R&S®FSV
Signal Analyzer
Signal analysis at its best

Product Brochure | 01.01

75 Years of Driving Innovation

ROHDE&SCHWARZ

R&S®FSV Signal Analyzer At a glance

The R&S®FSV is the fastest and most versatile signal analyzer available for performance-oriented, cost-conscious users working in the development, production, installation and servicing of RF systems.

In development applications, the R&S®FSV excels due to its outstanding RF properties, a 40 MHz signal analysis bandwidth that is unmatched in its class, and a wide range of analysis packages for analog modulation methods as well as mobile radio and wideband communications standards.

The R&S®FSV is five times faster than comparable signal analyzers and provides measurement routines that are optimized for speed and high data throughput. This is a crucial advantage in production applications.

With its touch screen for easy operation, compact dimensions, low weight and direct support of power sensors, the R&S®FSV is the best-possible choice for installation and service work.

- Frequency range up to 3.6 GHz/7 GHz
- 40 MHz signal analysis bandwidth
- 0.4 dB level measurement uncertainty up to 7 GHz
- Analysis software for GSM/EDGE, WCDMA/HSPA, LTE, WiMAX, WLAN, analog modulation methods
- Support of power sensors from the R&S®NRP family along with extensive power measurement functions
- Easy on-site upgrading with options
- –106 dBc/Hz phase noise at 10 kHz frequency offset
- +15 dBm third order intercept (TOI)
- –155 dBm displayed average noise level (DANL) in 1 Hz bandwidth
- Removable hard disk for applications where security is a concern

R&S®FSV Signal Analyzer

Benefits and key features

Ready for today's – and tomorrow's – standards

- Fully digital back-end ensures high measurement accuracy and excellent repeatability
- 40 MHz signal analysis bandwidth largest in its class; suitable for all WiMAX profiles and WLAN IEEE 802.11n
- Largest I/Q memory depth in its class for recording long signal sequences

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Low test costs and high throughput for efficient production

- Up to five times faster than other signal analyzers
- Customized test routines for production applications
- Efficient remote-control operation

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Wealth of functions and performance for effective usage in labs

- Outstanding RF performance for a mid-range analyzer
- Unsurpassed level measurement accuracy up to 7 GHz
- Power measurement functions for analysis of digital communications systems
- Versatile marker and trace functions

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Easy, intuitive operation

- Touch screen operation
- Hotkeys for fast access to all primary functions

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Easy transition to the next generation in signal analysis

- Easy transition due to remote-control compatibility with the R&S®FSP and R&S®FSU
- Fast familiarization due to functional compatibility with existing Rohde&Schwarz spectrum and signal analyzers

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Low life-cycle costs

- Easy on-site upgrading with options
- Easy scalability to handle application-specific requirements
- Always up to date with free firmware updates

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Ready for today's and tomorrow's standards

Featuring a signal analysis bandwidth of up to 40 MHz – the largest in its class – the R&S®FSV is a future-proof investment. The R&S®FSV has what is needed to analyze and demodulate existing and future communications standards.

Fully digital back-end ensures high measurement accuracy and excellent repeatability

- 28 MHz signal analysis bandwidth in base unit (40 MHz optional)
- 16-bit A/D converter with 128 MHz sampling frequency ensures wide dynamic range and excellent display linearity
- 200 Msamples signal memory for largest memory depth in its class
- High measurement accuracy and good repeatability with digitally implemented analysis filters

40 MHz signal analysis bandwidth largest in its class; suitable for all WiMAX profiles and WLAN IEEE802.11n

Mobile radio and wireless communications systems are using ever larger RF bandwidths in their quest to boost data rates and transmission capacity. Due to its large analysis bandwidth and wealth of software options, the new R&S®FSV signal analyzer is the only instrument in its class that can handle all existing and most forthcoming wireless communications applications:

	28 MHz bandwidth (standard)	40 MHz bandwidth (optional)
LTE	exceeds the LTE signal bandwidth of up to 20 MHz	–
WiMAX	covers the signal bandwidths for all WiMAX profiles	covers signal and adjacent channels
WLAN	exceeds the 20 MHz channel width of WLAN IEEE802.11a/b/g signals	covers WLAN IEEE802.11n wideband technology
WCDMA	exceeds the 20 MHz bandwidth required for CCDF measurements on four-carrier WCDMA signals	–

Largest I/Q memory depth in its class for recording long signal sequences

The base unit of the R&S®FSV provides an I/Q memory depth of 200 Msamples. This ensures data recording over a long time period even when testing systems with high bandwidths and thus high sample rates. Conventional signal analyzers have an I/Q memory depth of only a few Msamples.

The R&S®FSV is ideally suited for performing wideband modulation measurements during the development and production of chipsets and mobile stations as well as in the development, maintenance and installation of infrastructures.

Low test costs and high throughput for efficient production

The R&S®FSV signal analyzer significantly reduces total test cost in a production environment. It performs everything from simple measurements up to complex modulation analysis quickly, reliably and with low measurement uncertainty. Fast access to I/Q data with a wide bandwidth also allows the speedy execution of complex evaluation routines in an external computer as well as use of the R&S®FSV as a fast digitizer with a wide dynamic range.

The R&S®FSV signal analyzer thus opens the door to fast, flexible and efficient production.

Up to five times faster than other signal analyzers

With more than 500 sweeps/s in manual operation and up to 1000 sweeps/s in remote operation, the R&S®FSV is up to five times faster than other spectrum and signal analyzers. Such a high measurement speed cuts production time especially in cases that require the averaging of a large number of measurements (as specified in many standards).

Customized test routines for production applications

The R&S®FSV also offers a number of functions that speed up test routines by cutting alignment and measurement time, thereby increasing the overall throughput.

- Wideband RF power detector speeds up automatic level control
- Frequency list mode (LIST MODE):
  Fast measurement on up to 300 different frequencies using different analyzer settings with a single remote-control command
- Measurement of different power levels in the time domain in a single sweep for very fast alignment ("multi summary marker")
- Fast ACP measurement in the time domain with channel filters or in the frequency domain using FFT sweep
- Frequency counter with 0.1 Hz resolution at a measurement time of <50 ms

Efficient remote-control operation

- GBIT LAN interface for quickly transferring large quantities of data
- Trigger interface for synchronization with the production system in LIST MODE

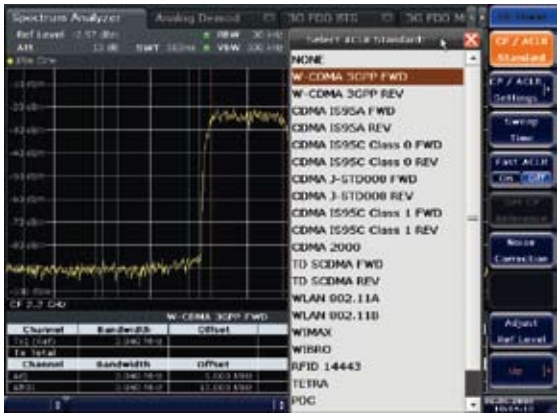
Measurement speed	
Sweep rate, remote control, 1000 sweep averages	1000/s (1 ms/sweep)
LIST MODE, measurement of the level of the fundamental and five harmonics	21 ms
Marker peak search	1.5 ms
Frequency change and query	15 ms
Sweep rate, manual mode	500/s (2 ms/sweep)
Fastest sweep time (zero span)	1 µs
Fastest sweep time (frequency sweep)	1 ms

Wealth of functions and performance for effective use in labs

Outstanding RF performance for a mid-range analyzer

- DANL (Displayed average noise level): –155 dBm (1 Hz) at 1 GHz
- Very low DANL even at 9 kHz: typ. –140 dBm (1 Hz)
- Intercept point (3rd order) of 15 dBm, typ. 18 dBm
- Phase noise at 10 kHz offset from carrier: –106 dBc (1 Hz), typ. –110 dBc (1 Hz)
- Dynamic range for WCDMA ACLR: 73 dB
- Resolution bandwidths from 1 Hz to 10 MHz, as well as 20 MHz and 28 MHz in zero span mode (40 MHz optional)

ACP measurement: A wealth of predefined standards included to simplify making settings



Measurement of the power of a wideband WLAN signal using the time domain power function

Unsurpassed level measurement accuracy up to 7 GHz

The R&S®FSV is a leader when it comes to level measurement accuracy. Featuring a measurement uncertainty figure of 0.4 dB up to 7 GHz, the analyzer delivers accurate and dependable measurement results. This means that the R&S®FSV can also measure levels in the 5.8 GHz ISM band and higher satellite bands with outstanding accuracy, eliminating the need for an additional power meter in many cases.

When equipped with the R&S®FSV-K9 option, the R&S®FSV also supports the direct connection of power sensors from the R&S®NRP series. This increases the accuracy for power measurements in applications requiring extremely high precision, thereby saving the expense of an additional power meter. The R&S®NRP-Z27/R&S®NRP-Z37 sensors (R&S®NRP series) contain an integrated power splitter so that the power sensor and the R&S®FSV signal analyzer can measure the same signal in parallel without any switching required.

Power measurement functions for the analysis of digital communications systems

Comprehensive power measurement functions are an absolute must when analysing digital communications systems:

- Channel/adjacent channel power measurements
  - Up to 12 user channels and up to 12 adjacent channels
  - Numerous predefined test configurations for transmission standards
- Occupied bandwidth (OBW)
- Spectrum emission mask measurement
- CCDF (complementary cumulative distribution function)
- Burst power measurement
- Spurious emissions
- C/N and C/No
- Complete selection of detectors: RMS, average, auto peak, pos/neg peak, sample, quasi peak

Versatile marker and trace functions

- Up to 16 markers
- Marker measurement functions such as AM modulation factor, TOI, phase noise/noise, frequency counter
- Up to six simultaneously active traces with any combination of detectors
- Selectable number of sweep points (up to 32001)
- Peak list for evaluating up to 100 peaks at the press of a key
- Limit lines for PASS/FAIL monitoring
- Transducer factors

Easy, intuitive operation

The R&S®FSV is unsurpassed in ease of operation. Whether you are using the touch screen, the onscreen keyboard or the hotkeys, the operating concept sets new standards in meeting the expectations placed on a modern-day signal analyzer. The ultimate customer benefit is thus fast and straightforward operation.

Touch screen operation

The R&S®FSV enables convenient, intuitive operation with its touch screen. Users can complete their work faster and in fewer steps while enjoying greater convenience. The straight forward menu-driven design also reduces training time.

Alternatively (depending on user preferences), all functions and measurement parameters can be configured in the conventional manner by using the keys and rotary knob or mouse/keyboard. The large SVGA display ensures high resolution and good readability.

Hotkeys for fast access to all primary functions

The clearly labeled keys allow fast access to all main menu items, settings and functions. Parameters such as frequency, resolution bandwidth and more can be directly set using these keys. Hardkeys are also provided to simplify access to commonly used functions such as PRESET, SAVE/RECALL and Marker Peak.

Built-in HELP function:
The context-sensitive help provides a detailed explanation of the current function and lists the associated remote-control commands. Thus, even inexperienced users come up to speed quickly and programming becomes a much easier task

Touch screen:
Convenient, intuitive operation with direct entry exactly where needed

Automatic parameter settings at the press of a key using the **AUTO SET** function:
Automatic adaptation of settings to the individual measurement signal

USB ports:
Easy firmware updates at the press of a key via USB, simple documentation of measurement results

On-screen keyboard:
The analyzer's virtual keyboard together with the touch screen to make an external keyboard completely unnecessary

UNDO/REDO softkeys:
Up to six prior operating steps can be undone, even beyond a preset. This allows you to correct your mistakes or quickly toggle between two different states

Easy transition to the next generation in signal analysis

Compatibility with earlier instrument families based on the Rohde&Schwarz family concept greatly simplifies the transition to the new generation – no matter whether the issue is remote-control software programs used on a production line, the space required to replace an instrument in a rack, or the manual operation of an instrument in a development lab. The ultimate customer benefit is security of investments in software, system design and training.

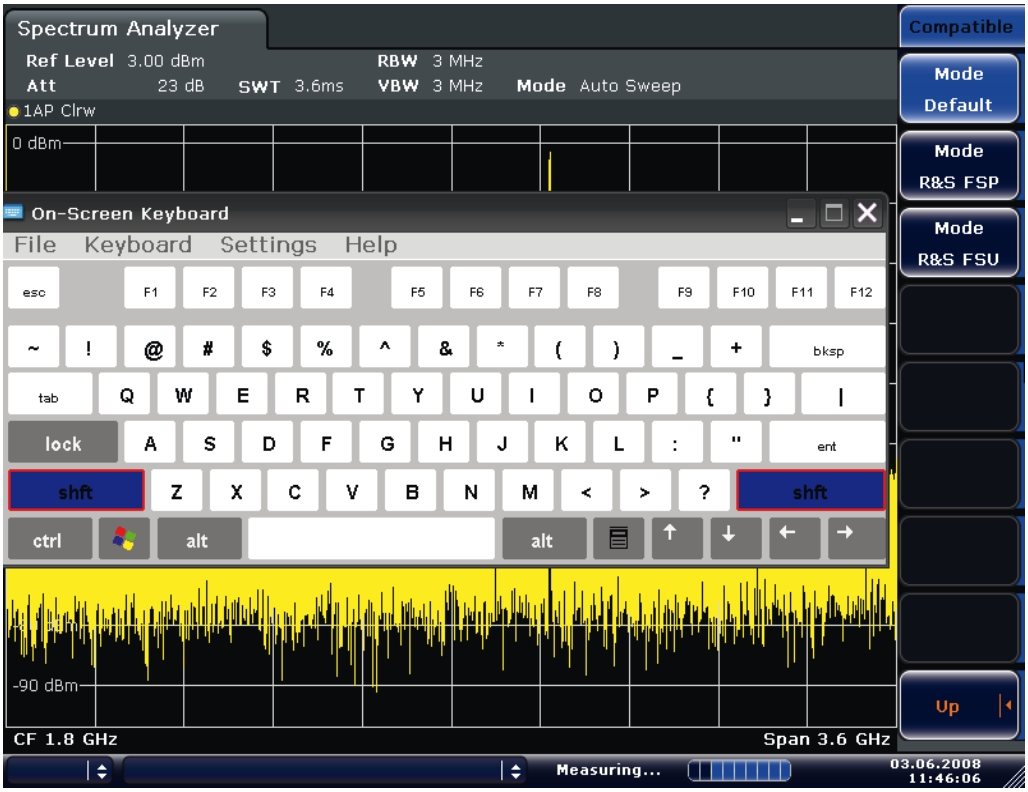
Easy transition due to remote-control compatibility with the R&S®FSP and R&S®FSU

The remote-control command set used in the R&S®FSV is compatible with that used in the R&S®FSP and R&S®FSU when operating in the spectrum analysis mode and also in most applications. This allows you to continue using existing remote-control programs without encountering any additional costs as you transition to the new generation in signal analysis. Replacing spectrum and signal analyzers in development and production environments is thus made easier. Introducing new instruments used in manufacturing will increase production throughput due to the increased speed provided by the R&S®FSV and it will boost efficiency and capacity in the simplest manner ever available.

Fast familiarization due to functional compatibility with existing Rohde&Schwarz spectrum and signal analyzers

The Rohde&Schwarz family concept is also highly beneficial. The harmonized way of operation and the largely identical functions in all analyzers are kept in the new generation as well. The R&S®FSV represents a further development of the existing concept. New features include operation with the touch screen and on-screen keyboard along with new functions such as AUTO SET and UNDO/REDO. Users can learn how to operate the new signal analyzers in only a minimum of time.

The special compatibility mode with the R&S®FSP and R&S®FSU makes it easy to continue using existing remote-control programs



Low life-cycle costs

Easy on-site upgrading with options

The R&S®FSV can meet new requirements in the fastest possible time.

The plug & play concept used for upgrading the instrument with options is unique. You can add almost any option without having to open the instrument.

This concept offers a variety of benefits:

- No additional alignment after installation
- No recalibration
- No need to send the instrument in to a service center (i.e. negligible downtime)
- No installation costs
- Easy expandability for additional tasks

Easy scalability to handle application-specific requirements

The base unit already has all functions expected in a modern-day signal analyzer. Using a wide variety of options, it is possible to customize the R&S®FSV to handle diverse applications in accordance with equipment needs and available budget.

Always up to date with free firmware updates

The firmware used in the R&S®FSV can easily be updated with a USB memory stick or via the LAN interface. Firmware updates are free of charge and can be easily downloaded from the Rohde & Schwarz website.

Instrument rear panel with plug-in options

Instrument hard drive:
The hard drive can be easily removed and replaced with a second hard drive (R&S®FSV-B19) if measurement results and instrument settings need to be kept confidential

Additional interfaces:
IF/video output, trigger output, two additional USB ports, AUX port

Ready for future expansion

OCXO for increased frequency accuracy

Specifications in brief

Base unit data		
Frequency		
Frequency range	R&S®FSV3	9 kHz to 3.6 GHz
	R&S®FSV7	9 kHz to 7 GHz
	R&S®FSV3 with R&S®FSV-B29 option	20 Hz to 3.6 GHz
	R&S®FSV7 with R&S®FSV-B29 option	20 Hz to 7 GHz
Aging of frequency reference		1×10^{-6}
	with R&S®FSV-B4 option	1×10^{-7}
Resolution/bandwidths		
Resolution bandwidths	Standard sweep	1 Hz to 10 MHz
	Standard sweep, ZERO SPAN	1 Hz to 10 MHz, 20 MHz, 28 MHz; 40 MHz optional
	FFT sweep	1 Hz to 300 kHz
	Channel filter	100 Hz to 5 MHz
	EMI filter	200 Hz, 9 kHz, 120 kHz, 1 MHz
Video filter		1 Hz to 10 MHz, 20 MHz, 28 MHz, 40 MHz
Signal analysis bandwidth		28 MHz
	with R&S®FSV-B70 option	40 MHz
Displayed average noise level (DANL)		
DANL (1 Hz bandwidth)	1 GHz	–152 dBm, typ. –155 dBm
	3 GHz	–150 dBm, typ. –153 dBm
	7 GHz	–146 dBm, typ. –149 dBm
DANL with preamplifier, option R&S®FSV-B22	1 GHz	–162 dBm, typ. –165 dBm
	3 GHz	–160 dBm, typ. –163 dBm
	7 GHz	–156 dBm, typ. –159 dBm
Intermodulation		
Third order intercept	f < 3.6 GHz	+13 dBm, typ. +16 dBm
	3.6 GHz to 7 GHz	+15 dBm, typ. +18 dBm
Dynamic range WCDMA ACLR		
	Without noise compensation	70 dB
	With noise compensation	73 dB
Phase noise		
1 GHz carrier frequency	10 kHz offset from carrier	–106 dBc (1 Hz), typ. –110 dBc (1 Hz)
	100 kHz offset from carrier	–115 dBc (1 Hz)
	1 MHz offset from carrier	–134 dBc (1 Hz)
Overall measurement uncertainty		
	3.6 GHz	0.3 dB
	7 GHz	0.4 dB

Applications

Transmitter and modulation measurements in wireless communications systems

R&S®FSV-K7: AM/FM/PM	R&S®FSV-K10: GSM/EDGE	R&S®FSV-K72/73: WCDMA
Power Carrier power	**Power** Power measurement in time domain including carrier power	**Power** Code domain power Code domain power vs. time CCDF
Modulation Modulation depth Frequency deviation Phase deviation Modulation frequency	**Modulation quality** EVM Phase frequency error Origin offset suppression	**Modulation quality** EVM Peak code domain error Constellation diagram I/Q offset Gain imbalance Center frequency error (chip rate error)
Spectrum measurements RF spectrum and RF power vs. time Audio spectrum and time domain	**Spectrum measurements** Modulation spectrum Transient spectrum Spurious emissions	**Spectrum measurements** Spectrum mask ACLR Power measurement
Miscellaneous Audio filters: 20 Hz/50 Hz/300 Hz HP, 3 kHz/15 kHz/23 kHz/150 kHz LP, deemphasis, CCITT filter; Detectors: +Peak, –Peak, RMS; SINAD, THD	**Miscellaneous** –	**Miscellaneous** Channel table with summary of channels used on base station Timing offset
Special features Universal wideband AM/FM/PM measurement demodulator, analysis bandwidth up to 40 MHz	**Special features** Single and multiburst	**Special features** Automatic detection of active channels and decoding of signal information Automatic detection of encryption code Automatic detection of HSDPA modulation format Support for signals with compressed mode

R&S®FSV-K91/K91n: WLAN 802.11a,b,g,j,n	R&S®FSV-K93: WiMAX 802.16e, OFDM and OFDMA	R&S®FSV-K100/102: LTE
Power Power measurement in time and frequency domains Rising/falling edge CCDF	**Power** Power measurement in time and frequency domains Rising/falling edge CCDF	**Power** Power measurement in time and frequency domains CCDF
Modulation quality EVM Constellation diagram I/Q offset Gain imbalance Quadrature error Center frequency error (symbol clock error)	**Modulation quality** EVM Constellation diagram I/Q offset Gain imbalance Quadrature error Center frequency error (symbol clock error)	**Modulation quality** EVM Constellation diagram I/Q offset Gain imbalance Quadrature error Center frequency error (symbol clock error)
Spectrum measurements Spectrum mask ACP Spectrum flatness	**Spectrum measurements** Spectrum mask ACP Spectrum flatness	**Spectrum measurements** Spectrum flatness
Miscellaneous Bit stream Signal field Averaging over multiple measurements	**Miscellaneous** Bit stream Signal field Averaging over multiple measurements Burst summary list Graphical display of DL map	**Miscellaneous** Bit stream Allocation summary list Signal flow diagram Averaging over multiple measurements
Special features 40 MHz bandwidth for WLAN 11n	**Special features** Automatic demodulation in accordance with DL map User-definable spectrum mask	**Special features** Automatic detection of modulation, cyclic prefix length and cell ID MIMO measurements

Ordering information

Product designation	Type	Order No.
Base unit (including supplied accessories such as power cable, manual, etc.)		
Signal analyzer 9 kHz to 3.6 GHz	R&S®FSV3	1307.9002K03
Signal analyzer 9 kHz to 7 GHz	R&S®FSV7	1307.9002K07
Hardware options		
Ruggedized housing	R&S®FSV-B1	1310.9500.02
AM/FM audio demodulator	R&S®FSV-B3	1310.9516.02
OCXO, precision reference frequency	R&S®FSV-B4	1310.9522.02
Additional interfaces (IF/video/AM/FM output, AUX port, trigger output, two additional USB ports)	R&S®FSV-B5	1310.9539.02
Spare hard drive (removable hard drive)	R&S®FSV-B19	1310.9574.02
Preamplifier 9 kHz to 3.6 GHz/7 GHz	R&S®FSV-B22	1310.9600.02
Electronic attenuator and 1 dB steps	R&S®FSV-B25	1310.9622.02
Frequency range extension to 20 Hz	R&S®FSV-B29	1310.9639.02
Extension of analysis bandwidth to 40 MHz	R&S®FSV-B70	1310.9645.02
Software options		
Analog modulation analysis for AM/FM/PM	R&S®FSV-K7	1310.8103.02
Power measurement with the R&S®NRP power sensors	R&S®FSV-K9	1310.8203.02
GSM/EDGE analysis	R&S®FSV-K10 [1)]	1310.8055.02
3 GPP BS (DL) analysis including HSDPA	R&S®FSV-K72	1310.8503.02
3 GPP UE (UL) analysis including HSUPA	R&S®FSV-K73 [1)]	1310.8555.02
WLAN 802.11a/b/g analysis	R&S®FSV-K91	1310.8903.02
WLAN 802.11n analysis	R&S®FSV-K91n [1)]	1310.9468.02
WiMAX 802.16e OFDM/OFDMA analysis	R&S®FSV-K93	1310.8955.02
LTE BS (DL) analysis	R&S®FSV-K100	1310.9151.02
LTE UE (UL) analysis	R&S®FSV-K101	1310.9200.02

[1)] Planned for a later release.

Service you can rely on

- In 70 countries
- Person-to-person
- Customized and flexible
- Quality with a warranty
- No hidden terms

About Rohde&Schwarz

Rohde&Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established 75 years ago, Rohde&Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

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For data sheet, see
PD 5214.0499.22
and www.rohde-schwarz.com
(search term: FSV)

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*0.14 €/min within German wireline network; rates may vary in other networks (wireline and mobile) and countries.