tracking preselection filters
- Logarithmic amplifier with more than 70 dB dynamic range
- Preamplifier with wide dynamic range, can be switched between preselection filter and 1st mixer
- Crystal-controlled synthesizer as 1st LO, variable in 100-Hz steps, sweep mode for fast frequency scans
- High-level mixer for converting input frequency into first IF (1354.7 MHz)
- High-level mixers for conversion into second (74.7 MHz) and third (10.7 MHz) IF
- Peak, average and quasi-peak detectors operating in parallel
- Peak indication with automatic consideration of IF bandwidth correction factors for measuring broadband interference (PK/MHz)
- IF filters (10 kHz and 120 kHz) with low delay distortion in third IF stage
- Digital level indication on LC display and analog level indication on moving-coil meter taking into account transducer factors and their units
- 12-bit A/D converter with short conversion time
- Highly linear envelope detector with more than 70 dB dynamic range
- Automatic overload detection in mixer stages and in test channel by permanently activated peak detectors



- Flash EPROMs allowing convenient and fast firmware updating
- Automatic calibration with the aid of a high-precision built-in generator
- Measurement time selectable between 1 ms and 100 s
- Demodulator circuits for FM, AM and A0; headphones connector and built-in loudspeaker
- Automatic monitoring of all synthesizer loops and supply voltages during operation
- Detection of faulty modules by built-in selftest facilities

Superior RF circuit design

- Parallel detectors for average, peak and quasi-peak indication
- Fast synthesizer: frequency resolution 100 Hz, any frequency step in ≤30 ms, sweep mode for fast frequency scanning
- High pulse loading capacity of input attenuator when using option ESVS-B1
- High measuring accuracy: error ≤1 dB; typ. <0.5 dB
- Wide dynamic range: noise figure typ. 7 dB with preamplifier, 12 dB without preamplifier, third-order intercept point typ. 20 dBm (without preamplifier)
- 60-dB operating range also for quasi-peak and average indication

Powerful processor system

- Macros for automatic and semi-automatic test runs

- Automatic level calibration
- Automatic consideration of frequency-dependent transducer factors
- Nonvolatile storage of 9 complete instrument settings and 22 different transducer factors and limit lines

Optimal result display for every application

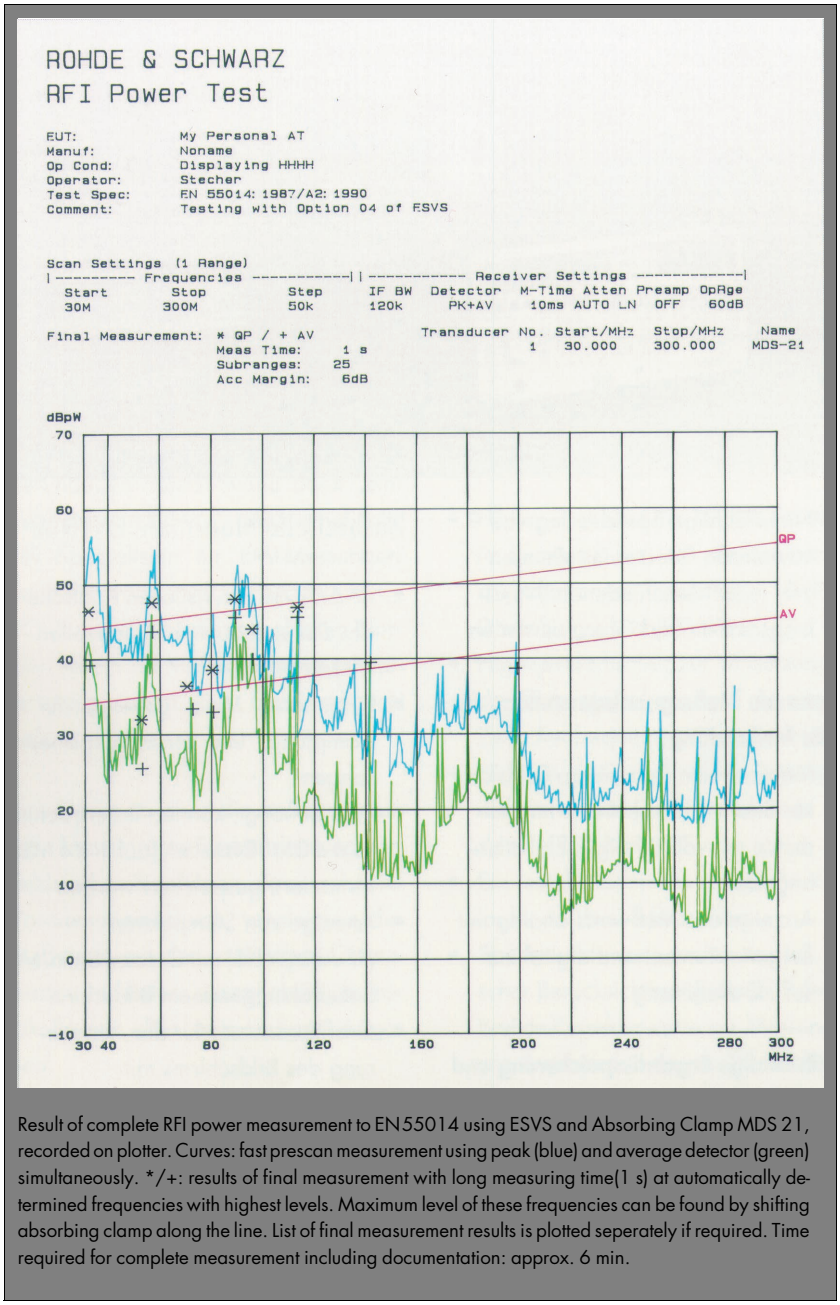
- Measurement of voltage, field strength, current and pulse spectral density with full indication of units
- Indication of level on analog meter and digital display with 0.1-dB resolution

Full storage and listing of results

- Output of results as lists and diagrams on printer or plotter including limit lines and user-definable labelling
- Time-consuming quasi-peak measurement only carried out in cases where peak values are close to the relevant limits

Additional features of ESVS30

- IF analysis for visual check of interference spectrum in manual measurement mode
- Built-in tracking generator for attenuation and gain measurements
- If required, test results can be stored on 3½" floppy disks with 1.44-Mbyte storage capacity (formatted) by means of built-in disk drive
- Display of interference spectra (RF ANALYSIS) including limit lines on low-emission screen
- Graphics processor for driving the screen with a resolution of 1024 × 1024 pixels
- IF analysis module with resolution bandwidth of 1.3 kHz and 10 kHz; IF analysis executed automatically during level measurement



Result of complete RFI power measurement to EN55014 using ESVS and Absorbing Clamp MDS 21, recorded on plotter. Curves: fast prescan measurement using peak (blue) and average detector (green) simultaneously. */+: results of final measurement with long measuring time(1 s) at automatically determined frequencies with highest levels. Maximum level of these frequencies can be found by shifting absorbing clamp along the line. List of final measurement results is plotted seperately if required. Time required for complete measurement including documentation: approx. 6 min.

Manual operation

For solving complex EMC problems, manual measurement often is the most efficient way, since the operator can make full use of his experience in identifying interference sources. The ESVS receivers feature conventional test receiver operation with tuning knob, indication of results on a meter and built-in loudspeaker.

Automatic operation

The input keys for automatic measurements are arranged on the left of the front panel. Three groups of menu keys on the ESVS10 and a row of menu keys and a row of softkeys on the ESVS30 are provided below the screen to enter frequency scans, limits, transducer factors, configuration data and macros for test routines.

In a frequency scan (lin or log), up to five subscans are covered; each subscan can be assigned a specific test receiver setting. Nonvolatile storage of 22 limit lines and transducer factors with up to 50 values is possible. By combining the transducer factors, all configurations occurring in practice can be covered.

The results of a frequency scan are usually output on a printer as a list and/or on a plotter as a graph. Additionally, on the ESVS30 the results are displayed in graphical form on the screen.

Time can be saved by simultaneous printing of the lists and plotting of the graphs. Plotting is also possible during the frequency scan so that the desired document is already obtained during the measurement. Any relevant information can be added to the test report, either by entering it via a line editor or, more conveniently, via an MF2 keyboard that can be connected. Information can be automatically added to the parameters known to the ESVS such as date, time and receiver settings.

Macros for automatic test runs (ANALYSIS OPTIONS) match the ESVS to the specific configuration, device under test and measurement specification. Being thus prepared, the test receivers perform the following routines:

- Fast prescan measurement using the peak and/or average detector, multiple scans for spectrum observation possible
- Final measurement at critical frequencies using the average and/or quasi-peak detector
- Determination of critical frequencies by means of limit lines with data reduction to shorten the measuring time

- Report of results on printer or plotter
- Storage of results on floppy disk of ESVS 30

The minimum configuration consisting of ESVS 10 or 30, absorbing clamp and plotter is already an extremely powerful test set for RFI measurements.

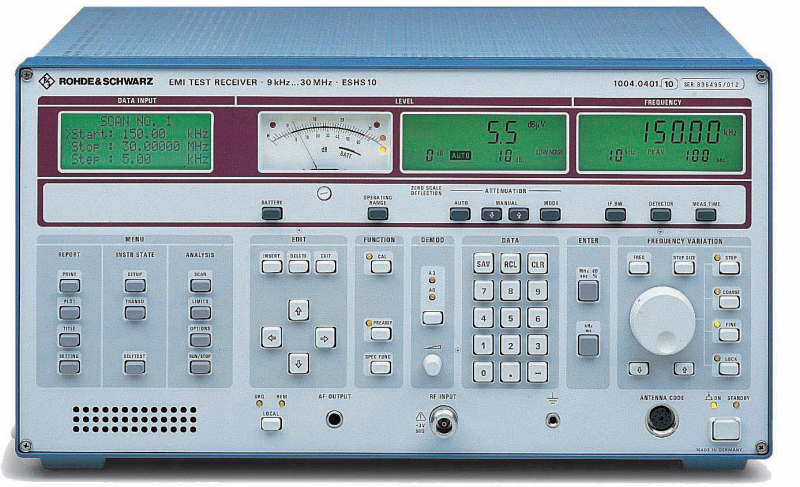
Remote control

The IEC/IEEE-bus interface complies with the latest IEEE Standard 488 Part 2. The measured values are output with a resolution of 0.01 dB.

Interfaces

For further signal evaluation and for driving or feeding add-on units, ESVS 10 and 30 have the following interfaces:

- Parallel interface (PRINTER INTERFACE) for connecting a printer
- Coding and supply socket (ANTENNA CODE) for antennas and other accessories

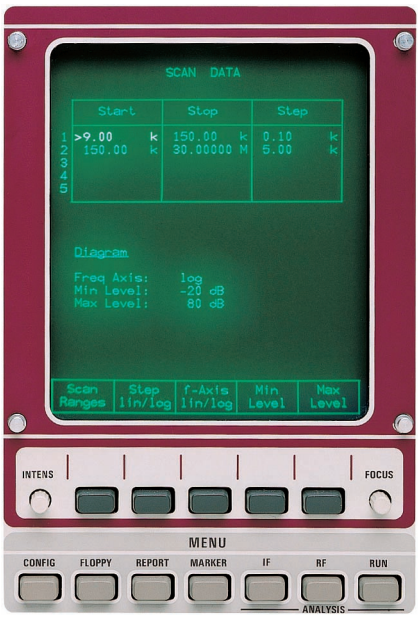


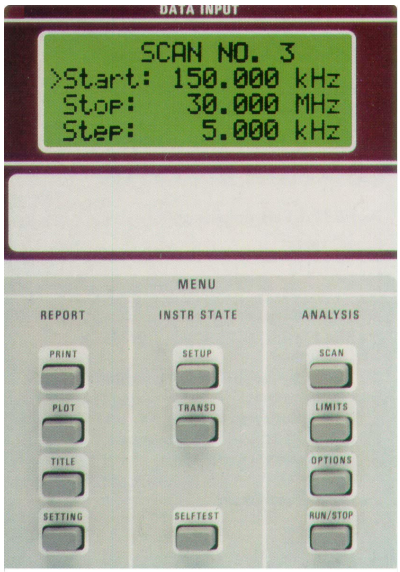
- IF output 74.7 MHz (ESVS 10 only)
- IEC/IEEE-bus interface
- IF output 10.7 MHz for evaluating the IF signal eg with an oscilloscope
- Envelope detector output (VIDEO OUTPUT) for evaluating the detected IF signal eg with an oscilloscope
- USER INTERFACE with
  - 6 TTL ports for driving external devices
  - input for external triggering of measurements
  - outputs for the analog display voltage with and without meter simulation for connecting a discontinuous interference analyzer
  - RS-232-C interface for firmware updating by reprogramming the built-in flash EPROMs via an AT-compatible computer
- Connector for an MF2-compatible keyboard for text entry
- Input for an external reference frequency (5 MHz or 10 MHz, automatic detection)
- Connector (11 V to 33 V) for battery-powered operation, eg in a vehicle

Design

The service-friendly modular design of the ESVS 10 and 30 in conjunction with a consequent design to EMC rules including the low-emission screen ensures excellent results regarding RFI emission and immunity.

A faulty module can easily be found by the built-in selftest and replaced with a minimum of effort and without affecting the other modules.





Specifications

Frequency range 20 MHz to 1000 MHz
Frequency setting with tuning knob in 100-Hz, 100-kHz steps or any step size selectable
numerical by keyboard entry
in steps any size selectable
automatic scanning for RF analysis
Display 8-digit LCD
Resolution 100 Hz
Setting error $<3 \times 10^{-6}$

RF input N connector, female, 50 Ω
VSWR <1.2 with ≥10 dB RF attenuation, <2 with 0 dB RF attenuation

Oscillator reradiation at RF input (0 dB RF attenuation)
without preamplifier <20 dBµV
with preamplifier <10 dBµV
Preamplifier switchable between preselector and 1st mixer
Gain 10 dB

Preselector
1 filter with fixed tuning 20 MHz to <51.3 MHz
5 tracking filters 51.3 MHz to <125.3 MHz
125.3 MHz to <273.3 MHz
273.3 MHz to <495.3 MHz
495.3 MHz to <717.3 MHz
717.3 MHz to 1000 MHz

Maximum input level (with and without preamplifier)
RF attenuation 0 dB (AC-coupled)
DC voltage 50 V
Sinewave AC voltage 130 dBµV
Pulse spectral density 96 dBµV/MHz (100 V for 0.5 ns)
RF attenuation ≥10 dB (AC-coupled)
DC voltage 50 V
Sinewave AC voltage 137 dBµV = 1 W
Max. pulse voltage 150 V
Max. pulse energy (10 µs) 10 mWs
RF attenuation ≥10 dB with option ESVS-B1 (DC-coupled)
DC voltage 7 V
Sinewave AC voltage 137 dBµV = 1 W
Max. pulse voltage 150 V
Max. pulse energy (10 µs) 100 mWs

Interference rejection, non-linearities
Image-frequency rejection 1st IF >90 dB, typ. 100 dB
2nd IF >90 dB, typ. 100 dB
IF rejection >90 dB, typ. 100 dB

Intercept point d3, with $f_1 - f_2 \geq 5$ MHz	Preamplifier off	Preamplifier on
Level (f_1, f_2) at receiver input	–10 dBm	–20 dBm
f_{in} <50 MHz	typ. 15 dBm	typ. 5 dBm
f_{in} ≥50 MHz	>15 dBm, typ. +20 dBm	>5 dBm typ. +10 dBm
Intercept point k2	>35 dBm	>25 dBm

RF shielding
Voltage indication at a field strength of 10 V/m with 0 dB RF attenuation ($f \neq f_{in}$) <0 dBµV
Additional error in CISPR indication range at 10 V/m <1 dB
Interference/interference immunity to EN 50081-1/EN 50082-1

Intermediate frequencies (IF)
1st IF 1354.7 MHz
2nd IF 74.7 MHz
3rd IF 10.7 MHz

IF bandwidths

Nominal bandwidth	–3 dB (±20%)	–6 dB	Shape factor $BW_{6\,dB}:BW_{60\,dB}$
10 kHz	7 kHz	9.5 kHz ±0.5 kHz	1:4.0 (typ.)
120 kHz	90 kHz	120 kHz ±10%	1:5.5 (typ.)

Noise indication

	Preamplifier off	Preamplifier on
Average value,		
BW = 10 kHz	<–10 dBµV typ. –15 dBµV	<–16 dBµV typ. –21 dBµV
BW = 120 kHz	<1 dBµV typ. –4 dBµV	<–5 dBµV typ. –10 dBµV
Peak value,		
BW = 10 kHz	typ. –4 dBµV	typ. –9 dBµV
BW = 120 kHz	typ. +7 dBµV	typ. +1 dBµV
Quasi-peak band C/D	typ. +2 dBµV	typ. –4 dBµV
PK/MHz (spectral density measurement, BW = 120 kHz)	typ. 25 dBµV/MHz	typ. 21 dBµV/MHz

Voltage measurement range
Lower limit (additional error caused by inherent noise <1 dB)

	Preamplifier off	Preamplifier on
Average indication (AV)		
BW = 10 kHz	<–6 dBµV typ. –11 dBµV	<–12 dBµV typ. –17 dBµV
BW = 120 kHz	<+5 dBµV typ. 0 dBµV	<–1 dBµV typ. –6 dBµV
Peak indication (PK)		
BW = 10 kHz	typ. 12 dBµV	typ. 7 dBµV
BW = 120 kHz	typ. 23 dBµV	typ. 17 dBpV
Quasi-peak indication (QP)		
CISPR band C/D	<10 dBµV	<4 dBµV
(100 Hz pulse frequency)	typ. 6 dBµV	typ. 0 dBµV

Upper limit AV, PK, QP 137 dBµV (RF attenuation ≥10 dB)
Inherent spurious response <0 dBµV (equivalent input voltage)

Level display
digital 3½ digits in dBµV, dBµA, dBm, dBµV/m, dBµA/m or dBµW, resolution 0.1 dB
analog on moving-coil meter in operating range of IF detector with additional digital display of lower range limit
Operating ranges 30 dB, 60 dB
Screen ESVS30 (RF analysis) 5" CRT with digital display memory
Resolution 1024 x 1024 pixels
Display range X axis (frequency) freely selectable (20 MHz to 1000 MHz), linear or logarithmic
Y axis (level) 10 dB to 200 dB, adjustable
Display modes average (AV), peak (PK), spectral density measurement (PK/MHz), quasi-peak (QP)
Averaging, hold and measuring times 1 ms to 100 s (1/2/5 steps)
Measuring error (AV for S/N >16 dB)
Digital display,
0 °C to 55 °C <1 dB
–10 °C to 0 °C <1.5 dB
Analog display typ. <2 dB
Level calibration sinewave and harmonics generator

Demodulation modes A0 (zero beat)
A3 (for A3E emissions)
F3 (for F3E emissions)

IF analysis (ESVS30 only)
Display range 10 kHz to 2 MHz in 1, 2, 5 steps

Resolution		–3 dB (±20%)	Shape factor $BW_{3\,dB}:BW_{60\,dB}$
Nominal bandwidth	10 kHz	10 kHz	1:4
	3 kHz	3 kHz	1:6
	1 kHz	1 kHz	1:9

Sweep time 50 ms to 10 s (adjustable)
Level display range 80 dB
Input attenuation 0/20 dB, selectable

Date, time of day internal clock, permanently operated from internal battery

3½" floppy disk drive (ESVS30 only) 1.44 Mbyte formatted
Formatting MS-DOS-compatible
Data format binary or HP-GL

Connectors and interfaces

Remote control	to IEC 625-2 (IEEE 488)
Remote-control connector	24-contact Amphenol connector
Plotter	via IEC/IEEE-bus interface
Front-panel outputs	
Supply and coding connector for antennas etc	12-contact Tuchel connector
AF output	jack JK34, 10 Ω
EMF	adjustable up to 2 V
Generator output (ESVS 30 only)	N connector, female, 10 kΩ
EMF	96 dBµV ±1 dB
Rear-panel outputs	
IF 74.7 MHz (ESVS 10 only)	Z_{out} = 50 Ω, BNC connector, female
Gain ref. to RF input (RF attenuation 0 dB)	10 dB without preamplifier, 20 dB with amplifier
Bandwidth (–3 dB)	2 MHz
IF 10.7 MHz	BNC connector, female, 50 Ω
EMF in range of analog level display for unmodulated sinewave signal:	
Operating range 30 dB	1 mV to 30 mV
60 dB	1 mV to 1 V
Bandwidth = IF bandwidth	
Video output (envelope detector)	BNC connector, female
EMF in range of analog level display:	
Operating range 30 dB	4 mV to 126 mV
60 dB	4 mV to 4 V
User interface	25-contact Cannon connector; includes 6 control lines for an external device (eg artificial mains network), display voltage (analog) with and without meter simulation, input for external triggering, RS-232-C interface for firmware updating
Printer connection	parallel interface (15-contact Cannon connector)
Keyboard connection	5-contact DIN connector for MF 2 keyboard
Rear-panel inputs	
Ext. reference frequency	BNC connector, female
Required level	EMF ≥1 V from 50 Ω
Frequency	5/10 MHz
Ext. battery	3-contact connector
Required voltage	11 to 33 V

General data

Rated temperature range	–10 °C to +55 °C (without condensation)
Temperature range for floppy disk drive (ESVS 30 only)	+5 °C to +50 °C
Storage temperature range	–25 °C to +70 °C
Mechanical resistance	shock-tested to MIL-STD-810D (shock spectrum 40 g), vibration-tested to MIL-T-28800D, class 5; complies with IEC Publ. 68-2-6
EMC	complies with VDE 0876, Part 1a, Regulation 527/1979 and MIL-STD-461B (CE03 and RE02)
Power supply	
AC supply	100/120/240 V ±10%, 230 V +6/–10%, 47 Hz to 420 Hz, 90 VA, safety class I to VDE 0411 (IEC 348)
Battery	
ESVS 10: internal	12 V, 10 Ah (operating time approx. 2.5 h)
external	11 V to 33 V (switch-on voltage >12 V) 1.9 A at 24 V 3.3 A at 12 V
ESVS 30: external	11 V to 33 V 2.6 A at 24 V, 4.8 A at 12 V
Dimensions (W×H×D)	
ESVS 30	435 mm × 236 mm × 460 mm
ESVS 10	435 mm × 236 mm × 363 mm
Weight	
ESVS 30	26.4 kg
ESVS 10	23.7 kg with batteries 20.4 kg without batteries

Ordering information

Order designation		
EMI Test Receiver ESVS 30		1010.5001.30
EMI Test Receiver ESVS 10		1011.2006.10
Accessories supplied	power cable, connector for external battery, operating manual	
Option		
Pulse Power Attenuator	ESVS-B1	0816.1815.02

Recommended extras

For interference measurements:		
Current Probe 20 Hz to 100 MHz	EZ-17	0816.2063.02
Current Probe 20 Hz to 100 MHz for EMS measurements	EZ-17	0816.2063.03
VHF Current Probe 20 MHz to 300 MHz	ESV-Z1	0353.7019.02
Absorbing Clamp 30 MHz to 1000 MHz	MDS-21	0194.0100.50
Antennas and accessories		
Broadband Dipole 20 MHz to 80 MHz	HUF-Z1	0358.0512.52
Log-periodic Broadband Antenna 80 MHz to 1300 MHz	HL023 A1	0577.8017.02
Biconical Antenna 20 MHz to 300 MHz	HK116	4000.7752.02
Log-periodic Antenna 200 MHz to 1300 MHz	HL223	4001.5501.02
Conical Log Spiral Antenna 200 MHz to 1000 MHz	HUF-Z4	0837.2210.52
Probe (BNC connector)	HFV-Z	0204.1010.02
Adapter (BNC female to N male)		0118.2812.00
Preamplifier 10 dB	ESV-Z3	0397.7014.52
Tripod	HFU-Z	0100.1114.02
Mast (for tripod)	HFU-Z	0100.1120.02
Wooden Tripod	HZ-1	0837.2310.02
RF Connecting Cable 7 m	HFU2-Z5	0252.0055.55
RF Connecting Cable 12 m	HFU2-Z4	0252.0090.56

Other accessories

Keyboard	PSA-Z1	1009.5001.32
Headphones		0110.2959.00
Service Manual		
ESVS 30		1010.5147.24
ESVS 10		1011.2441.24
Service Kit	EZ-8	0816.1067.02
19" Rack Adapter		
with front handles	ZZA-95	0396.4911.00
without front handles	ZZA-951	0396.9488.00
Set of Front Handles	ZZG-95	0396.5176.00
Transit Case		
ESVS 30	ZZK-954	1013.9395.00
ESVS 10	ZZK-953	1013.9389.00
Trolley	ZZK-1	1014.0510.00
Printer Cable	EZ-11	0816.1767.02
IEC-bus Connecting Cable 1 m	PCK	0292.2013.10
IEC-bus Connecting Cable 2 m	PCK	0292.2013.20
ESVS 10 only:		
6-V Lead Acid Storage Battery, maintenance-free, 10 Ah (2 required)		0338.4012.00

Certified Quality System
ISO 9001
DQS REG. NO 1954

Fax Reply (EMI Test Receivers ESVS)

❑ **Please send me an offer**

❑ **I would like a demo**

❑ **Please call me**

❑ **I would like to receive your free-of-charge CD-ROM catalogs**

Others: _____

_____

_____

Name: _____

Company/Department: _____

Position: _____

Address: _____

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Country: _____

Telephone: _____

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