

R&S® FSH

Handheld Spectrum Analyzer

R&S® FSH3 100 kHz to 3 GHz
R&S® FSH6 100 kHz to 6 GHz
R&S® FSH18 10 MHz to 18 GHz



Fourth Edition March 2007



ROHDE & SCHWARZ

Spectrum analysis anywhere, anytime - on earth and in space

The R&S®FSH is the ideal spectrum analyzer for rapid, high-precision, cost-effective signal investigations. It provides a large number of measurement functions and so can handle anything from the installation or maintenance of a mobile radio base station up to on-site fault location in RF cables as well as development and service – an extensive range of applications.

Due to its excellent characteristics, the R&S®FSH3 is used on board the International Space Station (ISS) for distance-to-fault measurements on RF antenna cables.



Handy, robust, and portable

The R&S®FSH has been designed as a robust, portable spectrum analyzer that can be used in the field.

- Robust edge protection, stable carrying handle**
- Easy operation**
- Four hours operating time on battery power**
- Storage of up to 256 traces and setups**
- Easy data transfer to PC**
- High measurement accuracy**
- Best RF characteristics in its class**

The R&S®FSH can, of course, also be used on the lab bench. The R&S®FSH has an adjustable, fold-out stand to position the instrument to an optimal display viewing angle.



The R&S®FSH and its accessories can be stored and transported in the compact and sturdy aluminum transit case.



- Trace
- Memory Trace
- Clear/Write
- Max/Min Hold
- Average
- View
- Detectors
 - Auto Peak
 - Sample
 - Max/Min Peak
 - RMS

Function keys

Softkey function



Selection of measurement functions:

- Spectrum analysis
- Scalar network analysis
- Vector network analysis
- Receiver mode
- Channel power
- TDMA power
- Occupied bandwidth
- DTF
- 3GPP code domain power
- Isotropic antenna
- C/N measurement
- Power
- Transducer factors
- Limit lines
- Display line

Selection of following functions:

- Marker
- Delta marker
- Noise marker
- Frequency counter
- Multimarker

- Memory for up to 256 traces and setups
- Direct printout of measurement results

Transflective color display with 320 × 240 pixel, switchable to monochrome display for high-contrast display when used in direct sunlight in the field

RS-232-C optical interface

Simple menu-based operation via softkeys

General instrument setups

Current instrument setting

Rotary knob

Default setting

Cursor keys

AC power supply connector

Generator output, N connector

Power sensor connector

Trigger input/
external reference input

RF input, N connector



Headphones connector

Data in brief

| | R&S® FSH3 | R&S® FSH6 | R&S® FSH18 |
|-------------------------------|--|------------------------|--|
| Frequency range | 100 kHz to 3 GHz | 100 kHz to 6 GHz | 10 MHz to 18 GHz |
| Resolution bandwidths | 1 kHz to 1 MHz (model .13) 100 Hz to 1 MHz (models .03 and .23) | 100 Hz to 1 MHz | |
| Video bandwidths | 10 Hz to 1 MHz | | |
| Displayed average noise level | typ. -114 dBm (1 kHz) (model .13) typ. -135 dBm (100 Hz) (models .03 and .23) | typ. -135 dBm (100 Hz) | typ. -128 dBm (100 Hz) |
| TOI | typ. 13 dBm | | typ. 7 dBm |
| SSB phase noise | <-100 dBc (1 Hz) at 100 kHz from carrier | | -90 dBc (1 Hz) |
| Detectors | sample, max/min peak, auto peak, RMS | | |
| Level measurement uncertainty | <1.5 dB, typ. 0.5 dB | | <1.5 dB to 6 GHz <2.5 dB to 16 GHz <3 dB to 18 GHz |
| Reference level | -80 dBm to +20 dBm | | |
| Dimensions | 170 mm × 120 mm × 270 mm (6.69 in × 4.72 in × 10.63 in) | | |
| Weight | 2.5 kg (5,52 lb) | | |

R&S® FSH – options and applications

The R&S® FSH can be used for measurements up to an upper frequency limit of 3 GHz, 6 GHz, and 18 GHz. The 3 GHz and 6 GHz are available with or without internal tracking generator. When the tracking generator is included, the R&S® FSH can be used for distance-to-fault (DTF) measurements, scalar and vector network analysis, and one-port cable loss measurement. Almost all models come standard with an adjustable preamplifier, making them suitable for measuring very small signals. Power sensors are available as accessories for high-precision terminating power measurements up to 8 GHz or 18 GHz as well as for directional power measurements up to 4 GHz. The following tables show possible configurations for various applications and an overview of available models.

| Product | Application | TDMA power measurements | Channel-power measurements | Field-strength measurements/ measurements with isotropic antenna | C/N measurements | Channel tables | Receiver mode | Code domain power measurements on 3GPP base stations ¹⁾ | Power measurements | Directional power measurements up to 8 GHz/18 GHz | Measurements on cables (distance-to-fault) | Scalar transmission measurements up to 1 GHz/4 GHz | Vector transmission measurements ²⁾ | Scalar reflection measurements ²⁾ | Vector reflection measurements ²⁾ | Remote control via RS-232-C interface | One-port cable loss measurements |
|--|-------------|-------------------------|----------------------------|---|------------------|-----------------|-----------------|---|---------------------------|--|--|---|--|--|--|--|-------------------------------------|
| R&S® FSH (models .03/.06) with preamplifier | ■ | ■ | ■ | ■ | ■ | +R&S® FSH-K3 | – | +R&S® FSH-Z1/ -Z18 | +R&S® FSH-Z14/ -Z44 | – | – | – | +R&S® FSH-K1 | – | – | – | – |
| R&S® FSH (model .13) with tracking generator | ■ | ■ | ■ | ■ | ■ | +R&S® FSH-K3 | – | +R&S® FSH-Z1/ -Z18 | +R&S® FSH-Z14/ -Z44 | +R&S® FSH-Z2/Z3 +R&S® FSH-B1 | ■ | +R&S® FSH-Z2 | +R&S® FSH-K1 | +R&S® FSH-Z2/Z3 +R&S® FSH-K2 | – | – | – |
| R&S® FSH (models .23/.26) with tracking generator and preamplifier | ■ | ■ | ■ | ■ | ■ | +R&S® FSH-K3 | +R&S® FSH-K4 | +R&S® FSH-Z1/ -Z18 | +R&S® FSH-Z14/ -Z44 | +R&S® FSH-Z2/Z3 +R&S® FSH-B1 | ■ | +R&S® FSH-Z2/Z3 | +R&S® FSH-K1 | +R&S® FSH-Z2/Z3 +R&S® FSH-K2 | – | – | – |
| R&S® FSH18 | ■ | ■ | ■ | ■ | ■ | +R&S® FSH-K3 | – | +R&S® FSH-Z1/ -Z18 | +R&S® FSH-Z14/ -Z44 | – | – | – | +R&S® FSH-K1 | – | – | – | – |

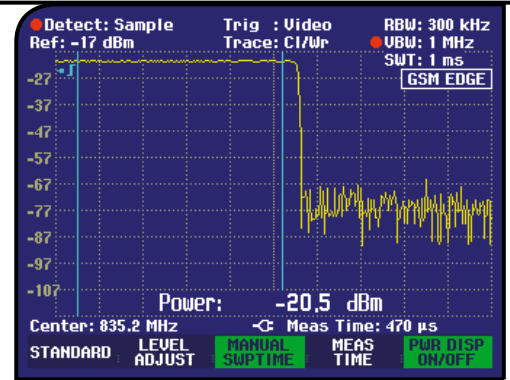
¹⁾ For R&S® FSH 3 model .23 with serial no. 103500 or later. ■ R&S® FSH standard function
²⁾ R&S® FSH-K2 required. – Not available

R&S® FSH – models

| | Frequency range | Tracking generator | Output power of tracking generator | Preamplifier | Resolution bandwidth |
|---------------------|------------------|--------------------|--|--------------|----------------------|
| R&S® FSH3 model .03 | 100 kHz to 3 GHz | – | – | ■ | 100 Hz to 1 MHz |
| R&S® FSH3 model .13 | 100 kHz to 3 GHz | ■ | –20 dBm | – | 1 kHz to 1 MHz |
| R&S® FSH3 model .23 | 100 kHz to 3 GHz | ■ | –20 dBm/0 dBm, selectable | ■ | 100 Hz to 1 MHz |
| R&S® FSH6 model .06 | 100 kHz to 6 GHz | – | – | ■ | 100 Hz to 1 MHz |
| R&S® FSH6 model .26 | 100 kHz to 6 GHz | ■ | –10 dBm (f < 3 GHz) –20 dBm (f > 3 GHz) | ■ | 100 Hz to 1 MHz |
| R&S® FSH18 | 10 MHz to 18 GHz | – | – | – | 100 Hz to 1 MHz |

TDMA power measurements

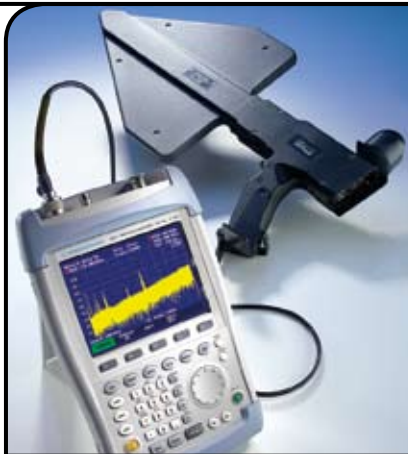
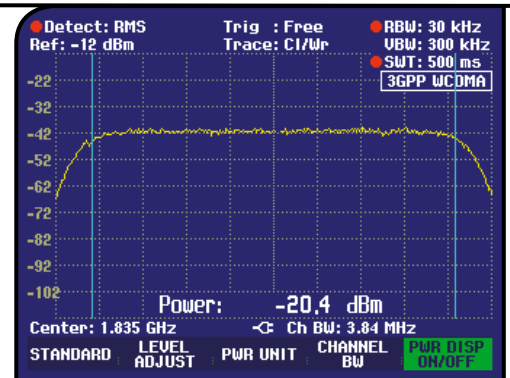
By means of the TDMA POWER function, the R&S®FSH performs time-domain power measurements within a timeslot of TDMA (time division multiple access) methods. All the settings required for the GSM and EDGE standards are predefined on the R&S®FSH to make these measurements easier for the user. In addition, up to five user-definable instrument setups can be loaded into the R&S®FSH using the R&S®FSH View software.



Channel-power measurements

The R&S®FSH determines the power of a definable transmission channel by means of the channel-power measurement function. A channel-power measurement for the digital mobile radio standards 3GPP WCDMA, cdmaOne, and CDMA2000® 1x is performed at a keystroke with all the correct instrument settings. With the R&S®FSHView software, the user can quickly and easily define further standards and load them into the R&S®FSH.

CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA USA)



Field-strength measurements

When measuring electric field strength, the R&S®FSH takes into account the specific antenna factors of the connected antenna. Field strength is displayed directly in dBμV/m. If W/m² is selected, the power flux density is calculated and displayed. In addition, frequency-dependent loss or gain of, for example, a cable or an amplifier can be corrected. For quick and easy result analysis, the R&S®FSH provides two user-definable limit lines with automatic limit monitoring.

R&S®FSH with R&S®HE 200 active directional antenna (optional accessory)

Field-strength measurements with isotropic antenna

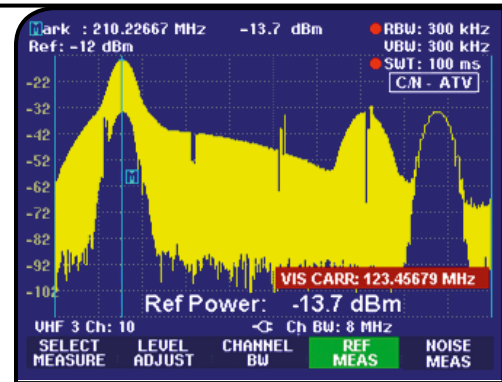
When used with the R&S®TS-EMF isotropic antenna, the R&S®FSH can determine the direction-independent resultant field strength in the frequency range from 30 MHz to 3 GHz. For measuring the resultant field strength, the antenna has three orthogonal antenna elements. The R&S®FSH successively triggers the three antenna elements and calculates the resultant field strength. The calculation takes into account the antenna factors for each individual antenna element as well as the cable loss of the connecting cable.

R&S®FSH with R&S®TS-EMF isotropic antenna (optional accessory)



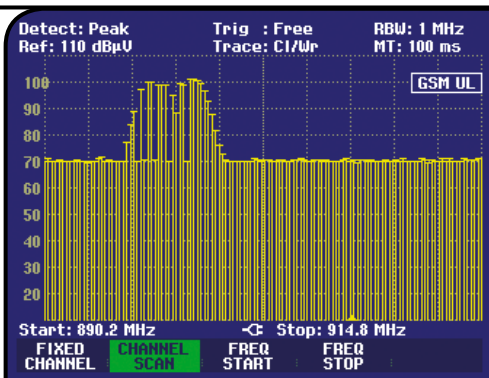
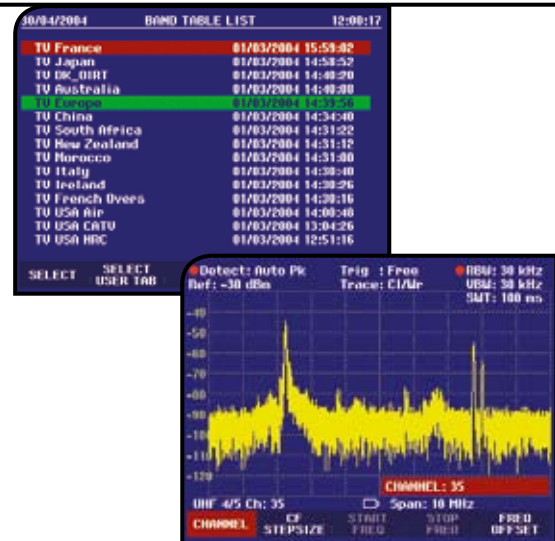
C/N measurements

The R&S®FSH offers a carrier/noise (C/N) measurement for determining the ratio of carrier power to noise power or carrier power to noise power density. The R&S®FSH supports three different modes for carrier power measurement. In the CW TX mode, the R&S®FSH determines the power of an unmodulated carrier. In the digital TX mode, it determines the channel power of a reference channel, as is common with digitally modulated carriers (e.g. the DAB, DVB, DVB-T, DVB-H, and J.83/A/B/C standards). Furthermore, the ATSC standard for digital terrestrial television with 8VSB modulation is supported. In the analog TV mode, the R&S®FSH measures the peak power of the vision carrier with amplitude-modulated TV signals.



Channel tables

If preferred, the R&S®FSH can be tuned by channel numbers rather than by entering the frequency. The channel number is displayed instead of the center frequency. Users who are accustomed to channel assignments, which are common in TV and mobile radio applications, can operate the R&S®FSH more easily. The channel tables are generated with the R&S®FSHView software and loaded into the R&S®FSH. The R&S®FSH includes TV channel tables for a number of countries

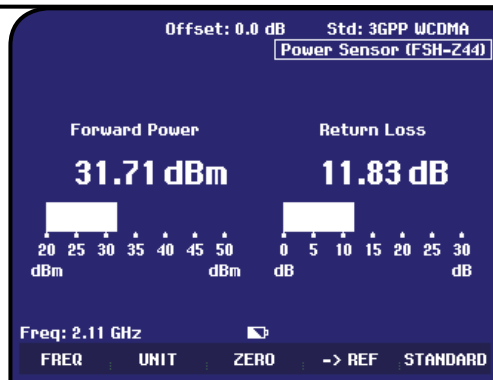
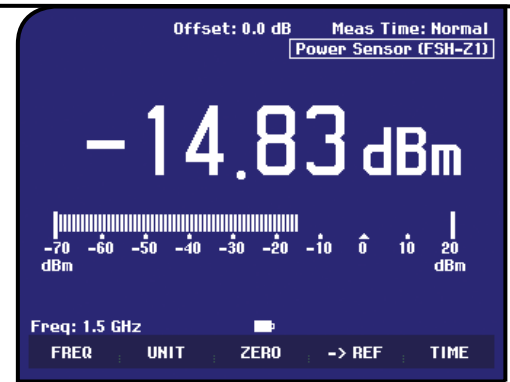


Receiver mode

When equipped with the R&S®FSH-K3 option, the R&S®FSH can be operated as a receiver for monitoring and precompliance EMC applications. Measurements are performed at a predefined frequency with a user-selectable measurement time. In the scan mode, the R&S®FSH sequentially measures each level at various frequencies defined in a channel table. The channel tables are generated with the R&S®FSHView software and loaded into the R&S®FSH. For a few TV transmitter and mobile radio standards, the tables are predefined. In addition, the CISPR bandwidths 200 Hz, 9 kHz, 120 kHz, and 1 MHz are available for EMI emission measurements. The R&S®FSH offers peak, average, RMS, and quasi-peak detectors.

Power measurements

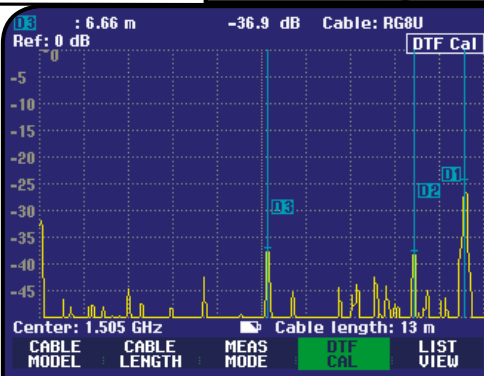
The R&S®FSH-Z1 and R&S®FSH-Z18 power sensors expand the R&S®FSH to a high-precision RF power meter up to 8 GHz and 18 GHz respectively. As with thermal sensors, the true RMS value of the measured signal is obtained over the entire measurement range of -67 dBm to +23 dBm irrespective of the signal waveform. In particular with modulated signals, additional measurement errors can thus be prevented, and handling becomes easy.



Directional power measurements

The R&S®FSH-Z14 and R&S®FSH-Z44 directional power sensors turn the R&S®FSH into a full-fledged directional power meter with a frequency range of 25 MHz to 1 GHz and 200 MHz to 4 GHz. The R&S®FSH can then simultaneously measure the output power and the matching of transmitter system antennas under operating conditions. The power sensors measure average power up to 120 W and normally eliminate the need for any extra attenuators. They are compatible with the common standards GSM/EDGE, 3GPP WCDMA, cdmaOne, CDMA2000® 1x, DVB-T, and DAB. Additionally, the peak envelope power (PEP) can be determined up to a maximum of 300 W.

R&S®FSH with R&S®FSH-Z44 directional power sensor



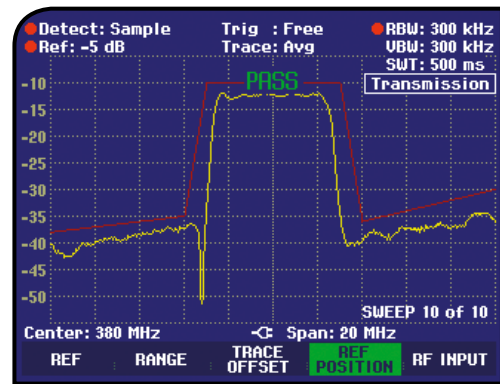
Measurements on cables (distance to fault)

The R&S®FSH-B1 option allows the distance to any faults in an RF cable to be determined rapidly and accurately. Distance-to-fault measurements using the R&S®FSH-Z2/-Z3 VSWR bridge provide an immediate overview of the state of the device under test (return loss and distance, see figure). The marker-zoom function allows detailed analysis of faults with a resolution of up to 1024 pixel.

Only applies to the R&S®FSH with tracking generator and R&S®FSH-B1 (distance-to-fault measurement) and R&S®FSH-Z2/-Z3 (VSWR bridge) options installed

Scalar transmission and reflection measurements with VSWR bridge

The R&S®FSH with built-in tracking generator rapidly determines the transmission characteristics of cables, filters, amplifiers, etc, with a minimum of effort. When equipped with the R&S®FSH-Z2/-Z3 VSWR bridge (10 MHz to 3 GHz/6 GHz), the R&S®FSH can also measure the matching (return loss, reflection coefficient, or VSWR) of an antenna, for example. The bridge is screw-connected directly to the R&S®FSH's RF input and tracking generator output without involving cumbersome, extra cabling. The innovative design of the R&S®FSH-Z3 VSWR bridge with integrated RF bypass switch allows the user to make spectrum and transmission measurements also with the bridge connected. Active components such as amplifiers can be supplied directly via the RF cable by means of the two integrated bias tees.



R&S®FSH-Z3 VSWR bridge

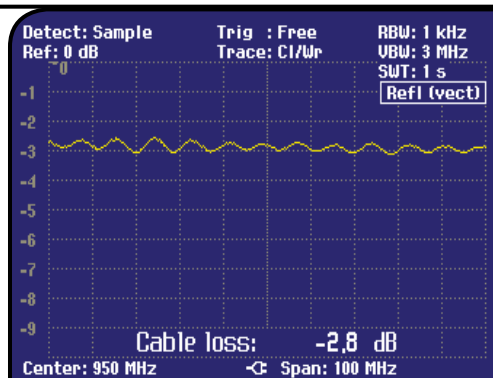
Measurement of magnitude and phase in Smith chart



Measurement of phase

Vector transmission and reflection measurements

Compared to scalar transmission and reflection measurements, the R&S®FSH-K2 option offers a significant increase in measurement accuracy and number of measurement functions. In addition to the magnitude of S11 and S21, the phase, group delay, and electrical length of a DUT can be determined. The Smith chart allows simultaneous display of magnitude and phase in order to analyze the matching of an antenna in detail, for example. A user-definable limit line and a zoom function come in handy when evaluating the measurement results. Owing to a wide variety of marker formats, the measured values are displayed in virtually all the conventional formats used in network analysis. The input of a reference impedance permits measurements on DUTs whose impedance is not 50 Ω. To increase measurement accuracy, the R&S®FSH performs complex correction of the system errors after calibration.



One-port cable loss measurements

The R&S®FSH with tracking generator and VSWR bridge can determine the cable loss of previously installed long cables without much effort. One end of the cable is connected to the VSWR bridge, and the other end is terminated with a short circuit or simply left open. The calculated cable loss represents the average value within the displayed frequency range. The loss at specific frequencies is determined via markers. The one-port cable loss measurement is only available with the R&S®FSH-K2 option.

3GPP FDD code domain power measurements on base stations

The R&S®FSH-K4 option¹⁾ allows code domain power measurements on a 3GPP base station. It measures the total power and the power of the most important code channels, such as the common pilot channel (CPICH), primary common control physical channel (P-CCPCH), primary synchronization channel (P-SCH), and secondary synchronization channel (S-SCH). Furthermore, the carrier frequency offset and the error vector magnitude (EVM) are measured and displayed. The scrambling code can be determined at the press of a button and used automatically for decoding the code channels. The user can also get a quick overview of adjacent base stations. The R&S®FSH can display up to eight scrambling codes with their CPICH power. The R&S®FSH-K4 option provides automatic level setting for fast and optimal setting of the reference level. In practice, this means very easy operation. To display the code domain power measurement values, only four operating steps are necessary:

- Select the 3GPP CDP function
- Set the center frequency
- Use "Level Adjust" to optimize the level setting
- Start the scrambling code search

For base stations with two antennas, the user can select which antenna the R&S®FSH should synchronize to (antenna diversity).

| 3GPP BTS CDP | |
|---------------------------|-------------|
| Synchronization Result | SYNC OK |
| Scrambling Code (prm/sec) | 377 / 0 |
| CPICH Slot Number | 12 |
| Center Frequency | 2.14 GHz |
| Carrier Frequency Error | -160 Hz |
| Total Power | -30.8 dBm |
| <hr/> | |
| CPICH (15 ksps, Code 0) | |
| Power | -40.8 dBm |
| Symbol EVM | 7.0 % rms |
| P-CCPCH (15 ksps, Code 1) | |
| Power | -41.4 dBm |
| Symbol EVM | 6.8 % rms |
| P-SCH Power | -44.4 dBm |
| S-SCH Power | -44.9 dBm |
| <hr/> | |
| LEVEL ADJUST | SCRAMB CODE |
| ANT DIV | SYMBOL EVM |

¹⁾ Available for the R&S®FSH3 (model .23) with serial number 103500 or later.

Locating EMC weak spots

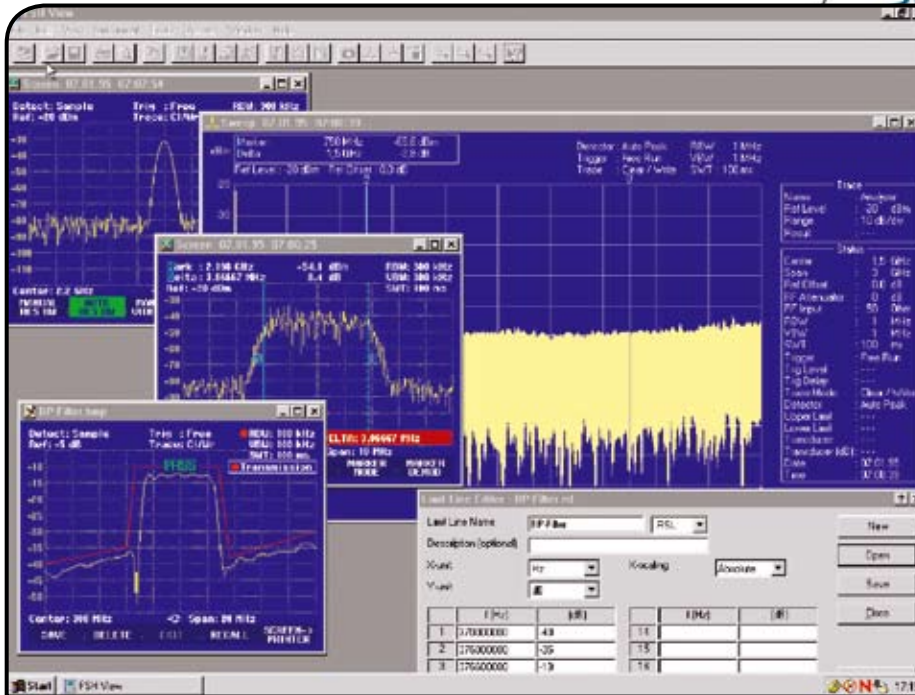
The R&S®HZ-15 near-field probe set is a diagnostic tool for locating EMC weak spots on printed boards, integrated circuits, cables, shieldings, and other trouble spots. The R&S®HZ-15 near-field probe set can handle emission measurements from 30 MHz to 3 GHz. Its sensitivity can be enhanced by adding the R&S®HZ-16 preamplifier, which has a frequency range of up to 3 GHz, a gain of approx. 20 dB, and a noise figure of 4.5 dB. In combination with the R&S®FSH, the preamplifier and near-field probe set are a cost-effective means of analyzing and locating sources of interference during development.



R&S®FSH with near-field probe set and DUT

R&S® FSH View Control Software

The powerful software package for documenting your measurements is supplied with every R&S® FSH.



Features

- Runs under Windows 98/ME/NT/2000/XP
- Rapid and simple transfer of measurement data from the R&S® FSH to a PC and vice versa
- Data export in ASCII or MS Excel format
- Printout of all relevant data via Windows (screenshot of the R&S® FSH display for documentation)
- Graphics data stored in standard formats (.bmp, .pcx, .png, .wmf)
- Permanent and continuous transfer of sweeps to the PC; facilities for subsequent analysis (markers, zoom, etc)
- Storage space for traces and measurement data, as well as for comparisons of current and previous measurements (available space is limited only by the size of the hard disk of the controlling PC)
- Automatic storage of measurement results at selectable intervals
- Generation of cable data with a built-in cable editor; downloading to the R&S® FSH for distance-to-fault measurements (R&S® FSH-B1)
- Editor for generating limit lines, user-definable standards (measurement of occupied bandwidth, channel power, and TDMA power), transducer factors, and correction factors for taking into account external attenuators or amplifiers, as well as channel lists
- Macro function for Word for fast and easy documentation of measurement results
- Connection between PC and R&S® FSH via interference-free, RS-232-C optical interface

Specifications

Specifications apply under the following conditions: 15 minutes warm-up time at ambient temperature, specified environmental conditions met, and calibration cycle adhered to. Data without tolerances: typical values.

Data designated as “nominal”: design parameters, i. e. not tested.

| | | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|-------------------------------|---|---|---------------------------------|---------------------------------------|
| Frequency | | | | |
| Frequency range | | 100 kHz to 3 GHz | 100 kHz to 6 GHz | 10 MHz to 18 GHz |
| Reference frequency | | | | |
| Aging | | 1 ppm/year | | |
| Temperature drift | 0 °C to +30 °C +30 °C to +50 °C | 2 ppm in addition 2 ppm/10 °C | | |
| Frequency counter | | | | |
| Resolution | | 1 Hz | | |
| Counter accuracy | S/N > 25 dB | ± (frequency × reference frequency error) | | |
| Frequency span | model .03/.23, model .06/.26 model .13 model .18 | 0 Hz, 100 Hz to 3 GHz – | – 0 Hz, 100 Hz to 6 GHz – | – – – 0 Hz, 100 Hz to 18 GHz |
| Spectral purity | | | | |
| SSB phase noise | f = 500 MHz, +20 °C to +30 °C | | | |
| 30 kHz from carrier | | <–85 dBc (1 Hz) | | <–85 dBc (1 Hz) |
| 100 kHz from carrier | | <–100 dBc (1 Hz) | | <–90 dBc (1 Hz) |
| 1 MHz from carrier | | <–120 dBc (1 Hz) | | <–98 dBc (1 Hz) |
| Sweep time | | | | |
| | span = 0 Hz | 1 ms to 100 s | | |
| | span > 0 Hz | 20 ms to 1000 s, min. 20 ms/600 MHz | | |
| Bandwidths | | | | |
| Resolution bandwidths (–3 dB) | model .13 | 1, 3, 10, 30, 100, 200, 300 kHz, 1 MHz | | |
| | model .03/.23, model .06/.26/.18 | in addition 100 Hz, 300 Hz | | |
| Tolerance | ≤300 kHz | ±5 %, nominal | | |
| | 1 MHz | ±10 %, nominal | | |
| Resolution bandwidths (–6 dB) | with R&S®FSH-K3 option installed | in addition 200 Hz, 9 kHz, 120 kHz, 1 MHz | | |
| Video bandwidths | | 10 Hz to 1 MHz in 1, 3 steps | | |

| | | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|---|---|---|-----------------------------------|--|
| Amplitude | | | | |
| Display range | | average noise level displayed to +20 dBm | | |
| Maximum permissible DC voltage at RF input | | 50 V/80 V ¹⁾ | | 50 V |
| Maximum power | | 20 dBm, 30 dBm (1 W) for max. 3 minutes | | 20 dBm |
| Intermodulation-free dynamic range | third-order IM products, 2 × -20 dBm, reference level = -10 dBm at signal offset ≤2 MHz at signal offset >2 MHz | typ. 66 dB (typ. +13 dBm third-order intercept, TOI) | | typ. 54 dBc (typ. +7 dBm TOI) |
| | | 60 dB (nominal, +10 dBm TOI) | 66 dB (nominal, typ. +13 dBm TOI) | 50 dB (nominal, +5 dBm TOI) 50 dB (nominal, +5 dBm TOI) |
| Displayed average noise level | resolution bandwidth 1 kHz, video bandwidth 10 Hz, reference level ≤-30 dBm | | | |
| 10 MHz to 50 MHz | | <-105 dBm, typ. -114 dBm | <-105 dBm, typ. -112 dBm | <-90 dBm, typ. -98 dBm |
| 50 MHz to 3 GHz | | <-105 dBm, typ. -114 dBm | <-105 dBm, typ. -112 dBm | <-110 dBm, typ. -118 dBm |
| 3 GHz to 5 GHz | | - | <-103 dBm, typ. -108 dBm | <-110 dBm, typ. -118 dBm |
| 5 GHz to 6 GHz | | - | <-96 dBm, typ. -102 dBm | <-110 dBm, typ. -118 dBm |
| 6 GHz to 8 GHz | | - | - | <-108 dBm, typ. -113 dBm |
| 8 GHz to 12 GHz | | - | - | <-105 dBm, typ. -113 dBm |
| 12 GHz to 16 GHz | | - | - | <-100 dBm, typ. -108 dBm |
| 16 GHz to 18 GHz | | - | - | <-90 dBm, typ. -102 dBm |
| With preamplifier | only models .03 ²⁾ , .23, .06 and .26 | | | |
| 10 MHz to 2.5 GHz | | <-120 dBm, typ. -125 dBm | <-120 dBm, typ. -125 dBm | - |
| 2.5 GHz to 3 GHz | | <-115 dBm, typ. -120 dBm | <-115 dBm, typ. -120 dBm | - |
| 3 GHz to 5 GHz | | - | <-115 dBm, typ. -120 dBm | - |
| 5 GHz to 6 GHz | | - | <-105 dBm, typ. -110 dBm | - |
| Inherent spurious | reference level ≤-20 dBm, f > 30 MHz, RBW ≤ 100 kHz | <-80 dBm | | |
| Input related spurious | R&S®FSH3/6: mixer level ≤-40 dBm, carrier offset >1 MHz | | | |
| Up to 3 GHz | | -70 dBc (nominal) | -70 dBc (nominal) | - |
| 3 GHz to 6 GHz | | - | -64 dBc (nominal) | - |
| Receive frequency = signal frequency - 2.0156 GHz | for signal frequencies 2 GHz to 3.2 GHz | -55 dBc (nominal) | -55 dBc (nominal) | - |
| Input related spurious | R&S®FSH18: mixer level ≤-20 dBm carrier offset >1 MHz | | | |
| 10 MHz to 14 GHz | 10 MHz to 7.6 GHz | - | - | -60 dBc (nominal) |
| | 7.6 GHz to 18 GHz | - | - | -50 dBc (nominal) |
| 14 GHz to 18 GHz | 10 MHz to 2.8 GHz | - | - | -50 dBc (nominal) |
| | 2.8 GHz to 7.6 GHz | - | - | -30 dBc (nominal) |
| | 7.6 GHz to 18 GHz | - | - | -50 dBc (nominal) |
| Receive frequency = signal frequency - 3.9 GHz | for signal frequencies 3.9 GHz to 18 GHz | - | - | -40 dBc (nominal) |
| signal frequency + 0.6 GHz to + 1 GHz | 7.4 GHz to 7.7 GHz | - | - | -45 dBc (nominal) |
| signal frequency - 0.6 GHz to - 1 GHz | 7.8 GHz to 8.5 GHz | - | - | -45 dBc (nominal) |
| 2nd harmonic, receive frequency: | mixer level -40 dBm | | | |
| Up to 6 GHz | | -60 dBc (nominal) | -60 dBc (nominal) | -60 dBc (nominal) |
| 6 GHz to 9 GHz | | - | - | -50 dBc (nominal) |
| Level display | | | | |
| Reference level | | -80 dBm to +20 dBm in steps of 1 dB | | |
| Display range | | 100 dB, 50 dB, 20 dB, 10 dB, linear | | |
| Display units | | | | |
| Logarithmic | | dBm, dBμV, dBmV, with transducer also dBμV/m and dBμA/m | | |
| Linear | | μV, mV, V, nW, μW, mW, W, with transducer also V/m, mV/m, μV/m and W/m ² | | |
| Traces | | 1 trace and 1 memory trace | | |
| Trace mathematics | | A-B and B-A (trace - memory trace and memory trace - trace) | | |
| Detectors | | auto peak, maximum peak, minimum peak, sample, RMS | | |
| | with option R&S®FSH-K3 installed | in addition average and quasi-peak | | |

¹⁾ 80 V valid as of serial number 100900 (model.03) or 101600 (model.13); model.23, .06, and .26 all serial numbers.

²⁾ As of serial number 101362.

| | | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|--|---|--|--|----------------|
| Level measurement error | reference level to reference level | -50 dB, +20 °C to +30 °C | | |
| | 1 MHz to 10 MHz | <1.5 dB, typ. 0.5 dB | | – |
| | 10 MHz to 20 MHz | <1.5 dB, typ. 0.5 dB | | 2 dB |
| | 20 MHz to 6 GHz | <1.5 dB, typ. 0.5 dB | | <1.5 dB |
| | 6 GHz to 14 GHz | – | | <2.5 dB |
| | 14 GHz to 18 GHz | – | | <3 dB |
| Markers | | | | |
| Number of markers or delta markers | | max. 6 | | |
| Marker functions | | peak, next peak, minimum, center = marker frequency, reference level = marker level, all markers to peak | | |
| Marker displays | | normal (level), noise marker, frequency counter (count) | | |
| Trigger | | free-running, video, external | | |
| Audio demodulation | | AM (video voltage without AGC) and FM | | |
| Inputs | | | | |
| RF input | | N female | | |
| Input impedance | | 50 Ω | | |
| VSWR | 10 MHz to 3 GHz | <1.5 (nominal) | <1.5 (nominal) | <1.5 (nominal) |
| | 3 GHz to 6 GHz | – | <1.5 (nominal) | <1.5 (nominal) |
| | 6 GHz to 10 GHz | – | – | <2 (nominal) |
| | 10 GHz to 18 GHz | – | – | <3 (nominal) |
| Trigger/external reference input | | BNC female, selectable | | |
| Trigger voltage | | TTL | | |
| Reference frequency | | 10 MHz | | |
| Required level | from 50 Ω | 10 dBm | | |
| Outputs | | | | |
| AF output | | 3.5 mm mini jack | | |
| Output impedance | | 100 Ω | | |
| Open-circuit voltage | | adjustable up to 1.5 V | | |
| Tracking generator | only models .13, .23, .26 | | | – |
| Frequency range | | 5 MHz to 3 GHz | 5 MHz to 6 GHz | – |
| Output level | model .13 model .23 model .26 f < 3 GHz f > 3 GHz | –20 dBm (nominal) 0 dBm/–20 dBm, selectable | –10 dBm (nominal) –20 dBm (nominal) | – |
| Step attenuator | model .26 ³⁾ model .23 ⁴⁾ | 20 dB step attenuator adjustable in 1 dB steps | | – |
| Output impedance | | 50 Ω, nominal | | – |
| Interfaces | | | | |
| RS-232-C optical interface ⁵⁾ | | | | |
| Baud rate | | 1200, 2400, 9600, 19200, 38400, 57600, 115200 baud | | |
| Power sensor | | 7-contact female connector (type Binder 712) | | |

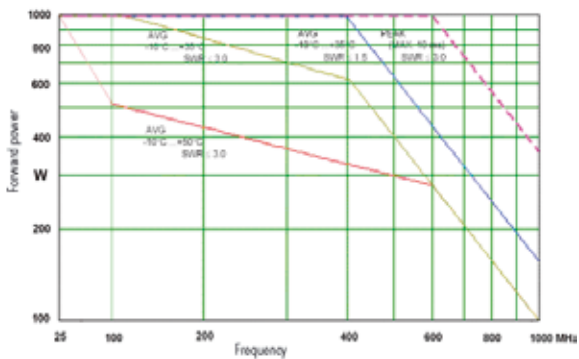
³⁾ As of serial no. 100500.

⁴⁾ As of serial no. 102314.

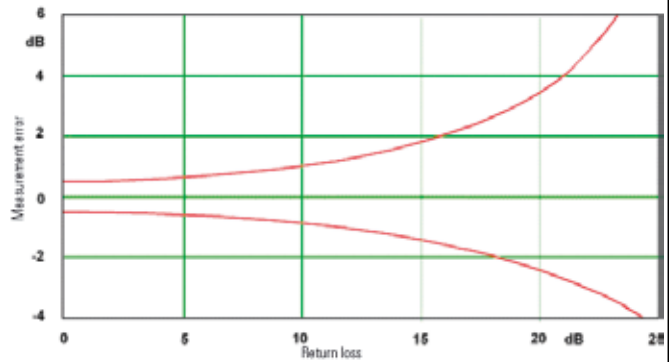
⁵⁾ Standard accessory: optical USB cable.

| | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|--|------------------|--|---|
| Accessories | | | |
| R&S®FSH-Z1 and R&S®FSH-Z18 power sensors | | | |
| Frequency range | | | |
| R&S®FSH-Z1 | | 10 MHz to 8 GHz | |
| R&S®FSH-Z18 | | 10 MHz to 18 GHz | |
| VSWR | | | |
| 10 MHz to 30 MHz | | <1.15 | |
| 30 MHz to 2.4 GHz | | <1.13 | |
| 2.4 GHz to 8 GHz | | <1.20 | |
| 8 GHz to 18 GHz | | <1.25 | |
| Maximum input power | | average power | 400 mW (+26 dBm) |
| | | peak power | 1 W (+30 dBm) |
| | | (<10 μs, 1 % duty cycle) | |
| Measurement range | | | 200 pW to 200 mW (–67 dBm to +23 dBm) |
| Signal weighting | | | average power |
| Effect of harmonics | | | <0.5 % (0.02 dB) at harmonic ratio of 20 dBc |
| Effect of modulation | | | <1.5 % (0.07 dB) for continuous digital modulation |
| Absolute measurement uncertainty | | sine signals, no zero offset | |
| 10 MHz to 8 GHz | +15 °C to +35 °C | | <2.5 % (0.11 dB) |
| | 0 °C to +50 °C | | <4.5 % (0.19 dB) |
| 8 GHz to 18 GHz | +15 °C to +35 °C | | <3.5 % (0.15 dB) |
| | 0 °C to +50 °C | | <5.2 % (0.22 dB) |
| Zero offset after zeroing | | | <150 pW |
| Dimensions (W × H × D) | | | 48 mm × 31 mm × 170 mm (1.89 in × 1.22 in × 6.69 in) , connecting cable 1.5 m (59.05 in) |
| Weight | | | <0.3 kg |
| R&S®FSH-Z14 directional power sensor | | | |
| Frequency range | | | 25 MHz to 1 GHz |
| Power measurement range | | | 30 mW to 300 W |
| VSWR referenced to 50 Ω | | | <1.06 |
| Power-handling capacity | | depending on temperature and matching (see diagram on page 15) | 100 W to 1000 W |
| Insertion loss | | | <0.06 dB |
| Directivity | | | >30 dB |
| Average power | | | |
| Power measurement range CW, FM, PM, FSK, GMSK Modulated signals | | CF: ratio of peak envelope power to average power | 30 mW to 300 W 30 mW to 300 W/CF |
| Measurement uncertainty 25 MHz to 40 MHz 40 MHz to 1 GHz | | sine signal, +18 °C to +28 °C, no zero offset | 4.0 % (0.17 dB) of measured value 3.2 % (0.14 dB) of measured value |
| Zero offset | | after zeroing | ±4 mW |
| Range of typical measurement error with modulation FM, PM, FSK, GMSK AM (80 %) two equal-power CW carriers EDGE, TETRA | | if standard is selected on the R&S®FSH | 0 % of measured value (0 dB) ±3 % of measured value (±0.13 dB) ±2 % of measured value (±0.09 dB) ±0.5 % of measured value (±0.02 dB) |

| | | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|---|--|---|----------|-----------|
| Temperature coefficient 25 MHz to 40 MHz 40 MHz to 1 GHz | | 0.40 %/K (0.017 dB/K) 0.25 %/K (0.011 dB/K) | | |
| Peak envelope power | | | | |
| Power measurement range for video bandwidth 4 kHz 200 kHz 600 kHz | | 0.4 W to 300 W 1 W to 300 W 2 W to 300 W | | |
| Measurement uncertainty | +18 °C to +28 °C | same as for average power, plus effect of peak hold circuit | | |
| Accuracy of peak hold circuit for burst signals Duty cycle ≤ 0.1 and repetition rate ≥ 100/s 20/s ≤ repetition rate < 100/s 0.001 ≤ duty cycle < 0.1 | video bandwidth 4 kHz 200 kHz 600 kHz | ±(3 % of measured value + 0.05 W) at burst width > 200 μs ±(3 % of measured value + 0.20 W) at burst width > 4 μs ±(7 % of measured value + 0.40 W) at burst width > 2 μs in addition ±(1.6 % of measured value + 0.15 W) in addition ±0.10 W | | |
| Temperature coefficient 25 MHz to 40 MHz 40 MHz to 1 GHz | | 0.50 %/K (0.022 dB/K) 0.35 %/K (0.015 dB/K) | | |
| Load matching | | | | |
| Matching measurement range Return loss VSWR | | 0 dB to 23 dB >1.15 | | |
| Minimum forward power | specs met at ≥ 0.4 W | 0.06 W | | |



Power-handling capacity

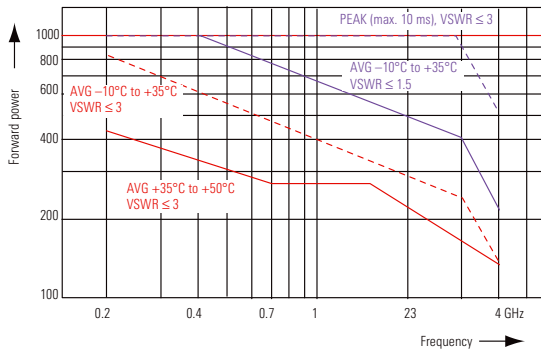


Limits of measurement uncertainty for matching measurements

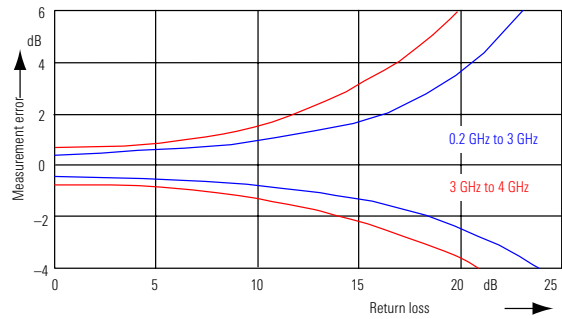
| | | |
|------------------------|--|---|
| Dimensions (W × H × D) | | 120 mm × 95 mm × 39 mm (4.72 in × 3.74 in × 1.53 in) connecting cable 1.5 m (59.05 in) |
| Weight | | 0.65 kg (1.43 lb) |

| | | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|--|--|---|----------|-----------|
| R&S®FSH-Z44 directional power sensor | | | | |
| Frequency range | | 200 MHz to 4 GHz | | |
| Power measurement range | | 30 mW to 120 W (300 W with unmodulated envelope) | | |
| VSWR referenced to 50 Ω | | 200 MHz to 3 GHz <1.07 3 GHz to 4 GHz <1.12 | | |
| Power-handling capacity | depending on temperature and matching (see diagram on page 17) | 120 W to 1000 W | | |
| Insertion loss | | 200 MHz to 1.5 GHz <0.06 dB 1.5 GHz to 4 GHz <0.09 dB | | |
| Directivity | | 200 MHz to 3 GHz >30 dB 3 GHz to 4 GHz >26 dB | | |
| Signal weighting | | average power | | |
| Measurement uncertainty | sine signals, +18 °C to +28 °C, no zero offset | 200 MHz to 300 MHz 4 % of measured value (0.17 dB) 300 MHz to 4 GHz 3.2 % of measured value (0.14 dB) | | |
| Zero offset | after zeroing | ±4 mW | | |
| Range of typical measurement error with modulation | if standard is selected on the R&S®FSH | 0 % of measured value (0 dB) ±3 % of measured value (±0.13 dB) ±1 % of measured value (±0.04 dB) ±2 % of measured value (±0.09 dB) ±2 % of measured value (±0.09 dB) ±2 % of measured value (±0.09 dB) | | |
| Temperature coefficient | | 200 MHz to 300 MHz 0.40 %/K (0.017 dB/K) 300 MHz to 4 GHz 0.25 %/K (0.011 dB/K) | | |
| Peak envelope power | | | | |
| Power measurement range | | DAB, DVB-T, cdmaOne, CDMA2000®, 3GPP WCDMA other signals at video bandwidth 4 kHz 4 W to 300 W 200 kHz 0.4 W to 300 W 4 MHz 1 W to 300 W 4 MHz 2 W to 300 W | | |
| Measurement uncertainty | +18 °C to +28 °C | same as for average power plus effect of peak hold circuit | | |
| Accuracy of peak hold circuit for burst signals | video bandwidth | Duty cycle ≥ 0.1 and repetition rate ≥ 100/s 4 kHz ±(3 % of measured value + 0.05 W) at burst width ≥100 μs 200 kHz ±(3 % of measured value + 0.20 W) at burst width ≥4 μs 4 MHz ±(7 % of measured value + 0.40 W) at burst width ≥1 μs 20/s ≤ repetition rate < 100/s in addition ±(1.6 % of measured value + 0.15 W) 0.001 ≤ duty cycle < 0.1 in addition ±0.10 W Burst width ≥ 0.5 μs in addition ±5 % of measured value Burst width ≥ 0.2 μs in addition ±10 % of measured value | | |
| Range of typical measurement error of peak hold circuit for cdmaOne, DAB, DVB-T, CDMA2000® 1xRTT, 3GPP WCDMA | 4 MHz video bandwidth and standard selected on the R&S®FSH | ±(5 % of measured value + 0.4 W) ±(15 % of measured value + 0.4 W) | | |
| Temperature coefficient | | 200 MHz to 300 MHz 0.50 %/K (0.022 dB/K) 300 MHz to 4 GHz 0.35 %/K (0.015 dB/K) | | |

| | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|-----------------------|------------------------|---------------|---------------|
| Load matching | | | |
| Return loss | | 0 dB to 23 dB | 0 dB to 20 dB |
| 200 MHz to 3 GHz | | | |
| 3 GHz to 4 GHz | | | |
| VSWR | | >1.15 | >1.22 |
| 200 MHz to 3 GHz | | | |
| 3 GHz to 4 GHz | | | |
| Minimum forward power | specs met ≥ 0.2 W | 0.03 W | |



Power-handling capacity



Limits of measurement uncertainty for matching measurements

| | |
|------------------------|---|
| Dimensions (W × H × D) | 120 mm × 95 mm × 39 mm (4.72 in × 3.74 in × 1.53 in) connecting cable 1.5 m (59.05 in) |
| Weight | 0.65 kg (1.43 lb) |

| | | R&S®FSH-Z2 | R&S®FSH-Z3 |
|--|-------------------------|---|--|
| R&S®FSH-Z2/R&S®FSH-Z3 VSWR bridge | | | |
| Frequency range | | 10 MHz to 3 GHz | 10 MHz to 6 GHz |
| Impedance | | 50 Ω | |
| VSWR bridge | | | |
| Directivity | | | |
| 10 MHz to 30 MHz | | typ. 30 dB | typ. 16 dB |
| 30 MHz to 1 GHz | | typ. 30 dB | >20 dB, typ. 28 dB |
| 1 GHz to 3 GHz | | typ. 25 dB | >20 dB, typ. 28 dB |
| 3 GHz to 6 GHz | | – | >16 dB, typ. 25 dB |
| Directivity, corrected | R&S®FSH-K2 option | | |
| 2 MHz to 10 MHz | | typ. 40 dB | typ. 40 dB |
| 10 MHz to 3 GHz | | typ. 43 dB | typ. 40 dB |
| 3 GHz to 6 GHz | | – | typ. 37 dB |
| Return loss at test port | | | |
| 10 MHz to 50 MHz | | typ. 20 dB | >12 dB, typ. 18 dB |
| 50 MHz to 3 GHz | | typ. 20 dB | >16 dB, typ. 22 dB |
| 3 GHz to 6 GHz | | – | >16 dB, typ. 22 dB |
| Return loss at test port, corrected | R&S®FSH-K2 option | | |
| 2 MHz to 3 GHz | | typ. 35 dB | typ. 40 dB |
| 3 GHz to 6 GHz | | – | typ. 37 dB |
| Insertion loss | | | |
| Test port | | typ. 9 dB | typ. 9 dB |
| Bypass | | – | typ. 4 dB |
| DC bias | | | |
| Max. input voltage | | – | 50 V |
| Max. input current | | – | 300 mA, 600 mA ⁶⁾ |
| Type of connector | | – | BNC female |
| Connectors | | | |
| Generator input/RF output | | N male | |
| Test port | | N female | |
| Control interface | | 7-contact connector (type Binder) | |
| Calibration standards | | | |
| Short/open | | R&S®FSH-Z29/-Z30/-Z31 | R&S®FSH-Z28 |
| 50 Ω load | | N male | |
| Impedance | | 50 Ω | |
| Return loss | | | |
| DC to 3 GHz | | >43 dB | >40 dB, typ. 46 dB |
| 3 GHz to 6 GHz | | – | >37 dB, typ. 43 dB |
| Power-handling capacity | | 1 W | 1 W |
| General data | | | |
| Power consumption | | – | 3 mW (nominal) |
| Dimensions (W × H × D) | | 169 mm × 116 mm × 30 mm 6.65 in × 4.57 in × 1.18 in | 149 mm × 144 mm × 45 mm 5.87 in × 5.67 in × 1.77 in |
| Weight | | 485 g (1.07 lb) | 620 g (1.37 lb) |
| Distance-to-fault measurement | | | |
| Display | | R&S®FSH-B1 option only with R&S®FSH models .13/.23/.26 and R&S®FSH-Z2/-Z3 VSWR bridges | |
| Maximum resolution, distance to fault | maximum zoom | 301 pixel cable length/1023 pixel | |
| Display range | | | |
| Return loss | | 10, 5, 2, 1, 0.1 dB/DIV, linear | |
| VSWR | | 1 to 2 and 1 to 6, 1 to 10, 1 to 20 with R&S®FSH-K2 option in addition 1 to 1.2 und 1 to 1.5 | |
| Reflection factor (ρ) | | 0 to 1, 0 to 0.1, 0 to 0.01, 0 to 0.001 | |
| milliRHO (mp) | | 0 to 1000, 0 to 100, 0 to 10, 0 to 1 | |
| Cable length | depending on cable loss | 3 m to max. 1000 m | |
| Maximum permissible spurious signal | | 1 dB compression point of 1st mixer typ. +10 dBm IF overload at reference level typ. +8 dB | |

⁶⁾ As of serial no. 100500.

| | | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|--|-------------------------------------|--|-----------------|---|
| Transmission measurements (only with R&S®FSH3 models .13, .23 and R&S®FSH6 model .26) | | | | |
| Frequency range | | 5 MHz to 3 GHz | 5 MHz to 6 GHz | – |
| Dynamic range | | | | – |
| 10 MHz to 2.2 GHz | scalar mode | typ. 60 dB | typ. 80 dB | |
| | vector mode, with R&S®FSH-K2 option | typ. 80 dB | typ. 90 dB | |
| 2.2 GHz to 3 GHz | scalar mode | typ. 50 dB | typ. 70 dB | |
| | vector mode, with R&S®FSH-K2 option | typ. 65 dB | typ. 85 dB | |
| 3 GHz to 5 GHz | scalar mode | – | typ. 40 dB | |
| | vector mode, with R&S®FSH-K2 option | – | typ. 55 dB | |
| 5 GHz to 6 GHz | scalar mode | – | typ. 35 dB | |
| | vector mode, with R&S®FSH-K2 option | – | typ. 50 dB | |
| Reflection measurements (only with R&S®FSH3 models .13, or .23, R&S®FSH6 model .26, and R&S®FSH-Z2) | | | | |
| Frequency range | | 10 MHz to 3 GHz | 10 MHz to 6 GHz | – |
| Display range of return loss | | 10, 20, 50, 100 dB, selectable | | – |
| VSWR display range | | 1 to 2, 1 to 6, 1 to 10, 1 to 20, selectable with R&S®FSH-K2 option also 1 to 1.2 and 1 to 1.5 | | – |
| Reflection factor (ρ) display range | | 0 to 1, 0 to 0.1, 0 to 0.01, 0 to 0.001 | | – |
| milliRHO (mp) display range | | 0 to 1000, 0 to 100, 0 to 10, 0 to 1 | | |
| Measurement uncertainty | | see diagrams | | |
| Smith chart | only with R&S®FSH-K2 option | | | – |
| Marker format: | | | | |
| Reflection | | dB mag and phase, lin mag and phase, real and imag | | – |
| Impedance | | $R+jX, (R+jX)/Z_0$ | | |
| Admittance | | $G+jB, (G+jB)/Z_0$ | | |
| Reference impedance Z_0 | | 10 m Ω to 10 k Ω | | – |
| Zoom function | | expansion factor 2, 4, 8 | | – |
| | | | | |
| | | <p>Measurement uncertainty with vector measurements (R&S®FSH-K2 option)</p> | | <p>Measurement uncertainty with scalar measurements</p> |

| | | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|--|---|--|-----------------|-----------|
| Phase measurements (transmission, reflection) (only with R&S®FSH3 models .13, or .23, R&S®FSH6 model .26, and R&S®FSH-K2) | | | | |
| Frequency range | with R&S®FSH-Z2/-Z3 | 10 MHz to 3 GHz | 10 MHz to 6 GHz | – |
| Reflection | | 5 MHz to 3 GHz | 5 MHz to 6 GHz | – |
| Transmission | | | | – |
| Display range | | ± 180° (wrap) 0° to 54360° (unwrap) | | – |
| Group delay measurements (only with R&S®FSH3 models .13 or .23, R&S®FSH6 model .26, and R&S®FSH-K2) | | | | |
| Frequency range | with R&S®FSH-Z2/-Z3 | 10 MHz to 3 GHz | 10 MHz to 6 GHz | – |
| Reflection | | 5 MHz to 3 GHz | 5 MHz to 6 GHz | – |
| Transmission | | | | – |
| Aperture increments | | 1 to 300 | | – |
| Display range | | 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1000 ns, selectable | | – |
| 3GPP FDD code domain power BTS/Node B measurement (only with R&S®FSH-K4 1300.7633.02 and R&S®FSH3 model .23)⁷⁾ | | | | |
| Frequency range | | 10 MHz to 3 GHz | – | – |
| Carrier frequency uncertainty | | (test case 6.3 in line with 3GPP 25.141) | – | – |
| Measurement range | | ±1 kHz | – | – |
| Measurement uncertainty | SNR > 30 dB | < 50 Hz + $\Delta f_{ref}^{(8)}$ ($\sigma = 20$ Hz) | – | – |
| Total power | SNR > 30 dB | (test case 6.2.1 in line with 3GPP 25.141) | – | – |
| Measurement range | frequency > 1 MHz +20 °C to +30 °C | –60 dBm < P_{total} < 20 dBm | – | – |
| Measurement uncertainty | $-40 \text{ dBm} < P_{total} < 20 \text{ dBm}$ $P_{REF_LEV} - 30 \text{ dB} < P_{total}$ $< P_{REF_LEV} + 3 \text{ dB}$ | ±1.5 dB, typ. 0.5 dB | – | – |
| CPICH power | SNR > 30 dB | (test case 6.2.2 in line with 3GPP 25.141) | – | – |
| Measurement range | $-40 \text{ dBm} < P_{total} < 20 \text{ dBm}$ | $P_{total} - 20 \text{ dB} < P_{CPICH} < P_{total}$ | – | – |
| Measurement uncertainty | $-P_{total} - 20 \text{ dBm} < P_{CPICH} < P_{total}$ | ±1.5 dB, typ. 0.5 dB | – | – |
| P-CCPCH power | SNR > 30 dB | | – | – |
| Measurement range | $-40 \text{ dBm} < P_{total} < 20 \text{ dBm}$ | $P_{total} - 40 \text{ dB} < P_{PCCPCH} < P_{total}$ | – | – |
| Measurement uncertainty | $P_{total} - 20 \text{ dBm} < P_{PCCPCH} < P_{total}$ | ±1.5 dB, typ. 0.5 dB | – | – |
| PSCH/SSCH power | SNR > 30 dB | | – | – |
| Measurement range | $-40 \text{ dBm} < P_{total} < 20 \text{ dBm}$ | $P_{total} - 30 \text{ dB} < P_{SCH} < P_{total}$ | – | – |
| Measurement uncertainty | $P_{total} - 20 \text{ dBm} < P_{PSCH} < P_{total}$ | ±2.5 dB, typ. 1.5 dB | – | – |
| Symbol EVM | | | | |
| Measurement range | | 3% < EVM_{symbol} < 25% | – | – |
| Measurement uncertainty | 3% < EVM_{symbol} < 10% | typ. ±2.5% | – | – |
| | 10% < EVM_{symbol} < 20% | typ. ±3% | – | – |
| Residual EVM _{symbol} | | typ. 3% | – | – |
| 3GPP FDD scrambling code detection | | | | |
| Frequency range | ±1 kHz | 10 MHz to 30 MHz | – | – |
| Single scrambling code detection | | | | |
| Calculation time | | 24 s | – | – |
| CPICH E_c/I_0 | | > –18 dB ⁹⁾ | – | – |
| Multiple scrambling code detection | | | | |
| Max. number of scrambling codes | | 8 | – | – |
| Calculation time | | 57 s | – | – |
| CPICH E_c/I_0 | | > –21 dB ⁹⁾ | – | – |
| CPICH power measurement uncertainty | $-40 \text{ dBm} < P_{total} < 20 \text{ dBm}$ | ±2,5 dB | – | – |

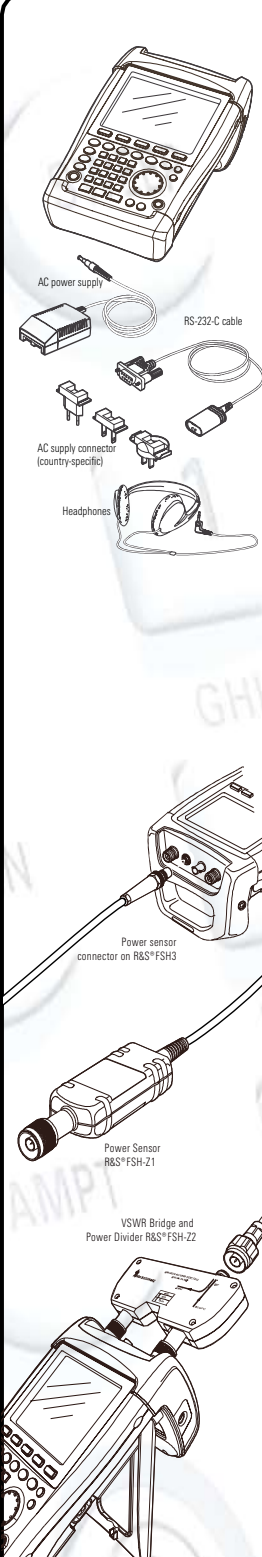
⁷⁾ As of serial no. 103500.

⁸⁾ Δf_{ref} = uncertainty of reference frequency.

⁹⁾ Probability of detection >50% with test model 1.16 in line with 3GPP TS 25.141 test specifications.

| | R&S®FSH3 | R&S®FSH6 | R&S®FSH18 |
|---|--|----------|-----------|
| General data | | | |
| Display | transflective 14 cm (5.7") LC color display | | |
| Resolution | 320 × 240 pixel | | |
| Memory Settings and traces | CMOS RAM up to 256 | | |
| Environmental conditions | | | |
| Temperature | | | |
| Operating temperature range R&S®FSH powered from internal battery R&S®FSH powered from AC power supply | 0 °C to +50 °C 0 °C to +40 °C | | |
| Storage temperature range | -20 °C to +60 °C | | |
| Battery charging mode | 0 °C to +40 °C | | |
| Climatic conditions | | | |
| Relative humidity | 95 % at +40 °C (IEC 60068) | | |
| IP class of protection | 51 | | |
| Mechanical resistance | | | |
| Vibration, sinusoidal | in line with EN 60068-2-1, EN 61010-1 5 Hz to 55 Hz: max 2 g, 55 Hz to 150 Hz: 0.5 g constant, 12 minutes per axis | | |
| Vibration, random | in line with EN 60068-2-64, 10 Hz to 500 Hz, 1.9 g, 30 minutes per axis | | |
| Shock | in line with EN 60068-2-27, 40 g shock spectrum | | |
| RFI suppression | in line with EMC directive of EU (89/336/EEC) and German EMC legislation | | |
| Immunity to radiated interference Level display at 10 V/m (reference level ≤-10 dBm) Input frequency IF Other frequencies | 10 V/m <-75 dBm (nominal) <-85 dBm (nominal) < displayed noise level | | |
| Power supply | | | |
| AC supply | plug-in AC power supply (R&S®FSH-Z33) 100 V AC to 240 V AC, 50 Hz to 60 Hz, 400 mA | | |
| External DC voltage | 15 V to 20 V | | |
| Internal battery | NiMH battery, type Fluke BP190 (R&S®FSH-Z32) | | |
| Battery voltage | 6 V to 9 V | | |
| Operating time with fullycharged battery | typ. 4 h with tracking generator off, typ. 3 h with tracking generator on | | typ. 3 h |
| Power consumption | typ. 7 W | | |
| Safety | in line with EN 61010-1:2001 (ed.2) EN 61010-1:2001 (second edition) CAN C22.2 No. 61010-1-04 UL 61010-1 No. 1010-1 (second edition) in line with EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1 | | |
| Test mark | VDE, GS, CSA, CSA-NRTL | | |
| Dimensions (W × H × D) | 170 mm × 120 mm × 270 mm 6.69 in × 4.72 in × 10.63 in | | |
| Weight | 2.5 kg 5.51 lb | | |

Accessories and ordering information

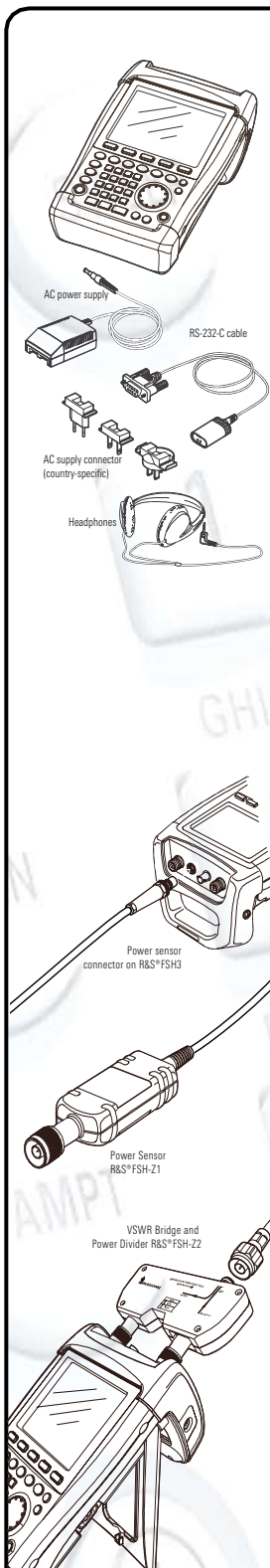


The image shows various accessories for the R&S FSH handheld spectrum analyzer. At the top left is the handheld device. Below it are: an AC power supply with a cable, an RS-232-C cable, an AC supply connector (country-specific), and headphones. In the middle left, a power sensor connector is shown attached to the device. Below that is a Power Sensor R&S FSH-Z1. At the bottom left, a VSWR Bridge and Power Divider R&S FSH-Z2 is shown connected to the device.

| Ordering information | | |
|--|---------------------------|--------------|
| Designation | Type | Order No. |
| Handheld Spectrum Analyzer, 100 kHz to 3 GHz, with preamplifier | R&S®FSH3 | 1145.5850.03 |
| Handheld Spectrum Analyzer, 100 kHz to 3 GHz, with tracking generator | R&S®FSH3 | 1145.5850.13 |
| Handheld Spectrum Analyzer, 100 kHz to 3 GHz, with tracking generator and preamplifier | R&S®FSH3 | 1145.5850.23 |
| Handheld Spectrum Analyzer, 100 kHz to 6 GHz, with preamplifier | R&S®FSH6 | 1145.5850.06 |
| Handheld Spectrum Analyzer, 100 kHz to 6 GHz, with tracking generator and preamplifier | R&S®FSH6 | 1145.5850.26 |
| Handheld Spectrum Analyzer, 10 MHz to 18 GHz | R&S®FSH18 | 1145.5850.18 |
| Accessories supplied External power supply, battery pack (built-in), USB optical cable, headphones, Quick Start manual, CD-ROM with R&S®FSHView Control Software and documentation | | |
| Options | | |
| Designation | Type | Order No. |
| Distance-to-Fault Measurement (includes 1 m cable, R&S®FSH-Z2 required) | R&S®FSH-B1 | 1145.5750.02 |
| Remote Control via RS-232-C | R&S®FSH-K1 | 1157.3458.02 |
| Vector Transmission and Reflection Measurements | R&S®FSH-K2 | 1157.3387.02 |
| Receiver Mode | R&S®FSH-K3 | 1157.3429.02 |
| 3GPP FDD Code Domain Power BTS/Node B Measurement for R&S®FSH3 model .23 | R&S®FSH-K4 ¹⁰⁾ | 1300.7633.02 |

¹⁰⁾ For R&S®FSH3 model .23 only, as of serial no. 103500.

Accessories and ordering information



| Optional accessories | | | |
|---|-------------|--------------|--|
| Designation | Type | Order No. | |
| Power Sensor, 10 MHz to 8 GHz | R&S®FSH-Z1 | 1155.4505.02 | |
| VSWR Bridge and Power Divider, 10 MHz to 3 GHz (incl. open, short, 50 Ω load R&S®FSH-Z29) | R&S®FSH-Z2 | 1145.5767.02 | |
| VSWR Bridge with DC Bias and Bypass Connector for the R&S®FSH, 10 MHz to 6 GHz (incl. open, short, 50 Ω load R&S®FSH-Z28) | R&S®FSH-Z3 | 1300.7756.02 | |
| Directional Power Sensor, 25 MHz to 1 GHz | R&S®FSH-Z14 | 1120.6001.02 | |
| Power Sensor, 10 MHz to 18 GHz | R&S®FSH-Z18 | 1165.1909.02 | |
| Directional Power Sensor, 200 MHz to 4 GHz | R&S®FSH-Z44 | 1165.2305.02 | |
| Matching Pad 50/75 Ω, 0 Hz to 2700 MHz | R&S®RAZ | 0358.5714.02 | |
| Spare RF Cable (1 m), N male/N female connectors for R&S®FSH-B1 | R&S®FSH-Z20 | 1145.5867.02 | |
| 12 V Car Adapter | R&S®FSH-Z21 | 1300.7579.02 | |
| Serial/Parallel Converter | R&S®FSH-Z22 | 1145.5880.02 | |
| Carrying Bag | R&S®FSH-Z25 | 1145.5896.02 | |
| Transit Case | R&S®FSH-Z26 | 1300.7627.02 | |
| Combined Short/Open and 50 Ω Load for VSWR and DTF calibration, DC to 6 GHz | R&S®FSH-Z28 | 1300.7804.02 | |
| Combined Short/Open and 50 Ω Load for VSWR and DTF calibration, DC to 3 GHz | R&S®FSH-Z29 | 1300.7504.02 | |
| Spare Short/Open for R&S®FSH-Z22 for VSWR calibration DC to 3 GHz | R&S®FSH-Z30 | 1145.5773.02 | |
| Spare 50 Ω Load for R&S®FSH-Z22 for VSWR and DTF calibration DC to 3 GHz | R&S®FSH-Z31 | 1145.5780.02 | |
| Spare AC Power Supply | R&S®FSH-Z33 | 1145.5809.02 | |
| RS-232-C Optical Cable | R&S®FSH-Z34 | 1145.5815.02 | |
| Spare CD-ROM with R&S®FSHView Control Software and documentation | R&S®FSH-Z35 | 1145.5821.02 | |
| Spare Headphones | R&S®FSH-Z36 | 1145.5838.02 | |
| USB Optical Cable, 1.5 m | R&S®FSH-Z37 | 1300.7733.02 | |
| 75 Ω Matching Pad, N to BNC female | R&S®FSH-Z38 | 1300.7740.02 | |
| Active Directional Antenna | R&S®HE200 | 4050.3509.02 | |
| Isotropic Antenna, 30 MHz to 3 GHz for R&S®FSH3 | R&S®TS-EMF | 1158.9295.13 | |
| Near-Field Probe Set | R&S®HZ-15 | 1147.2736.02 | |
| Pre-amplifier for R&S®HZ-15 | R&S®HZ-16 | 1147.2720.02 | |



More information at
www.fsh.rohde-schwarz.com



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