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## Test & Measurement

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## Complimentary Reference Material

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TMG will assist if you are unsure whether this model will suit your requirements.

Call TMG if you need to organise repair and/or calibrate your unit.

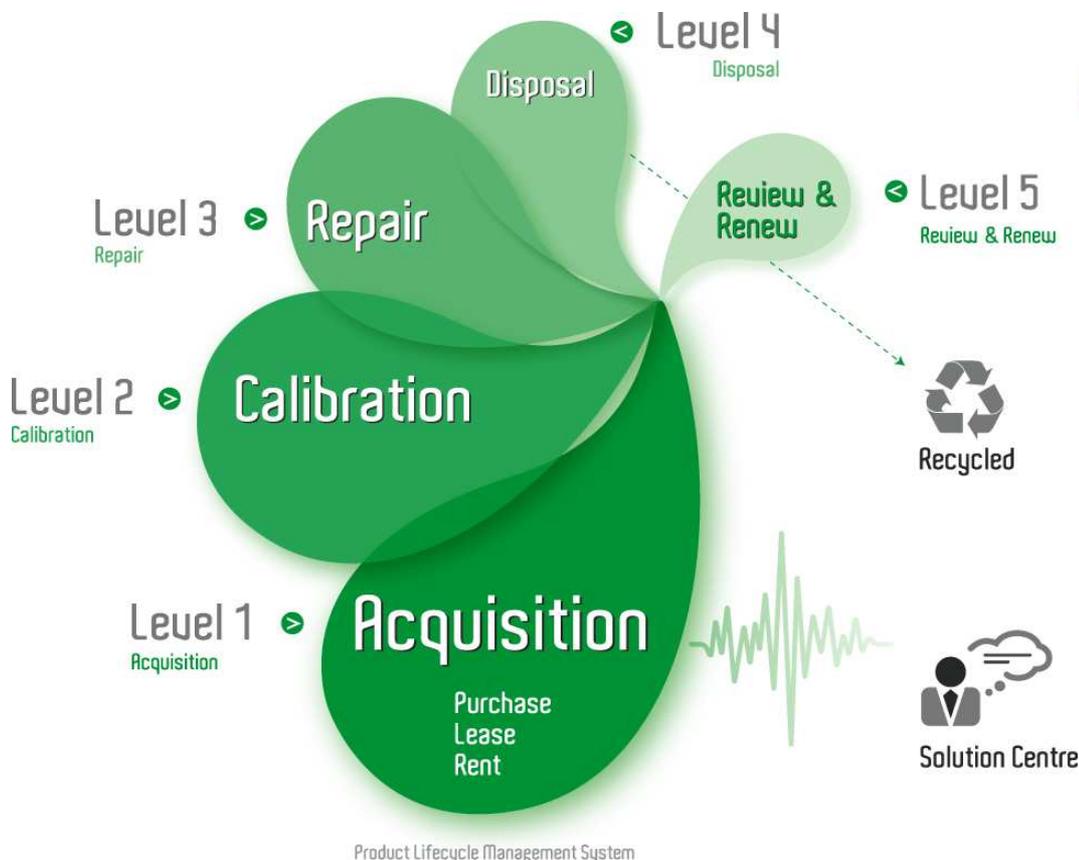
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Product Lifecycle Management System

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## 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	R&S FSH18
<b>Frequency</b>				
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		
Frequency span		0 Hz, 100 Hz to 3 GHz	0 Hz, 100 Hz to 6 GHz	0 Hz, 100 Hz to 18 GHz
	1145.5850.13	0 Hz, 1 kHz to 3 GHz	-	-
<b>Spectral purity</b>				
SSB phase noise	f = 500 MHz, 20 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)		< -100 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)	1145.5850.13	1, 3, 10, 30, 100, 200, 300 kHz, 1 MHz		
	1145.5850.03, .23, 1145.5850.06, .26, .18	In addition 100, 300 Hz		
Tolerance	≤ 300 kHz	± 5 %, nominal		
	1 MHz	± 10 %, nominal		

Specification	Condition	R&S FSH3	R&S FSH6	R&S FSH18
Resolution bandwidths (-6 dB)	with option R&S FSH-K3 installed	in addition 200 Hz, 9 kHz, 120 kHz, 1 MHz		
Video bandwidths		10 Hz to 1 MHz in 1, 3 steps		
<b>Amplitude</b>				
Display range		average noise level displayed to +20 dBm		
Maximum permissible DC voltage at RF input		50 V / 80 V <sup>1)</sup>		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 x -20 dBm, reference level = -10 dBm			
Carrier offset ≤ 2 MHz		60 dB (+10 dBm third-order intercept)		50 dB (nominal) (+5 dBm third-order intercept)
Carrier offset > 2 MHz		66 dB (+13 dBm third-order intercept)		50 dB (nominal) (+5 dBm third-order intercept)

<sup>1)</sup> 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	R&S FSH18
Displayed average noise level	average value, resolution bandwidth 1 kHz, video bandwidth 10 Hz, reference level $\leq$ -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 10 MHz to 2.5 GHz	only models 1145.5850.03 <sup>2</sup> ), 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	-

<sup>2</sup> As of serial number 100900 and firmware version 6.0 or higher.

Specification	Condition	R&S FSH3	R&S FSH6	R&S FSH18
Inherent spurious	reference level $\leq -20$ dBm, f > 30 MHz, RBW $\leq 100$ kHz, S/N > 10dB	<-80 dBm	<-80 dBm	<-80 dBm
Input related spurious R&S FSH3 / FSH6 Receive frequency Up to 3 GHz 3 GHz to 6 GHz Receive frequency = signal frequency – 2.0156 GHz	mixer level $\leq -40$ dBm carrier offset > 1 MHz  signal frequency 2 GHz to 3.2 GHz	-70 dBc (nominal)  55 dBc (nominal)	-70 dBc (nominal) -64 dBc (nominal)  55 dBc (nominal)	
Input related spurious R&S FSH18 Receive frequency: 10 MHz to 14 GHz  14 GHz to 18 GHz  Receive frequency = signal frequency – 3.9 GHz signal frequency + 0.6 GHz to + 1 GHz signal frequency – 0.6 GHz to – 1 GHz	mixer level $\leq -20$ dBm carrier offset > 1MHz  signal frequency: 10 MHz to 7.6 GHz 7.6 GHz to 18 GHz  10 MHz to 2.8 GHz 2.8 GHz to 7.6 GHz 7.6 GHz to 18 GHz  signal frequency: 3.9 GHz to 18 GHz 7.4 GHz to 7.7 GHz  7.8 GHz to 8.5 GHz			-60 dBc (nominal) -50 dBc (nominal)  -50 dBc (nominal) -30 dBc (nominal) -50 dBc (nominal)  -40 dBc (nominal) -45 dBc(nominal)  -45 dBc(nominal)
2nd harmonic Receive frequency Up to 6 GHz 6 GHz to 9 GHz	mixer level -40 dBm	-60 dBc (nominal)	-60 dBc (nominal)	-60 dBc (nominal) -50 dBc (nominal)
<b>Level display</b>				
Reference level		-80 to +20 dBm in steps of 1 dB		
Display range		100 dB, 50 dB, 20 dB, 10 dB, linear		

Specification	Condition	R&S FSH3	R&S FSH6	R&S FSH18
Display units Logarithmic Linear		dBm, dB $\mu$ V, dBmV with transducer also dB $\mu$ V/m and dB $\mu$ A/m $\mu$ V, mV, V, nW, $\mu$ W, mW, W with transducer also V/m, mV/m, $\mu$ V/m and W/m <sup>2</sup>		
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		
Level measurement error	at reference level down to -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	-		< 3.0 dB	
<b>Markers</b>				
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)		
<b>Trigger</b>		free-running, video, external		
<b>Audio demodulation</b>		AM (video voltage without AGC) and FM		

Specification	Condition	R&S FSH3	R&S FSH6	R&S FSH18
<b>Inputs</b>				
RF input		N female		
Input impedance		50 $\Omega$		
VSWR	10 MHz to 3 GHz 3 GHz to 6 GHz 6 GHz to 15 GHz 15 GHz to 18 GHz	<1.5 nominal	<1.5 nominal <1.5 nominal	<1.5 nominal <1.5 nominal <2 nominal <3 nominal
Trigger/external reference input		BNC female, selectable		
Trigger voltage		TTL		
Reference frequency		10 MHz		
Required level	from 50 $\Omega$	10 dBm		
<b>Outputs</b>				
AF output		3.5 mm mini jack		
Output impedance Open-circuit voltage		100 $\Omega$ adjustable up to 1.5 V		
Tracking generator	only models 145.5850.13, 1145.5850.23 und 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  model 1145.5850.26 f < 3 GHz f > 3 GHz	-20 dBm (nominal) 0 dBm / -20 dBm, selectable	- 10 dBm (nominal) - 20 dBm (nominal)	-
Output impedance		50 $\Omega$ , nominal		
<b>Interfaces</b>				
RS-232-C optical interface				
Baud rate		1200, 2400, 9600, 19200, 38400, 57600, 115200 baud		
Power sensor		7-contact female connector (type Binder 712)		

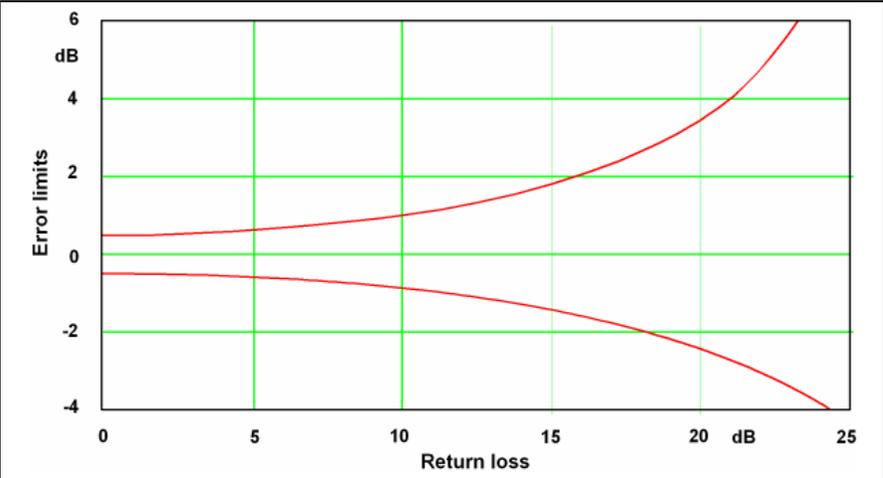
<b>Accessories</b>		
<b>Power Sensors R&amp;S FSH-Z1 and R&amp;S FSH-Z18</b>		
Frequency range R&S FSH-Z1		10 MHz to 8 GHz
R&S FSH-Z18		10 MHz to 18 GHz
VSWR		
10 MHz to 30 MHz		< 1.15
30 MHz to 2.4 GHz		< 1.13
2.4 GHz to 8 GHz		< 1.20
8 GHz to 18 GHz		<1.25
Maximum input power	average power peak power (<10 $\mu$ s, 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 Effect of modulation		<0.5 % (0.02 dB) at harmonic ratio of 20 dB <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

<b>Directional Power Sensor R&amp;S FSH-Z14</b>		
Frequency range		25 MHz to 1 GHz
Power measurement range		30 mW to 300 W
VSWR referenced to 50 $\Omega$		< 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
<b>Average power</b>		
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 % of measured value (0.17 dB) 3.2 % of measured value (0.14 dB)
Zero offset	after zeroing	$\pm 4$ mW
Range of typical meas. error with modulation FM, PM, FSK, GMSK AM (80 %) 2 CW carriers with identical power EDGE, TETRA	*) if standard is selected on the R&S FSH	0 % of measured value (0 dB) $\pm 3$ % of measured value ( $\pm 0.13$ dB) $\pm 2$ % of measured value ( $\pm 0.09$ dB) $\pm 0.5$ % of measured value ( $\pm 0.02$ dB) *)
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)

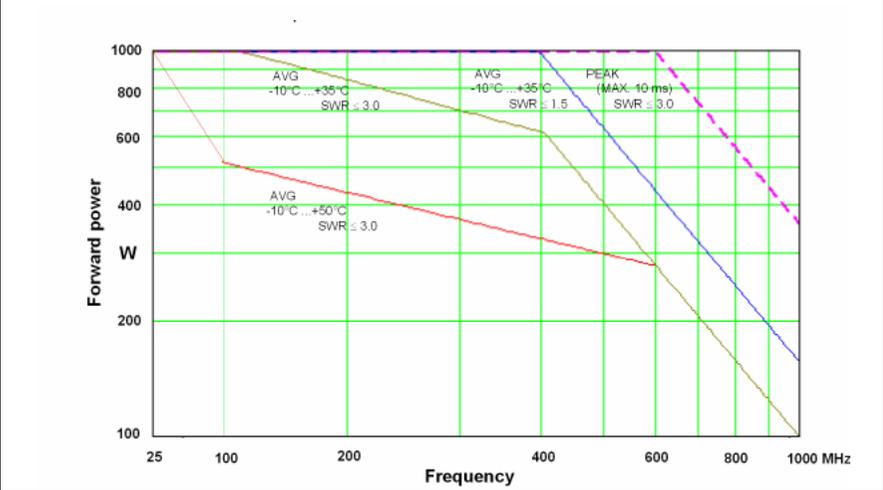
<b>Directional Power Sensor R&amp;S FSH-Z14</b>		
<b>Max. peak envelope power</b>		
Power measurement range Video bandwidth 4 kHz 200 kHz 600 kHz		0.4 W to 300 W 1 W to 300 W 2 W to 300 W
Measurement uncertainty	18°C to 28°C	same as for average power plus effect of peak hold circuit
Error limits of peak hold circuit for burst signals Duty cycle $\geq 0.1$ and repetition rate $\geq 100$ / s  20/s $\leq$ repetition rate $< 100$ /s 0.001 $\leq$ duty cycle $< 0.1$	video bandwidth 4 kHz 200 kHz 600 kHz	$\pm (3\% \text{ of measured value} + 0.05 \text{ W})$ starting from a burst width of 200 $\mu\text{s}$ $\pm (3\% \text{ of measured value} + 0.20 \text{ W})$ starting from a burst width of 4 $\mu\text{s}$ $\pm (7\% \text{ of measured value} + 0.40 \text{ W})$ starting from a burst width of 2 $\mu\text{s}$  plus $\pm (1.6\% \text{ of measured value} + 0.15 \text{ W})$ plus $\pm 0.10 \text{ W}$
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)
<b>Load matching</b>		
Matching measurement range Return loss VSWR		0 dB to 23 dB > 1.15
Minimum forward power	specs met from 0.4 W	0.06 W

**Directional Power Sensor R&S FSH-Z14**

Error limits for matching measurements



Power-handling capacity



Dimensions

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

Weight

0.65 kg

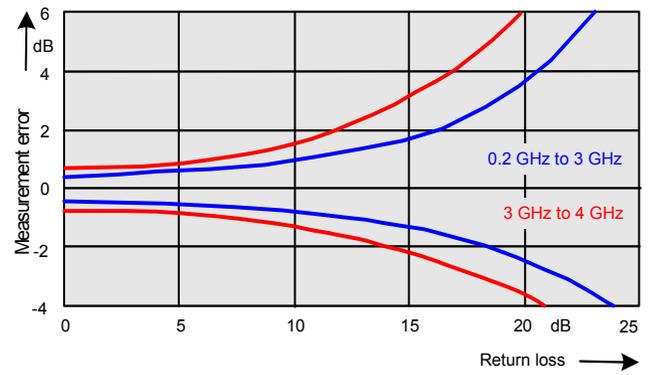
<b>Directional Power Sensor R&amp;S FSH-Z44</b>		
Frequency range		200 MHz to 4 GHz
Power measurement range		30 mW to 300 W
VSWR referenced to 50 $\Omega$ 200 MHz to 3 GHz 3 GHz to 4 GHz		< 1.07 < 1.12
Power-handling capacity	depending on temperature and matching (see diagram below)	120 W to 1000 W
Insertion loss 200 MHz to 1.5 GHz 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
<b>Average power</b>		
Power measurement range CW, FM, PM, FSK, GMSK 3GPP W-CDMA, cdmaOne, cdma2000, DAB, DVB-T Other modulated signals	CF: ratio of peak envelope power to average power	30 mW to 300 W 30 mW to 120 W  30 mW to 300 W / CF
Measurement uncertainty  200 MHz to 300 MHz 300 MHz to 4 GHz	sine signal, 18 °C to 28 °C, no zero offset	4.0 % of measured value (0.17 dB) 3.2 % of measured value (0.14 dB)

Directional Power Sensor R&S FSH-Z44		
Zero offset	after zeroing	± 4 mW
Range of typical measurement error with modulation FM, PM, FSK, GMSK AM (80 %) 2 CW carriers with identical power $\pi/4$ -DQPSK EDGE cdmaOne, DAB 3GPP W-CDMA, cdma2000 DVB-T	*) 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)  ± 2 % of measured value (± 0.09 dB) ± 0.5 % of measured value (± 0.02 dB) *) ± 1 % of measured value (± 0.04 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)
<b>Max. peak envelope power</b>		
Power measurement range DAB, DVB-T, cdmaOne, cdma2000, 3GPP W-CDMA 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

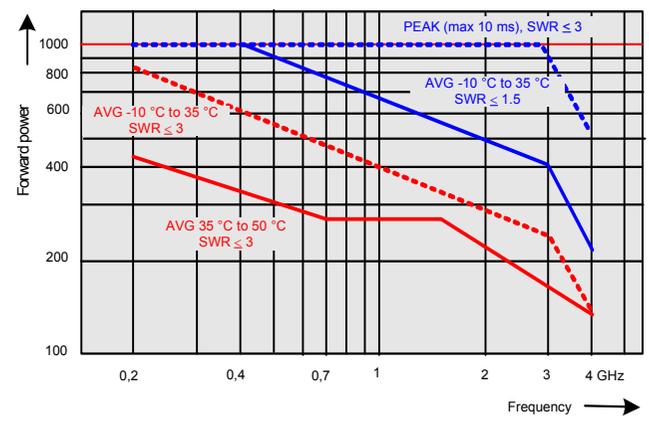
Directional Power Sensor R&S FSH-Z44		
Measurement uncertainty	18°C to 28°C	same as for average power plus effect of peak hold circuit
Error limits of peak hold circuit for burst signals Duty cycle $\geq 0.1$ und repetition rate $\geq 100 / s$  20/s $\leq$ repetition rate <100/s 0.001 $\leq$ duty cycle < 0.1 Burst width $\geq 0.5\mu s$ Burst width $\geq 0.2\mu s$	video bandwidth 4 kHz  200 kHz  4 MHz	$\pm (3 \% \text{ of measured value} + 0.05 \text{ W})$ starting from a burst width of 100 $\mu s$ $\pm (3 \% \text{ of measured value} + 0.20 \text{ W})$ starting from a burst width of 4 $\mu s$ $\pm (7 \% \text{ of measured value} + 0.40 \text{ W})$ starting from a burst width of 1 $\mu s$  plus $\pm (1.6 \% \text{ of measured value} + 0.15 \text{ W})$ plus $\pm 0.10 \text{ W}$ plus $\pm 5 \% \text{ of measured value}$ plus $\pm 10 \% \text{ of measured value}$
Range of typical measurement error of peak hold circuit for cdmaOne, DAB DVB-T, cdma2000, 3GPP W-CDMA	video bandwidth 4 MHz and standard selected on the R&S FSH	$\pm (5\% \text{ of measured value} + 0.4 \text{ W})$  $\pm (15\% \text{ of measured value} + 0.4 \text{ W})$
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)
<b>Load matching</b>		
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		0 dB to 23 dB  0 dB to 20 dB  > 1.15  > 1.22
Minimum forward power	specs met from 0.2 W	0.03 W

**Directional Power Sensor R&S FSH-Z44**

Error limits for matching measurements



Power-handling capacity



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

<b>VSWR Bridge R&amp;S FSH-Z2 / R&amp;S FSH-Z3</b>			
		R&S FSH-Z2	R&S FSH-Z3
Frequency range		10 MHz to 3 GHz	10 MHz to 3 GHz
Impedance		50 $\Omega$	
<b>VSWR bridge</b>			
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	option R&S FSH-K2		
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		20 dB, typ.	> 12 dB, typ. 18 dB
50 MHz to 3 GHz		20 dB, typ.	> 16 dB, typ. 22 dB
3 GHz to 6 GHz		-	> 16 dB, typ. 22 dB
Return loss at test port, corrected	option R&S FSH-K2		
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

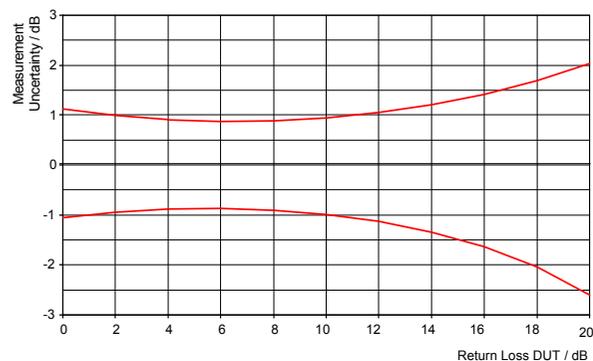
<b>VSWR Bridge R&amp;S FSH-Z2 / R&amp;S FSH-Z3</b>			
		R&S FSH-Z2	R&S FSH-Z3
<b>DC bias</b>		-	
Max. input voltage		-	50 V
Max. input current		-	300 mA /600 mA <sup>*)</sup>
Type of connector		-	BNC female
<b>Connectors</b>			
Generator input/RF output		N male	
Test port		N female	
Control interface		7-contact connector (type Binder)	
<b>General data</b>			
Power consumption		-	3 mW (nominal)
Dimensions (W x H x D)		169 mm x 116 mm x 30 mm	149 mm x 144 mm x 45 mm
Weight		485 g	620 g
<b>Calibration standards</b>		R&S FSH-Z29 R&S FSH-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

<sup>\*)</sup> as of serial number 100500

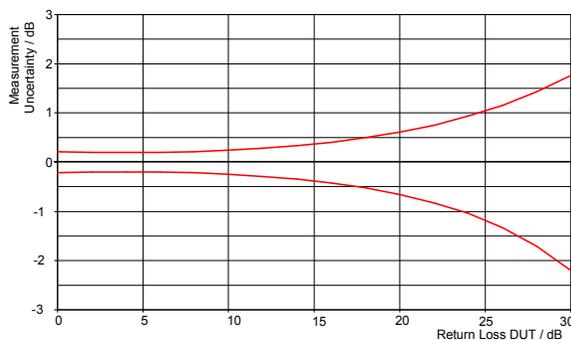
Distance-to-Fault Measurement R&S FSH-B1 (only with R&S FSH3 models 1145.5850.13, 1145.5850.23 and R&S FSH6 model 1145.5850.26)		
Display		301 pixels
Maximum resolution, distance to fault	maximum zoom	cable length/1023 pixels
Display range Return loss VSWR  Reflection coefficient mRho		10, 5, 2, 1 dB/div, linear 1 to 2, 1 to 6, 1 to 10 und 1 to 20 with option R&S FSH-K2 in addition 1 to 1.2 and 1 to 1.5  0 to 1, 0 to 0.1, 0 to 0.01, 0 to 0.001  0 to 100, 0 to 100, 0 to 10, 0 to 1
Cable length	depending on cable loss	0 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		5 MHz bis 3 GHz	5 MHz bis 6 GHz
Dynamic range 10 MHz to 2.2 GHz	scalar mode	typ. 60 dB	typ. 80 dB
	vector mode, option R&S FSH-K2	typ. 80 dB	typ. 90 dB
2.2 to 3 GHz	scalar mode	typ. 50 dB	typ. 70 dB
	vector mode, option R&S FSH-K2	typ. 65 dB	typ. 85 dB
3 to 5 GHz	scalar mode	-	typ. 40 dB
	vector mode, option R&S FSH-K2	-	typ. 55 dB
5 to 6 GHz	scalar mode	-	typ. 35 dB
	vector mode, option R&S FSH-K2	-	typ. 50 dB

Specification	Condition	R&S FSH3	R&S FSH6
<b>Reflection measurements</b> (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/-Z3)			
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, 1 to 6, 1 to 10 und 1 to 20, selectable, with option R&S FSH-K2 also 1 to 1.2 and 1 to 1.5	
Display range Reflection coefficient mRho		0 to 1, 0 to 0.1, 0 to 0.01, 0 to 0.001 0 to 100, 0 to 100, 0 to 10, 0 to 1	
Smith chart	only with option R&S FSH-K2		
Marker formats: Reflection		dB mag and phase lin mag and phase real and imag	
Impedance		R+jX (R+jX)/Z <sub>0</sub>	
Admittance		G+jB (G+jB)/Z <sub>0</sub>	
Reference impedance Z <sub>0</sub>		10 mΩ to 10 kΩ	
Zoom function		expansion factor 2, 4, 8	
Measurement uncertainty		see diagrams	



Measurement uncertainty with scalar measurements



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

Specification	Condition	R&S FSH3	R&S FSH6
<b>Phase measurements (transmission, reflection) (only with R&amp;S FSH3 models 1145.5850.13 or 1145.5850.23, R&amp;S FSH6 1145.5850.26 and R&amp;S FSH-K2)</b>			
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)	
<b>Group delay measurements (only with R&amp;S FSH3 models 1145.5850.13 or 1145.5850.23, R&amp;S FSH6 1145.5850.26 and R&amp;S FSH-K2)</b>			
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	

Specification	Condition	R&S FSH3 (only for model 1145.5850.23 as of serial number 103500)
<b>3GPP FDD code domain power BTS/Node B measurement (only with R&amp;S FSH-K4 1300.7633.02)</b>		
<b>Frequency range</b>		10 MHz to 3 GHz
<b>Carrier frequency error</b> Measurement range Measurement uncertainty	S/N > 30 dB	(test case 6.3 in accordance with 3GPP 25.141) $\pm 1$ kHz $< 50 \text{ Hz} + \Delta f_{\text{ref}}^{(1)}$ ( $\sigma = 20 \text{ Hz}$ )
<b>Total power</b> Measurement range Measurement uncertainty	S/N > 30 dB frequency > 1 MHz 20 °C to 30 °C -40 dBm < P <sub>total</sub> < 20 dBm P <sub>REF_LEV</sub> -30dB < P <sub>total</sub> < P <sub>REF_LEV</sub> +3dB	(test case 6.2.1 in accordance with 3GPP 25.141) -60 dBm < P <sub>total</sub> < 20 dBm $\pm 1.5$ dB, typ. 0.5 dB
<b>CPICH power</b> Measurement range Measurement uncertainty	S/N > 30 dB -40 dBm < P <sub>total</sub> < 20 dBm - P <sub>total</sub> -20 dBm < P <sub>CPICH</sub> < P <sub>total</sub>	(test case 6.2.2 in accordance with 3GPP 25.141) P <sub>total</sub> -20 dB < P <sub>CPICH</sub> < P <sub>total</sub> $\pm 1.5$ dB, typ. 0.5 dB
<b>P-CCPCH power</b> Measurement range Measurement uncertainty	S/N > 30 dB -40 dBm < P <sub>total</sub> < 20 dBm P <sub>total</sub> -20 dBm < P <sub>PCCPCH</sub> < P <sub>total</sub>	P <sub>total</sub> -40 dB < P <sub>PCCPCH</sub> < P <sub>total</sub> $\pm 1.5$ dB, typ. 0.5 dB
<b>PSCH/SSCH power</b> Measurement range Measurement uncertainty	S/N > 30 dB -40 dBm < P <sub>total</sub> < 20 dBm P <sub>total</sub> -20 dBm < P <sub>PSCH</sub> < P <sub>total</sub>	P <sub>total</sub> -30 dB < P <sub>SCH</sub> < P <sub>total</sub> $\pm 2.5$ dB, typ. 1.5 dB
<b>Symbol EVM</b> Measurement range Measurement uncertainty Residual EVM <sub>symbol</sub>	3% < EVM <sub>symbol</sub> < 10% 10% < EVM <sub>symbol</sub> < 20%	3% < EVM <sub>symbol</sub> < 25% $\pm 2.5\%$ typ. $\pm 3.0\%$ typ. 3% typ.

Specification	Condition	R&S FSH3
<b>3GPP FDD scrambling code detection</b>		
Frequency range	$\pm 1$ kHz	10 MHz to 3 GHz
<b>Single scrambling code detection</b> Calculation time CPICH $E_C / I_0$		24 s > -18 dB <sup>2)</sup>
<b>Multiple scrambling code detection</b> Max. number of scrambling codes Calculation time CPICH $E_C / I_0$ CPICH power Measurement uncertainty	$-40 \text{ dBm} < P_{\text{total}} < 20 \text{ dBm}$	8  57 s > -21 dB <sup>2)</sup> $\pm 4.2 \text{ dB}$

1)  $\Delta f_{\text{ref}}$  = uncertainty of reference frequency source.

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

**General data**

<b>Display</b>	14 cm (5.7") LC color display
Resolution	320 x 240 pixels
<b>Memory</b>	CMOS RAM
Settings and traces	100
<b>Environmental conditions</b>	
<b>Temperature</b>	
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
<b>Climatic conditions</b>	
Relative humidity	95 % at 40 °C (IEC60068)
<b>IP class of protection</b>	
	51
<b>Mechanical resistance</b>	
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
<b>RFI suppression</b>	
	complies with EMC directive of EU (89/336/EEC) and German EMC legislation
<b>Immunity to radiated interference</b>	
	10 V/m
Level display at 10 V/m (reference level $\leq$ -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	typ. 4 h with tracking generator off, typ. 3 h with tracking generator on, typ. 3 h for R&S FSH18
Battery charging time	4 h with instrument off
Lifetime	300 to 500 charging cycles
Power consumption	typ. 7 W

**Safety**

Test mark

complies with EN 61010-1, UL 3111-1,  
CSA C22.2 No. 1010-1

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
Handheld Spectrum Analyzer R&S FSH18 10 MHz to 18 GHz	1145.5850.18

**Power supply****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 for the R&S FSH (includes 1 m cable, R&S FSH-Z2 required)	R&S FSH-B1	1145.5750.02
Remote Control via RS-232-C for the R&S FSH	R&S FSH-K1	1157.3458.02
Vector Transmission and Reflection Measurements for the R&S FSH	R&S FSH-K2	1157.3387.02
Receiver Mode for the R&S FSH	R&S FSH-K3	1157.3429.02
3GPP FDD Code Domain Power BTS/Node B Measurement for the R&S FSH3 model 23 as of serial number 103500	R&S FSH-K4	1300.7633.02

**Optional accessories**

	Designation	Order No.
Power Sensor for the R&S FSH, 10 MHz to 8 GHz	R&S FSH-Z1	1155.4505.02
VSWR Bridge and Power Divider for the R&S FSH, 10 MHz to 3 GHz (incl. calibration standards open, short, 50 $\Omega$ load)	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. calibration standards open, short, 50 $\Omega$ load)	R&S FSH-Z3	1300.7756.02

## Power supply

## Optional accessories

	Designation	Order No.
Directional Power Sensor for the R&S FSH, 25 MHz to 1 GHz	R&S FSH-Z14	1120.6001.02
Power Sensor for the R&S FSH, 10 MHz to 18 GHz	R&S FSH-Z18	1165.1909.02
Directional Power Sensor for the R&S FSH, 200 MHz to 4 GHz	R&S FSH-Z44	1165.2305.02
Matching Pad, 50/75 $\Omega$ , 0 Hz to 2700 MHz	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 for the R&S FSH	R&S FSH-Z21	1145.5873.02
Serial/Parallel Converter for the R&S FSH	R&S FSH-Z22	1145.5880.02
Carrying Bag for the R&S FSH	R&S FSH-Z25	1145.5896.02
Transit Case for the R&S FSH	R&S FSH-Z26	1300.7627.00
Spare Combined Short/Open and 50 $\Omega$ Load for VSWR and DTF calibration, DC to 6 GHz	R&S FSH-Z28	1300.7804.02
Combined Short/Open and 50 $\Omega$ Load for VSWR and DTF calibration, DC to 3 GHz	R&S FSH-Z29	1300.7504.02
Spare Short/Open Calibration Standard for R&S FSH-Z2 for VSWR calibration, DC to 3 GHz	R&S FSH-Z30	1145.5773.02
Spare 50 $\Omega$ Load Standard for R&S FSH-Z2 for VSWR and DTF calibration, DC to 3 GHz	R&S FSH-Z31	1145.5780.02
Spare Battery Pack for the R&S FSH	R&S FSH-Z32	1145.5796.02
Spare AC Power Supply for the R&S FSH	R&S FSH-Z33	1145.5809.02

**Power supply****Optional accessories**

	Designation	Order No.
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
Spare USB Optical Cable	R&S FSH-Z37	1300.7733.02
Active Directional Antenna	R&S HE-200	4050.3509.02
Portable EMF Measurement System, 30 MHz to 3 GHz, for the Handheld Spectrum Analyzer R&S FSH	R&S TS-EMF	1158.9295.13
Near-Field Probe Set	R&S HZ-15	1147.2736.02
Preamplifier for the R&S HZ-15	R&S HZ-16	1147.2720.02