Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as Spectrum Analyzers, Signal Generators, Oscilloscopes, Power Meters, Network Analyzers etc from all the major suppliers such as Keysight, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. We fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 1 year warranty. Our staff have extensive backgrounds in T&M which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, presenting flexible technical + commercial solutions and supplying a loan unit during warranty repair, if available.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based in at Oakley, Bedfordshire in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our 40GHz in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

Test Equipment Solutions Ltd
Unit 3 Highfield Court
Highfield Road
Oakley
Bedfordshire
MK43 7TA

Telephone: 01183 800 800

Email: info@TestEquipmentHQ.com
Web: www.TestEquipmentHQ.com

R&S® FSH
Handheld Spectrum Analyzer

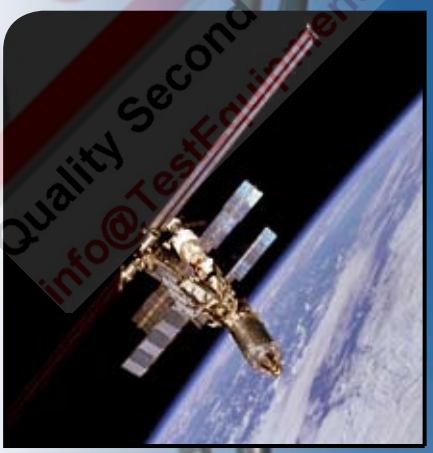
R&S® FSH3 100 kHz to 3 GHz
R&S® FSH6 100 kHz to 6 GHz
R&S® FSH18 10 MHz to 18 GHz

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.

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 up to 8 GHz/18 GHz	Directional power measurements up to 1 GHz/4 GHz	Measurements on cables (distance-to-fault)	Scalar transmission measurements	Vector transmission measurements	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.

[2] R&S®FSH-K2 required.

■ R&S®FSH standard function

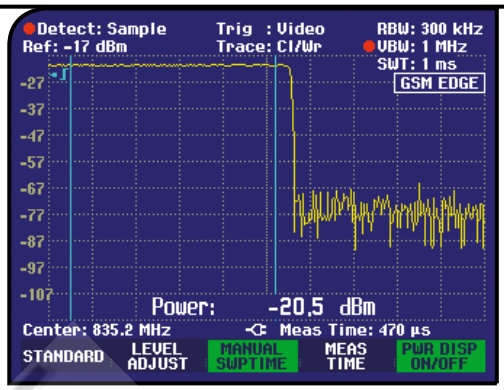
– Not available

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

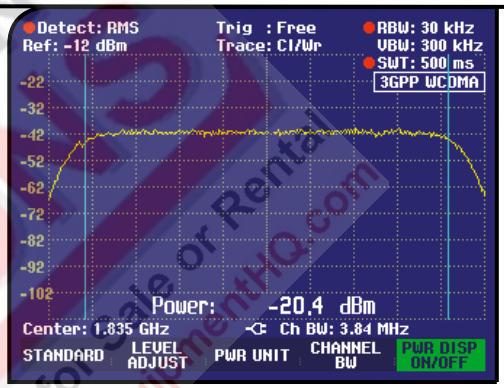
By means of the TDMA POWER function, the R&S®FSH performs time-domain power measurements within a timeslot of TDMA (time division multiple access) methods. All the settings required for the GSM and EDGE standards are predefined on the R&S®FSH to make these measurements easier for the user. In addition, 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/m^2 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)

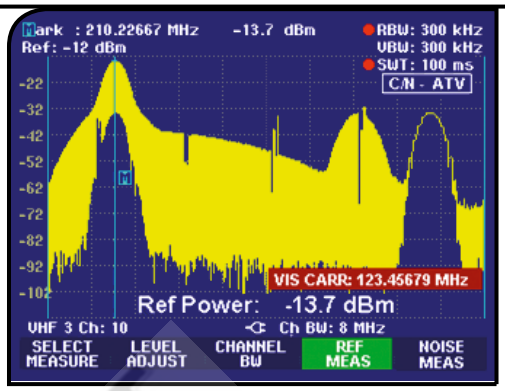
Field-strength measurements with isotropic antenna

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)

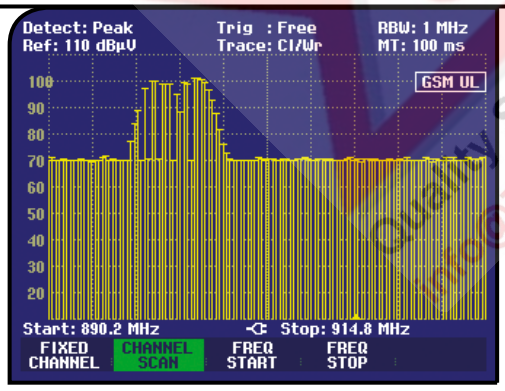
C/N measurements

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

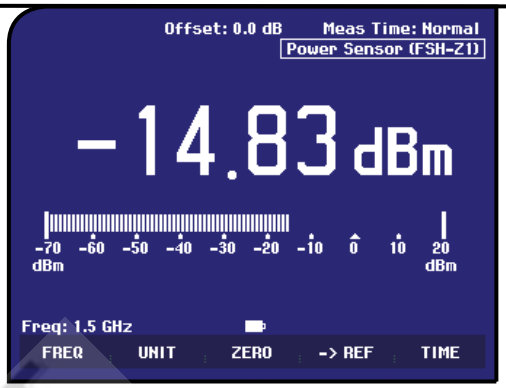


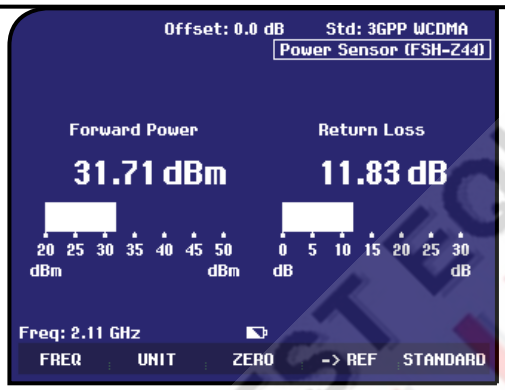
Receiver mode

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.

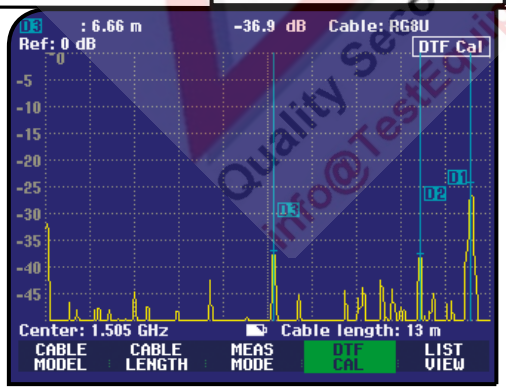




R&S®FSH with R&S®FSH-Z44 directional power sensor

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.



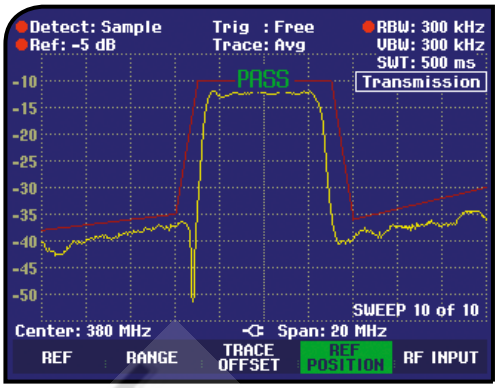
Measurements on cables (distance to fault)

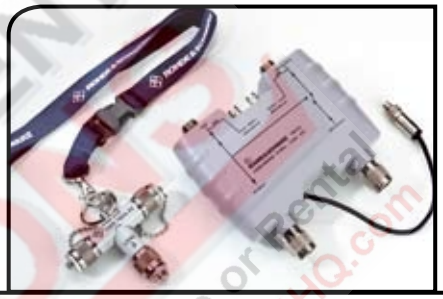
The R&S®FSH-B1 option allows the distance to any faults in an RF cable to be determined rapidly and accurately. Distance-to-fault measurements using the R&S®FSH-Z2/-Z3 VSWR bridge provide an immediate overview of the state of the device under test (return loss and distance, see figure). The marker-zoom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





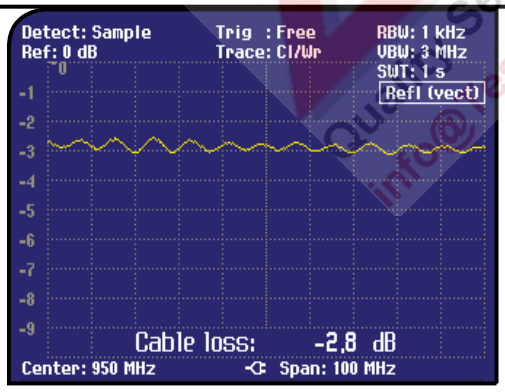
R&S®FSH-Z3 VSWR bridge

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

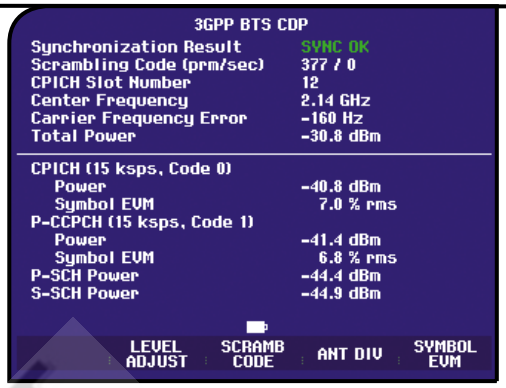
The R&S®FSH with tracking generator and VSWR bridge can determine the cable loss of previously installed long cables without much effort. One end of the cable is connected to the VSWR bridge, and the other end is terminated with a short circuit or simply left open. The calculated cable loss represents 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 option[1)] 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).



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, 1 kHz 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	typ. 66 dB (typ. +13 dBm third-order intercept, TOI)		typ. 54 dBc (typ. +7 dBm TOI)
	at signal offset ≤2 MHz	60 dB (nominal, +10 dBm TOI)		50 dB (nominal,+5 dBm TOI)
	at signal offset >2 MHz	66 dB (nominal, typ. +13 dBm TOI)		50 dB (nominal, +5 dBm TOI)
Displayed average noise level	resolution bandwidth			
10 MHz to 50 MHz	1 kHz,	<–105 dBm, typ. –114 dBm	<–105 dBm, typ. –112 dBm	<–90 dBm, typ. –98 dBm
50 MHz to 3 GHz	video bandwidth 10 Hz,	<–105 dBm, typ. –114 dBm	<–105 dBm, typ. –112 dBm	<–110 dBm, typ. –118 dBm
3 GHz to 5 GHz	reference level ≤–30 dBm	–	<–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,			
Up to 3 GHz	carrier offset >1 MHz	–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 =	for signal frequencies			
signal frequency – 3.9 GHz	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 3 GHz to 6 GHz	<1.5 (nominal) –	<1.5 (nominal) <1.5 (nominal)	<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 Open-circuit voltage		100 Ω 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)		

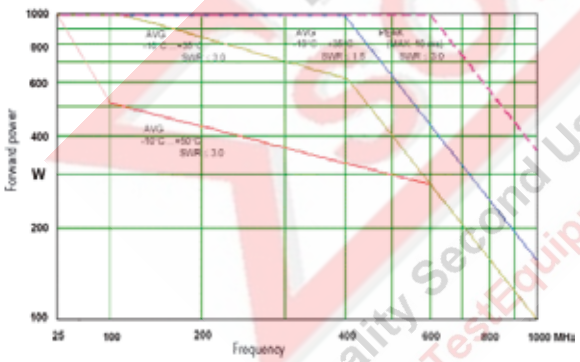
[3] *As of serial no. 100500.*

[4] *As of serial no. 102314.*

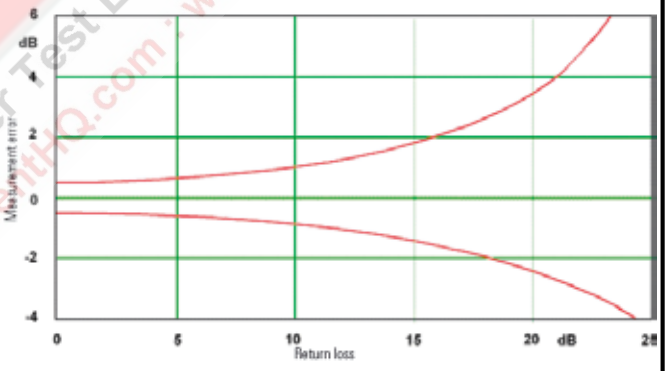
[5] *Standard accessory: optical USB cable.*

		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 peak power (<10 µs, 1 % duty cycle)	400 mW (+26 dBm) 1 W (+30 dBm)		
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 0 °C to +50 °C	<2.5 % (0.11 dB) <4.5 % (0.19 dB)		
8 GHz to 18 GHz	+15 °C to +35 °C 0 °C to +50 °C	<3.5 % (0.15 dB) <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		30 mW to 300 W		
Modulated signals	CF: ratio of peak envelope power to average power	30 mW to 300 W/CF		
Measurement uncertainty	sine signal, +18 °C to +28 °C, no zero offset			
25 MHz to 40 MHz		4.0 % (0.17 dB) of measured value		
40 MHz to 1 GHz		3.2 % (0.14 dB) of measured value		
Zero offset	after zeroing	±4 mW		
Range of typical measurement error with modulation	if standard is selected on the R&S®FSH			
FM, PM, FSK, GMSK		0 % of measured value (0 dB)		
AM (80 %)		±3 % of measured value (±0.13 dB)		
two equal-power CW carriers		±2 % of measured value (±0.09 dB)		
EDGE, TETRA		±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

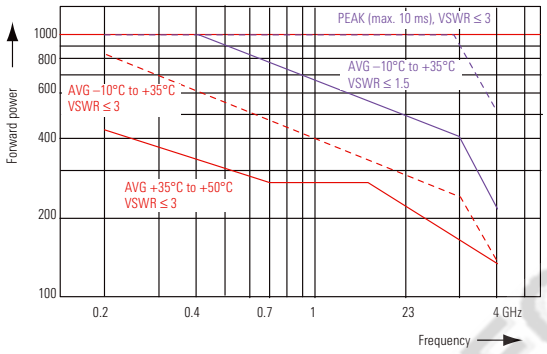


Limits of measurement uncertainty for matching measurements

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 3 GHz to 4 GHz		 <1.07 <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 1.5 GHz to 4 GHz		 <0.06 dB <0.09 dB		
Directivity 200 MHz to 3 GHz 3 GHz to 4 GHz		 >30 dB >26 dB		
Signal weighting		average power		
Measurement uncertainty 200 MHz to 300 MHz 300 MHz to 4 GHz	sine signals, +18 °C to +28 °C, no zero offset	 4 % of measured value (0.17 dB) 3.2 % of measured value (0.14 dB)		
Zero offset	after zeroing	±4 mW		
Range of typical measurement error with modulation FM, PM, FSK, GMSK AM (80 %) cdmaOne, DAB 3GPP WCDMA, CDMA2000® 1x DVB-T π/4-DQPSK	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 300 MHz to 4 GHz		 0.40 %/K (0.017 dB/K) 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 200 kHz 4 MHz		 4 W to 300 W 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 Burst width ≥ 0.5 µs Burst width ≥ 0.2 µs	video bandwidth 4 kHz 200 kHz 4 MHz	 ±(3 % of measured value + 0.05 W) at burst width ≥100 µs ±(3 % of measured value + 0.20 W) at burst width ≥4 µs ±(7 % of measured value + 0.40 W) at burst width ≥1 µs in addition ±(1.6 % of measured value + 0.15 W) in addition ±0.10 W in addition ±5 % of measured value 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 300 MHz to 4 GHz		 0.50 %/K (0.022 dB/K) 0.35 %/K (0.015 dB/K)		

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



Power-handling capacity

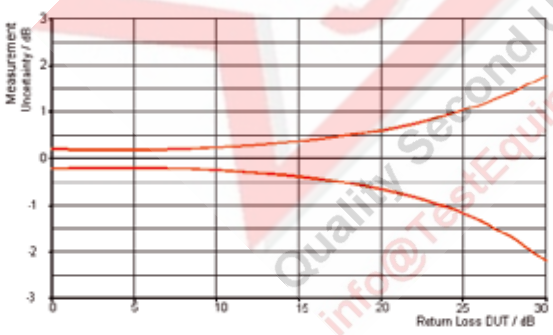
Limits of measurement uncertainty for matching measurements

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)

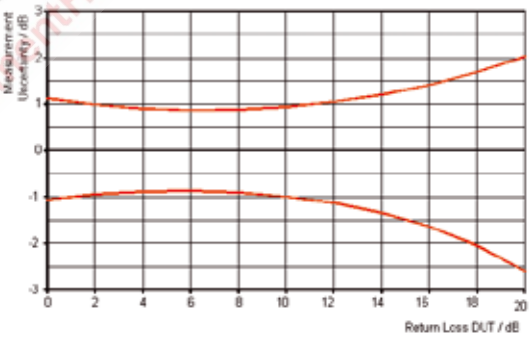
		R&S®FSH-Z2	R&S®FSH-Z3
R&S®FSH-Z2/R&S®FSH-Z3 VSWR bridge			
Frequency range		10 MHz to 3 GHz	10 MHz to 6 GHz
Impedance		50 Ω	
VSWR bridge			
Directivity			
10 MHz to 30 MHz		typ. 30 dB	typ. 16 dB
30 MHz to 1 GHz		typ. 30 dB	>20 dB, typ. 28 dB
1 GHz to 3 GHz		typ. 25 dB	>20 dB, typ. 28 dB
3 GHz to 6 GHz		–	>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		**R&S®FSH-Z29/-Z30/-Z31**	**R&S®FSH-Z28**
Short/open		N male	
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	**R&S®FSH-B1 option only with R&S®FSH models .13/.23/.26 and R&S®FSH-Z2/-Z3 VSWR bridges**		
Display		301 pixel	
Maximum resolution, distance to fault	maximum zoom	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 (mρ)		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 (mρ) 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 mΩ to 10 kΩ		–
Zoom function		expansion factor 2, 4, 8		–



Measurement uncertainty with vector measurements (R&S®FSH-K2 option)



Measurement uncertainty with scalar measurements

		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 Reflection Transmission	with R&S®FSH-Z2/-Z3	 10 MHz to 3 GHz 5 MHz to 3 GHz	 10 MHz to 6 GHz 5 MHz to 6 GHz	 – –
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 Reflection Transmission	with R&S®FSH-Z2/-Z3	 10 MHz to 3 GHz 5 MHz to 3 GHz	 10 MHz to 6 GHz 5 MHz to 6 GHz	 – –
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 + Δf_{ref}[8] (σ = 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 dBm < P_{total} < 20 dBm P_{REF_LEV} – 30 dB < P_{total} < P_{REF_LEV} + 3 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 dBm < P_{total} < 20 dBm	P_{total} – 20 dB < P_{CPICH} < P_{total}	–	–
Measurement uncertainty	– P_{total} –20 dBm < P_{CPICH} < P_{total}	±1.5 dB, typ. 0.5 dB	–	–
P-CCPCH power	SNR > 30 dB			
Measurement range	–40 dBm < P_{total} < 20 dBm	P_{total} – 40 dB < P_{PCCPCH} < P_{total}	–	–
Measurement uncertainty	P_{total} –20 dBm < P_{PCCPCH} < P_{total}	±1.5 dB, typ. 0.5 dB	–	–
PSCH/SSCH power	SNR > 30 dB		–	–
Measurement range	–40 dBm < P_{total} < 20 dBm	P_{total} – 30 dB < P_{SCH} < P_{total}	–	–
Measurement uncertainty	P_{total} –20 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 dBm < P_{total} < 20 dBm	±2,5 dB	–	–

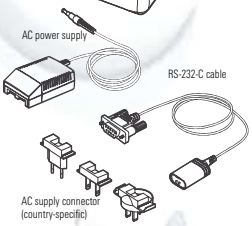
[7] *As of serial no. 103500.*

[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



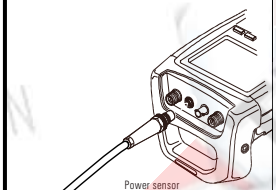
Ordering information

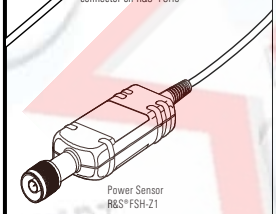
Designation	Type	Order No.
Handheld Spectrum Analyzer, 100 kHz to 3 GHz, with preamplifier	R&S®FSH3	1145.5850.03
Handheld Spectrum Analyzer, 100 kHz to 3 GHz, with tracking generator	R&S®FSH3	1145.5850.13
Handheld Spectrum Analyzer, 100 kHz to 3 GHz, with tracking generator and preamplifier	R&S®FSH3	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

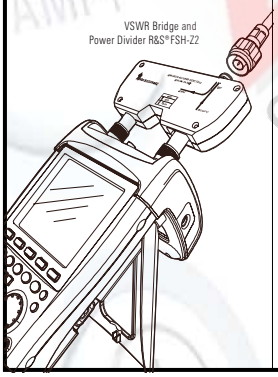
Accessories supplied
External power supply, battery pack (built-in), USB optical cable, headphones, Quick Start manual, CD-ROM with R&S®FSHView Control Software and documentation

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

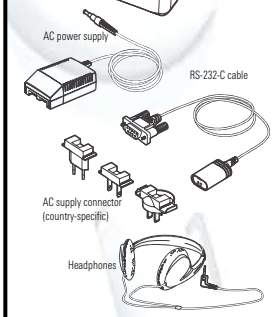


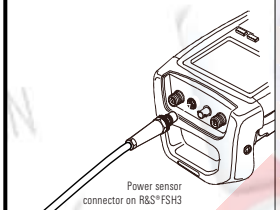


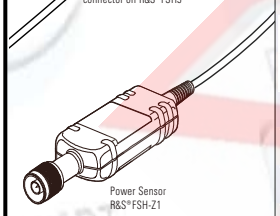


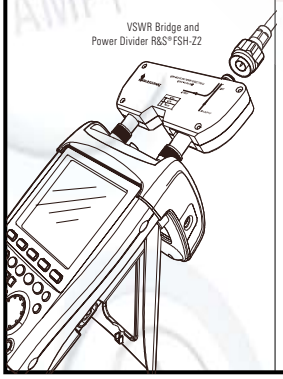
[10)] *For R&S®FSH3 model .23 only, as of serial no. 103500.*

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-Z2 for VSWR calibration DC to 3 GHz	R&S®FSH-Z30	1145.5773.02
Spare 50 Ω Load for R&S®FSH-Z2 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
Preamplifier for R&S®HZ-15	R&S®HZ-16	1147.2720.02

Certified Quality System
ISO 9001
DQS REG. NO 1954 QM

Certified Environmental System
ISO 14001
DQS REG. NO 1954 UM

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

ROHDE&SCHWARZ

www.rohde-schwarz.com
Europe: +49 1805 12 4242, customersupport@rohde-schwarz.com
USA and Canada: +1-888-837-8772, customer.support@rsa.rohde-schwarz.com
Asia: +65 65 130 488, customersupport.asia@rohde-schwarz.com

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