

Specifications

Specifications are valid 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.

Specification	Condition	R&S® FSH3	R&S® FSH6
Frequency			
Frequency range		100 kHz to 3 GHz	100 kHz to 6 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	
Frequency span		0 Hz, 100 Hz to 3 GHz	0 Hz, 100 Hz to 6 GHz
Spectral purity			
SSB phase noise	f = 500 MHz, 20 °C to 30 °C		
30 kHz from carrier		<85 dBc (1 Hz)	
100 kHz from carrier		<100 dBc (1 Hz)	
1 MHz from carrier		<120 dBc (1 Hz)	
Sweep time	span = 0 Hz span > 0 Hz	1 ms to 100 s 20 ms to 1000 s, min. 20 ms/600 MHz	
Bandwidths			
Resolution bandwidths (-3 dB)	1145.5850.13	1, 3, 10, 30, 100, 200, 300 kHz, 1 MHz	
	1145.5850.03, .23, 1145.5850.06, .26	in addition 100 Hz, 300 Hz	
Tolerance	≤300 kHz 1 MHz	±5 %, nominal ±10 %, nominal	
Resolution bandwidths (-6 dB)	with option R&S FSH-K3 installed	in addition 200 Hz, 9 kHz, 120 kHz	
Video bandwidths		10 Hz to 1 MHz in 1, 3 steps	
Amplitude			
Display range		average noise level displayed to +20 dBm	
Maximum permissible DC voltage at RF input		50 V/ 80 V ¹⁾	
Maximum power		20 dBm, 30 dBm (1 W) for max. 3 minutes	
Intermodulation-free dynamic range	third-order IM products, 2 x -20 dBm, reference level = -10 dBm	typ. 66 dB (+13 dBm third-order intercept)	

¹ 80 V valid as of serial number 100900 (model 1145.5850.03) or 101600 (model 1145.5850.13); models 1145.5850.23, 1145.5850.06 and .26 all serial numbers.

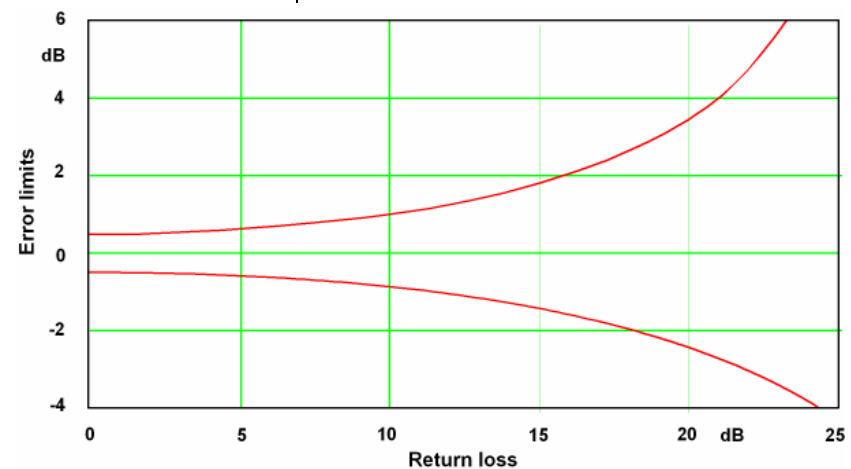
Specification	Condition	R&S® FSH3	R&S® FSH6
Displayed average noise level	resolution bandwidth 1 kHz, video bandwidth 10 Hz, reference level \leq -30 dBm		
10 MHz to 3 GHz		<-105 dBm, typ. -114 dBm	<-105 dBm, typ. -112 dBm
3 GHz to 5 GHz			<-103 dBm, typ. -108 dBm
5 GHz to 6 GHz			<-96 dBm, typ. -102 dBm
With preamplifier	only models		
10 MHz to 2.5 GHz	1145.5850.03 ²), 1145.5850.23, 1145.5850.06 and 1145.5850.26	<-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 \leq -20 dBm, f > 30 MHz, RBW \leq 100 kHz	<-80 dBm	<-80 dBm
Input related spurious	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)
Signal frequency minus 2.0156 GHz for signal frequencies 2 GHz to 3.2 GHz		typ. <-55 dBc	typ. <-55 dBc
2nd harmonic	mixer level -40 dBm	typ. <-60 dBc	typ. <-60 dBc
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		dBm, dB μ V, dBmV	
Logarithmic		with transducer also dB μ V/m and dB μ A/m	
Linear		μ V, mV, V, nW, μ W, mW, W	
		with transducer also V/m, mV/m and μ V/m	
Traces		1 trace and 1 memory trace	
Detectors		auto peak, maximum peak, minimum peak, sample, RMS	
	with option R&S FSH-K3 installed	in addition average and quasi-peak	
Level measurement error	frequency > 1 MHz, at reference level down to - 50 dB, 20 °C to 30 °C	<1.5 dB, typ. 0.5 dB	

² As of serial number 100900 and firmware version 6.0 or higher.

Specification	Condition	R&S® FSH3	R&S® FSH6
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			
Audio demodulation		free-running, video, external AM (video voltage without AGC) and FM	
Inputs			
RF input		N female	
Input impedance		50 Ω	
VSWR	10 MHz to 3 GHz	typ. 1.5	typ. 1.5
	10 MHz to 6 GHz		
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 145.5850.13, 1145.5850.23 and 1145.5850.26		
Frequency range		5 MHz to 3 GHz	5 MHz to 6 GHz
Output level	model 1145.5850.13 model 1145.5850.23	-20 dBm (nominal) 0 dBm/-20 dBm, selectable	
	model 1145.5850.26 f < 3 GHz f > 3 GHz		-10 dBm (nominal) -20 dBm (nominal)
Output impedance		50 Ω, nominal	
Interfaces			
RS-232-C optical interface			
Baud rate		1200, 2400, 9600, 19200, 38400, 57600, 115200 baud	
Power sensor		7-contact female connector (type Binder 712)	

Accessories		
Power Sensors R&S® FSH-Z1 and R&S® FSH-Z18		
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 (<10 μ s, 1% duty cycle)	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 dB
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	<2.3 % (0.10 dB) <4.2 % (0.18 dB)
8 GHz to 18 GHz	15 °C to 35 °C 0 °C to 50 °C	<3.5 % (0.15 dB) <5.0 % (0.21 dB)
Zero offset after zeroing		<110 pW
Dimensions		48 mm x 31 mm x 170 mm, connecting cable 1.5 m
Weight		<0.3 kg
Directional Power Sensor R&S® FSH-Z14		
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 below)	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 % of measured value (0.17 dB)
40 MHz to 1 GHz		3.2 % of measured value (0.14 dB)
Zero offset	after zeroing	\pm 4 mW

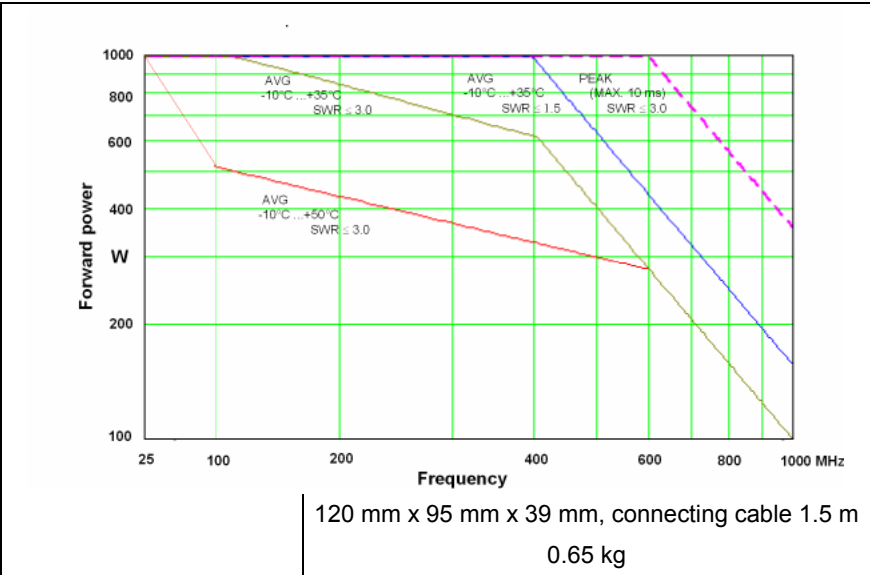
<p>Range of typical measurement error with modulation FM, PM, FSK, GMSK AM (80 %) 2 CW carriers with identical power EDGE, TETRA Temperature coefficient 25 MHz to 40 MHz 40 MHz to 1 GHz</p>	<p>*) if standard is selected on the R&S® FSH</p>	<p>0 % of measured value (0 dB) ±3 % of measured value (±0.13 dB) ±2 % of measured value (±0.09 dB) ±0.5 % of measured value (±0.02 dB) *) 0.40 %/K (0.017 dB/K) 0.25 %/K (0.011 dB/K)</p>
Peak envelope power		
<p>Power measurement range Video bandwidth 4 kHz 200 kHz 600 kHz Measurement uncertainty Error limits 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 Temperature coefficient 25 MHz to 40 MHz 40 MHz to 1 GHz</p>	<p>18 °C to 28 °C video bandwidth 4 kHz 200 kHz 600 kHz</p>	<p>0.4 W to 300 W 1 W to 300 W 2 W to 300 W same as for average power plus effect of peak hold circuit ±(3 % of measured value + 0.05 W) starting from a burst width of 200 µs ±(3 % of measured value + 0.20 W) starting from a burst width of 4 µs ±(7 % of measured value + 0.40 W) starting from a burst width of 2 µs plus ±(1.6 % of measured value + 0.15 W) plus ±0.10 W 0.50 %/K (0.022 dB/K) 0.35 %/K (0.015 dB/K)</p>
Load matching		
<p>Matching measurement range Return loss VSWR Minimum forward power Error limits for matching measurements</p>	<p>specs met from 0.4 W</p>	<p>0 dB to 23 dB >1.15 0.06 W</p>



Power-handling capacity

Dimensions

Weight



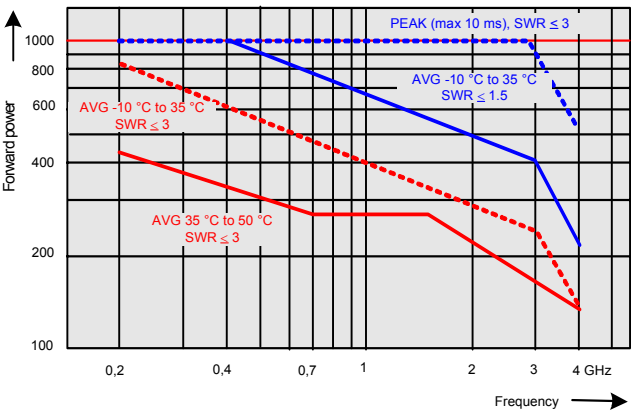
Directional Power Sensor R&S® FSH-Z44		
Frequency range		200 MHz to 4 GHz
Power measurement range		30 mW to 300 W
VSWR referenced to 50 Ω		
200 MHz to 3 GHz		<1.07
3 GHz to 4 GHz		<1.12
Power-handling capacity	depending on temperature and matching (see diagram below)	120 W to 1000 W
Insertion loss		
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
Average power		
Power measurement range		30 mW to 300 W
CW, FM, PM, FSK, GMSK		30 mW to 120 W
3GPP WCDMA, cdmaOne, CDMA2000, DAB, DVB-T		
Other 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	
200 MHz to 300 MHz		4.0 % 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		
FM, PM, FSK, GMSK		0 % of measured value (0 dB)
AM (80 %)		±3 % of measured value (±0.13 dB)
2 CW carriers with identical power		±2 % of measured value (±0.09 dB)
π/4-DQPSK		±2 % of measured value (±0.09 dB)
EDGE		±0.5 % of measured value (±0.02 dB) *)
cdmaOne, DAB		±1 % of measured value (±0.04 dB) *)
3GPP WCDMA, CDMA2000	*) if standard is selected on the R&S® FSH	±2 % of measured value (±0.09 dB) *)
DVB-T		±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		4 W to 300 W
DAB, DVB-T, cdmaOne, CDMA2000, 3GPP WCDMA		
Other signals at video bandwidth		
4 kHz		0.4 W to 300 W
200 kHz		1 W to 300 W
4 MHz		2 W to 300 W

<p>Measurement uncertainty</p> <p>Error limits of peak hold circuit for burst signals Duty cycle ≥ 0.1 and repetition rate $\geq 100/s$</p> <p>$20/s \leq$ repetition rate $< 100/s$ $0.001 \leq$ duty cycle < 0.1 Burst width $\geq 0.5 \mu s$ Burst width $\geq 0.2 \mu s$ Range of typical measurement error of peak hold circuit for cdmaOne, DAB DVB-T, CDMA2000, 3GPP WCDMA Temperature coefficient 200 MHz to 300 MHz 300 MHz to 4 GHz</p>	<p>18 °C to 28 °C</p> <p>video bandwidth 4 kHz 200 kHz 4 MHz</p> <p>video bandwidth 4 MHz and standard selected on the R&S FSH</p>	<p>same as for average power plus effect of peak hold circuit</p> <p>$\pm(3\%$ of measured value + 0.05 W) starting from a burst width of 100 μs $\pm(3\%$ of measured value + 0.20 W) starting from a burst width of 4 μs $\pm(7\%$ of measured value + 0.40 W) starting from a burst width of 1 μs</p> <p>plus $\pm(1.6\%$ of measured value + 0.15 W) plus ± 0.10 W plus $\pm 5\%$ of measured value plus $\pm 10\%$ of measured value</p> <p>$\pm(5\%$ of measured value + 0.4 W) $\pm(15\%$ of measured value + 0.4 W)</p> <p>0.50 %/K (0.022 dB/K) 0.35 %/K (0.015 dB/K)</p>
<p>Load matching</p> <p>Matching measurement range Return loss 200 MHz to 3 GHz 3 GHz to 4 GHz VSWR 200 MHz to 3 GHz 3 GHz to 4 GHz Minimum forward power</p>	<p>specs met from 0.2 W</p>	<p>0 dB to 23 dB 0 dB to 20 dB</p> <p>>1.15 >1.22</p> <p>0.03 W</p>
<p>Error limits for matching measurements</p>	<p>The graph plots Measurement error in dB on the y-axis (ranging from -4 to 6) against Return loss in dB on the x-axis (ranging from 0 to 25). Two sets of curves are shown: blue for 0.2 GHz to 3 GHz and red for 3 GHz to 4 GHz. For both ranges, the error is near 0 dB at 0 dB return loss and increases as return loss increases. The 3 GHz to 4 GHz range (red) shows a much steeper increase in error compared to the 0.2 GHz to 3 GHz range (blue).</p>	

Power-handling capacity

Dimensions

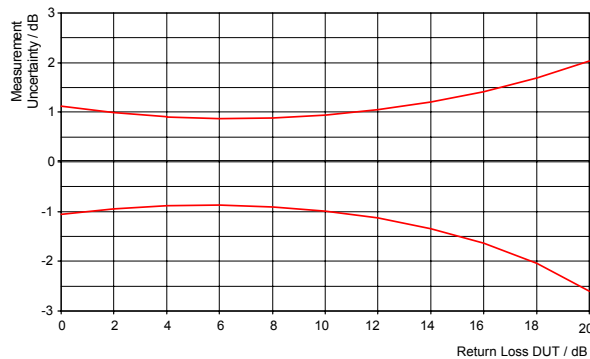
Weight



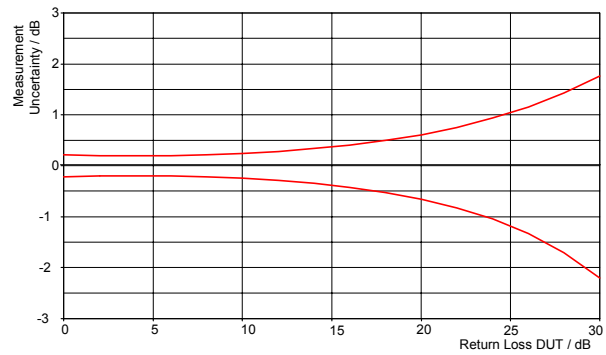
120 mm x 95 mm x 39 mm, connecting cable 1.5 m
0.65 kg

VSWR Bridge and Power Divider R&S® FSH-Z2		
Frequency range		10 MHz to 3 GHz
Impedance		50 Ω
VSWR bridge		
Directivity		
10 MHz to 1 GHz		typ. 30 dB
1 GHz to 3 GHz		typ. 25 dB
Directivity, corrected	option R&S® FSH-K2	
10 MHz to 3 GHz		typ. 43 dB
Return loss at test port		typ. 20 dB
Return loss, corrected	option R&S® FSH-K2	typ. 35 dB
Insertion loss		typ. 9 dB
Power divider		
Return loss at test port		typ. 20 dB
Connectors		
Generator input/RF output		N male
Test port		N female
Control interface		7-contact connector (type Binder)
Calibration standards		
Short/open		N male
50-Ω load		N male
Impedance		50 Ω
Return loss	up to 3 GHz	>43 dB
Power-handling capacity		1 W
General data		
Power consumption		500 mW (nominal)
Dimensions (W x H x D)		169 mm x 116 mm x 30 mm
Weight		485 g
Distance-to-Fault Measurement R&S® FSH-B1 (only model 1145.5850.13, 1145.5850.23 or 1145.5850.26)		
Display		301 pixels
Maximum resolution, distance to fault	maximum zoom	cable length/1023 pixels
Display range		
Return loss		10, 5, 2, 1 dB/div, linear
VSWR		1 to 2 and 1 to 6, with option R&S FSH-K2 in addition
Cable length	depending on cable loss	1 to 1.2 and 1 to 1.5 3 m to max. 1000 m
Maximum permissible spurious signal		1st mixer 1 dB compression point typ. +10 dBm IF overload at reference level typ. + 8 dB

Specification	Condition	R&S® FSH3	R&S® FSH6
Transmission measurements (only with R&S® FSH3 models 1145.5850.13, 1145.5850.23 and R&S® FSH6 model 1145.5850.26)			
Frequency range		10 MHz to 3 GHz	10 MHz to 6 GHz
Dynamic range 10 MHz to 2.2 GHz	scalar mode	60 dB	80 dB
	vector mode, option R&S® FSH-K2	80 dB	90 dB
2.2 GHz to 3 GHz	scalar mode	50 dB	70 dB
	vector mode, option R&S® FSH-K2	65 dB	85 dB
3 GHz to 5 GHz	scalar mode		40 dB
	vector mode, option R&S® FSH-K2		55 dB
5 GHz to 6 GHz	scalar mode		35 dB
	vector mode, option R&S® FSH-K2		50 dB
Reflection measurements (only with R&S® FSH3 model 1145.5850.13 or 1145.5850.23, R&S® FSH6 model 1145.5850.26 and R&S® FSH-Z2)			
Frequency range		10 MHz to 3 GHz	10 MHz to 3 GHz
Display range of return loss		10, 20, 50, 100 dB, selectable	
VSWR display range		1 to 2 and 1 to 6, selectable, with option R&S® FSH-K2 also 1 to 1.2 and 1 to 1.5	
Measurement uncertainty		see diagrams	



Measurement uncertainty with scalar measurements



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

General data

Display	14 cm (5.7") LC colour display
Resolution	320 x 240 pixels
Memory	CMOS RAM
Settings and traces	100
Environmental conditions	
Temperature	
Operating temperature range	
R&S® FSH powered from internal battery	0 °C to 50 °C
R&S® FSH powered from AC power supply	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 (EN 60068)
IP class of protection	51
Mechanical resistance	
Vibration, sinusoidal	complies with EN 60068-2-1, EN61010-1 5 Hz to 55 Hz: max. 2 g, 55 Hz to 150 Hz: 0.5 g constant, 12 minutes per axis
Vibration, random	complies with EN60068-2-64 10 Hz to 500 Hz, 1.9 g, 30 minutes per axis
Shock	complies with EN 60068-2-27 40 g shock spectrum
RFI suppression	complies with EMC directive of EU (89/336/EEC) and German EMC legislation
Immunity to radiated interference	10 V/m
Level display at 10 V/m (reference level ≤ -10 dBm)	
Input frequency	<-75 dBm (nominal)
IF	<-85 dBm (nominal)
Other frequencies	< 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 fully charged battery	4 h with tracking generator off, 3 h with tracking generator on
Battery charging time	4 h with instrument off
Lifetime	300 to 500 charging cycles
Power consumption	typ. 7 W
Safety	complies with EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1
Test mark	VDE, GS, CSA, CSA-NRTL
Dimensions (W x H x D)	170 mm x 120 mm x 270 mm
Weight	2.5 kg

Order No.

Handheld Spectrum Analyzer R&S® FSH3 100 kHz to 3 GHz, with preamplifier	1145.5850.03
Handheld Spectrum Analyzer R&S® FSH3 100 kHz to 3 GHz, with tracking generator	1145.5850.13
Handheld Spectrum Analyzer R&S® FSH3 100 kHz to 3 GHz, with tracking generator and preamplifier	1145.5850.23
Handheld Spectrum Analyzer R&S® FSH6 100 kHz to 6 GHz, with preamplifier	1145.5850.06
Handheld Spectrum Analyzer R&S® FSH6 100 kHz to 6 GHz, with tracking generator and preamplifier	1145.5850.26

Accessories supplied

external power supply, battery pack (built-in),
RS-232-C optical cable, headphones, Quick Start manual,
CD-ROM with Control Software R&S® FSH View and
documentation

Options

	Designation	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

Optional accessories

	Designation	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. calibration standards open, short, 50 Ω load)	R&S® FSH-Z2	1145.5767.02
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), connectors N male/N female for R&S® FSH-B1	R&S® FSH-Z20	1145.5867.02
12 V Car Adapter	R&S® FSH-Z21	1145.5873.02
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	1300.7627.00
Combined Short/Open and 50 Ω Load for VSWR and DTF calibration	R&S® FSH-Z29	1300.7504.02
Spare Short/Open Calibration Standard for R&S® FSH-Z2 for VSWR calibration	R&S® FSH-Z30	1145.5773.02

Spare 50 Ω Load Standard for R&S [®] FSH-Z2 for VSWR and DTF calibration	R&S [®] FSH-Z31	1145.5780.02
Spare Battery Pack	R&S [®] FSH-Z32	1145.5796.02
Spare AC Power Supply	R&S [®] FSH-Z33	1145.5809.02
Spare RS-232-C Optical Cable	R&S [®] FSH-Z34	1145.5815.02
Spare CD-ROM with Control Software R&S [®] FSH View and documentation	R&S [®] FSH-Z35	1145.5821.02
Spare Headphones	R&S [®] FSH-Z36	1145.5838.02