R&S®Spectrum Rider FPH Handheld Spectrum Analyzer

Specifications

ROHDE&SCHWARZ

Test & Measurement

Data Sheet | 03.00

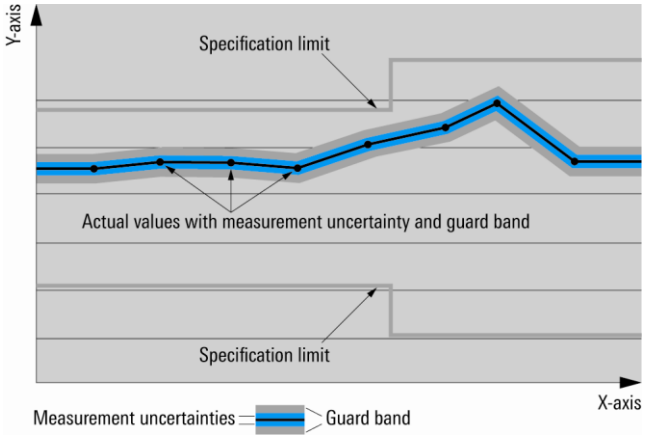
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: “parameter: value”.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Frequency

Frequency range	R&S®Spectrum Rider	5 kHz to 2 GHz
	with R&S®FPH-B3 option installed	5 kHz to 3 GHz
	with R&S®FPH-B3 and R&S®FPH-B4 options installed	5 kHz to 4 GHz
Frequency resolution		1 Hz

Reference frequency, internal		
Aging per year		1×10^{-6}
Temperature drift	0 °C to +50 °C	1×10^{-6}
Achievable initial calibration accuracy		5×10^{-7}
Total reference uncertainty		(time since last adjustment × aging rate) + temperature drift + calibration accuracy

Frequency readout		
Marker resolution		1 Hz
Uncertainty		±(marker frequency × reference uncertainty + 10 % × resolution bandwidth + ½ (span/(sweep points – 1) + 1 Hz)
Number of sweep (trace) points		711
Marker tuning frequency step size		span/710
Frequency counter resolution		0.1 Hz
Count uncertainty	SNR > 25 dB	±(frequency × reference uncertainty + ½ (last digit))
Frequency span		0 Hz, 10 Hz to 2 GHz
	with R&S®FPH-B3 option installed	0 Hz, 10 Hz to 3 GHz
	with R&S®FPH-B3 and R&S®FPH-B4 options installed	0 Hz, 10 Hz to 4 GHz
Span uncertainty		1 % (nom.)

Spectral purity SSB phase noise		f = 500 MHz
Carrier offset	30 kHz	< –88 dBc (1 Hz),–95 dBc (1 Hz) (typ.)
	100 kHz	< –98 dBc (1 Hz), –105 dBc (1 Hz) (typ.)
	1 MHz	< –118 dBc (1 Hz), –125 dBc (1 Hz) (typ.)

Sweep time

Sweep time	span = 0 Hz	1 ms to 1000 s
	10 Hz ≤ span ≤ 600 MHz	20 ms to 1000 s
	span > 600 MHz	20 ms × span / 1600 MHz to 1000 s
Uncertainty	span = 0 Hz	1 % (nom.)
	span ≥ 10 Hz	3 % (nom.)

Bandwidths

Resolution bandwidths		
Range	–3 dB bandwidth	1 Hz to 3 MHz in 1/3 sequence
Bandwidth accuracy	1 Hz ≤ RBW ≤ 300 kHz	< 5 % (nom.)
	300 kHz < RBW ≤ 1 MHz	< 10 % (nom.)
Selectivity 60 dB:3 dB		< 5 (nom.), (Gaussian type filters)
Video filters		
Range	–3 dB bandwidth	1 Hz to 3 MHz in 1/3 sequence

Level

Display range		displayed noise floor to +30 dBm
Maximum rated input level		
DC voltage		50 V
CW RF power		33 dBm (= 2 W)
Peak RF power	duration < 3 s	36 dBm (= 4 W)
Max. pulse voltage		150 V
Max. pulse energy	pulse width 10 µs	10 mWs
Intermodulation		
Third-order intercept (TOI)	intermodulation-free dynamic range, signal level 2 × –20 dBm, RF attenuation = 0 dB, RF preamplifier = off	
	f = 1 GHz	+7 dBm (meas.)
	f = 2.4 GHz	+10 dBm (meas.)
Second-harmonic intercept (SHI)	RF attenuation = 0 dB, RF preamplifier = off, signal level = –40 dBm	
	f_{in} = 20 MHz to 1.5 GHz	–60 dBc (nom.)
	f_{in} = 1.5 GHz to 2 GHz	–80 dBc (nom.)
Displayed average noise level	0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 10 Hz, sample detector, log scaling, normalized to 1 Hz	
	frequency	preamplifier = off
	1 MHz to 10 MHz	< –135 dBm, –142 dBm (typ.)
	10 MHz to 1 GHz	< –142 dBm, –146 dBm (typ.)
	1 GHz to 4 GHz	< –140 dBm, –144 dBm (typ.)
	frequency	preamplifier = on
	1 MHz to 10 MHz	< –150 dBm, –160 dBm (typ.)
	10 MHz to 3 GHz	< –158 dBm, –163 dBm (typ.)
	3 GHz to 4 GHz	< –156 dBm, –161 dBm (typ.)

Immunity to interference, nominal values		
Image frequencies	f_{in} – 2 × 30.15 MHz	< –70 dBc (nom.)
	f_{in} – 2 × 830.15 MHz	< –70 dBc (nom.)
	f < 3 GHz , f_{in} – 2 × 830.15 MHz	< –70 dBc (nom.)
	f < 3 GHz, f_{in} – 2 × 4042.65 MHz	–60 dBc (nom.)
	f ≥ 3 GHz, f_{in} + 2 × 830.15 MHz	–60 dBc (nom.)
Intermediate frequencies	30.15 MHz, 830.15 MHz, 4042.65 MHz	< –60 dBc (nom.)
Other interfering signals, signal level – RF attenuation < –30 dBm	f ≤ 3 GHz, spurious at f_{in} – 2021.325 MHz	< –60 dBc (nom.)
Other interfering signals, related to local oscillators	∆f ≥ 300 kHz	< –60 dBc (nom.)
	f = receive frequency	
Residual spurious response	input matched with 50 Ω, without input signal, RBW ≤ 30 kHz, f ≥ 3 MHz, RF attenuation = 0 dB	< –90 dBm (nom.)
Level display		
Logarithmic level axis		1/2/3/5/10/20/30/50/100/120/150 dB, 10 divisions
Linear level axis		0 % to 100 %, 10 divisions
Number of traces		2
Trace detectors		max. peak, min. peak, auto peak, sample, RMS
Trace functions		clear/write, max. hold, min. hold, average, view
Setting range of reference level		–130 dBm to +30 dBm
Units of level axis		dBm, dBmV, dBµV, V, W

Level measurement uncertainty		
Absolute level uncertainty at 100 MHz	+20 °C to +30 °C	< 0.3 dB
Frequency response (+20 °C to +30 °C)	5 kHz ≤ f < 10 MHz	< 1.5 dB (nom.)
	10 MHz ≤ f ≤ 4 GHz	< 1 dB
Attenuator uncertainty		< 0.3 dB
Uncertainty of reference level setting		< 0.1 dB (nom.)
Display nonlinearity	SNR > 16 dB, 0 dB to –50 dB, logarithmic level display	< 0.3 dB
Bandwidth switching uncertainty	reference: RBW = 10 kHz	< 0.1 dB (nom.)
Total measurement uncertainty	95 % confidence level, +20 °C to +30 °C, SNR > 16 dB, 0 dB to –50 dB below reference level, RF attenuation auto	
	10 MHz ≤ f ≤ 4 GHz	< 1.25 dB, typ. 0.5 dB

Trigger functions

Trigger		
Trigger source		free run, video, external
External trigger level threshold	low → high transition	2.4 V
	high → low transition	0.7 V
	maximum	3.0 V

Inputs and outputs

RF input		
Impedance		50 Ω (nom.)
Connector		N female
VSWR	100 kHz ≤ f ≤ 1 GHz	< 1.5 (nom.)
	1 GHz < f ≤ 4 GHz	< 2 (nom.)
Input attenuator	RF input only	0 dB to 40 dB in 5 dB steps
AF output		
AF demodulation types		AM and FM
Connector		3.5 mm mini jack
Output impedance		32 Ω (nom.)
Voltage (open circuit)		V_{RMS} adjustable from 0 V to > 100 mV
External reference, external trigger		
Connector		BNC, 50 Ω
Mode		ext. reference, ext. trigger
External reference	required level	0 dBm
	frequency	10 MHz
External trigger threshold	low → high transition	2.4 V
	high → low transition	0.7 V

General data

Manual operation		
Languages		Chinese, Chinese Traditional, English, French, German, Italian, Hungarian, Japanese, Korean, Portuguese, Russian, Spanish
Remote control		
Command set		SCPI 1997.0
LAN interface		10/100BASE-T, RJ-45
USB		mini B plug, version 2.0
Display		
Resolution		WVGA, 800 × 480 pixel
Audio		
Speaker		internal, external headphone supported
USB interface		type A plug, version 2.0
	number of interfaces	2
Mass memory		
Mass memory		USB stick/micro SD card (not supplied) size ≤ 32 Gbyte, USB version 1.1 or 2.0
Data storage	internal	> 160 instrument settings and traces
	on USB stick or micro SD card, ≥ 1 Gbyte	> 10000 instrument settings and traces
Temperature	operating temperature range	–10 °C to +55 °C
	storage temperature range	–40 °C to +70 °C
	battery charging mode	0 °C to +40 °C
Climatic loading	relative humidity	+25/+55 °C at 95 % relative humidity (EN 60068-2-30)
	IP class of protection	51
Mechanical resistance		
Vibration	sinusoidal	EN 60068-2-6, MIL-PRF-28800F class 2
	random	EN 60068-2-64, MIL-PRF-28800F class 2
Shock		40 g shock spectrum, in line with MIL-STD-810E, method 516.4 procedure 1, MIL-PRF-28800F

Power supply		
R&S®HA-Z301 AC power supply	input specifications	100 V to 240 V AC, 50 Hz / 60 Hz, 1.0 A to 0.5A
	output specifications	15 V, 2.67 A, max. 40 W
	operating temperature range	–30 °C to +60 °C
	storage temperature range	–40 °C to +85 °C
	test mark	CE, UL, PSE, TUV
External DC voltage		14.65 V to 15.45 V
Battery		Lithium-ion battery
Capacity	R&S®HA-Z306	72 Wh
Voltage		11.25 V (nom.)
Operating time with new, fully charged battery	R&S®HA-Z306	8 h
Charging time	instrument switched off or charge with R&S®HA-Z303 battery charger	3.5 h
	instrument switched on	4 h
Life time	charging cycles	> 80 % or more of its initial capacity after 300 charge/discharge
Power consumption		8 W (meas.)
Safety		IEC 61010-1, EN 61010-1, UL 61010-1 (Third Edition), CAN/CSA-C22.2 No. 61010-1-12
Test mark		VDE, CSA, CSA-NRTL
EMC		in line with European EMC Directive 2004/108/EC including
		EN 61326-1 class B (emission)
		CISPR 11/EN 55011/group 1 class B (emission)
		EN 61326-1 table 2 (immunity, industrial)
Dimensions	W × H × D	202 mm × 294 mm × 76 mm (8.0 in × 11.6 in × 3 in)
Weight		2.5 kg (5.5 lb)
Recommended calibration interval		1 year

Equivalence of specifications for different R&S®FPH part numbers

- The specifications for part number 1321.1111.02 are equivalent to part number 1321.1111.52.

R&S®FPH-K7 analog modulation analysis AM/FM

Measurement of analog modulation signals		
Center frequency		10 MHz to 4 GHz
Demodulation bandwidth		2 MHz, 1 MHz, 500 kHz, 300 kHz, 200 kHz, 100 kHz, 50 kHz, 30 kHz, 20 kHz, 10 kHz (nom.)
Bandwidth accuracy		< +/- 5% (nom.)
Display	AM	carrier power, carrier frequency offset, AM modulation depth, modulation frequency, THD, SINAD
	FM	carrier power, carrier frequency offset, FM deviation, modulation frequency, THD, SINAD

Carrier power		
Carrier power measurement accuracy		add 0.2 dB, see section Level measurement uncertainty,
Display resolution		0.1 dB

AF (modulation frequency) [1]		
Range	AM	20 Hz to 100 kHz (nom)
	FM	20 Hz to 200 kHz (nom)
Resolution		1 Hz
Measurement uncertainty	1 kHz ≤ AF ≤ 200 kHz	±(1 % of measured value) (nom.)
	20 Hz ≤ AF < 1 kHz	± 1 Hz (nom.)
AF filters		
Lowpass	audio decimation	bypass, 1/10, 1/30, 1/100 (nom.)
De-emphasis	FM demodulation and demodulation bandwidth 200 kHz and 300 kHz	off, 50 µs, 75 µs (nom.)

AM demodulation [2]		
Measurement range	modulation depth	5% to 95 % (nom.)
Modulation depth uncertainty		±(4 %) (nom.)

FM demodulation [3]		
Measurement range	frequency deviation	10 kHz to 400 kHz (nom.), max. 0.4 × demodulation bandwidth
Deviation uncertainty		±(0.04 × (AF + deviation)) (nom.)

Modulation distortion [1, 2, 3]		
Measurement functions		THD, SINAD
Measurement range		–50 dB to 0 dB (THD) 0 dB to 50 dB (SINAD, AM) 0 dB to 40 dB (SINAD, FM)
Display resolution		0.1 dB
Measurement uncertainty		1 dB (nom.)
AF frequency range		20 Hz to 100 kHz (nom.)

[1] Min. and max. detectable audio frequency and harmonics depend on the demodulation bandwidth and audio filter settings.

[2] Modulation frequency 1 kHz sine, AM modulation depth 50 %, carrier level 0 dBm, center frequency = 499 MHz, reference level 6 dBm, demodulation bandwidth = 20 kHz, SNR > 60 dB, audio filter = bypass.

[3] Modulation frequency 1 kHz sine, FM-deviation = 75 kHz, carrier level 0 dBm, center frequency = 499 MHz, reference level 6 dBm, demodulation BW = 300 kHz, SNR > 60 dB, audio filter = 1/10, de-emphasis = off.

R&S®FPH-K19 channel power meter

Frequency range	R&S®Spectrum Rider	5 kHz to 2 GHz
	with R&S®FPH-B3 option installed	5 kHz to 3 GHz
	with R&S®FPH-B3 and R&S®FPH-B4 options installed	5 kHz to 4 GHz
Channel bandwidth		100 kHz to 1 GHz
Amplitude		offset, dB relative, zeroing
Unit		dBm, W
Limits		on/off, upper limit, lower limit, beep on fail
Measurement range		–120 dBm to +30 dBm
Level measurement uncertainty		
Absolute level uncertainty at 100 MHz	+20 °C to +30 °C	< 0.3 dB
Frequency response (+20 °C to +30 °C)	100 kHz ≤ f < 10 MHz	< 1.5 dB (nom.)
	10 MHz ≤ f ≤ 4 GHz	< 1.25 dB

R&S®FPH-K29 pulse measurements with power sensor

In combination with one of the power sensors R&S®NRP-Z81, -Z85 or -Z86, the R&S®Spectrum Rider supports measurements on pulsed signals. The achievable RF performance is documented in the data sheet specifications of the R&S®NRP-Z81/-Z85/-Z86 power sensors. The list below shows which measurements are supported by the R&S®FPH-K29.

Measurements	**R&S®FPH-K29**
Pulse power parameters	●
Peak power	●
Pulse top power	●
Average power	●
Base power	●
Minimum power	●
Positive overshoot	●
Negative overshoot	●
Pulse timing parameters	●
Pulse duration	●
Pulse period	●
Pulse start/stop time	●
Rise/fall time	●
Duty cycle	●

R&S®FPH-K43 receiver mode and channel scan measurement application

The specifications below apply to the R&S®Spectrum Rider. They are based on the data sheet specifications of the R&S®Spectrum Rider, have not been checked separately and are not verified during instrument calibration.

Measurements	**R&S®FSH-K43**
Fixed frequency	●
Frequency scan	●
Channel scan	●
User defined channel list	●
EMI precompliance	●
CISPR bandwidths	●
CISPR detectors	●

Frequency range		see basic instrument
Measurement modes		fixed frequency, frequency scan, channel scan
Frequency scan stepsize		
Scan stepsize		100 Hz to max. frequency
Max. number of steps		10000
Channel scan		
Channel spacing		user definable
Max. number of channels		10000
Resolution bandwidths		
Range	–3 dB bandwidth	1 Hz to 3 MHz in 1/3 sequence
Detectors	CISPR bandwidths (– 6 dB)	200 Hz, 9 kHz, 120 kHz, 1 MHz
		max. peak, average, RMS, quasi peak
Level		see basic instrument

R&S®HA-Z350 log periodic OEM antenna 700 MHz to 4 GHz

Frequency range		700 MHz to 4000 MHz
Gain		4 dBi (typ.)
Impedance		50 Ω
VSWR		< 1:2 (nom.)
Connector type		SMA (f)
Dimensions	W x H x D	340 mm × 200 mm × 25 mm (13.3 in × 7.9 in × 1 in)
Weight		270 g (0.6 lb)
Accessories supplied	hardcase with foam, typical calibration data in 10 MHz steps, pistol grip with mini-tripod function, one set of SMA toolset	

R&S®FSH-Z1 and R&S®FSH-Z18 power sensors [4]

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 µs, 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	< 2.3 % (0.10 dB)
	0 °C to +50 °C	< 4.2 % (0.18 dB)
8 GHz to 18 GHz	+15 °C to +35 °C	< 3.5 % (0.15 dB)
	0 °C to +50 °C	< 5.0 % (0.21 dB)
Zero offset after zeroing		< 110 pW
Dimensions (W × H × D)		48 mm × 31 mm × 170 mm (1.9 in × 1.22 in × 6.7 in)
	connecting cable	1.5 m (59 in)
Weight		< 0.3 kg (0.66 lb)

R&S®FSH-Z14 directional power sensor [5]

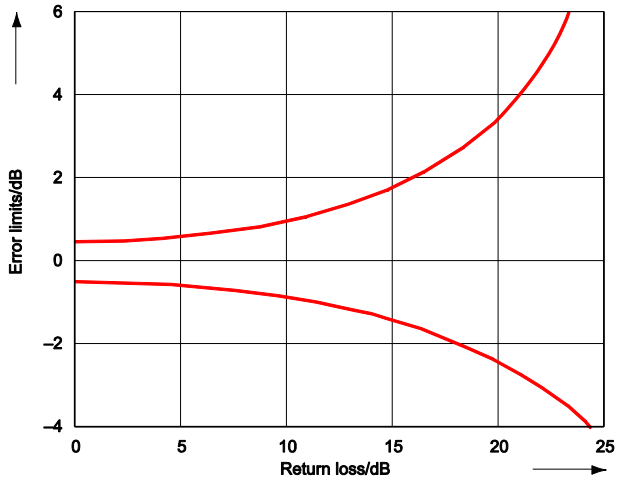
Frequency range		25 MHz to 1 GHz
Power measurement range		30 mW to 300 W
VSWR referenced to 50 Ω		< 1.06
Power-handling capacity	depending on temperature and matching (see diagram on page 13)	100 W to 1000 W
Insertion loss		< 0.06 dB
Directivity		> 30 dB
Average power		
Power measurement range		
CW, FM, PM, FSK, GMSK	CF: ratio of peak envelope	30 mW to 300 W
Modulated signals	power to average power	30 mW to 300 W/CF
Measurement uncertainty		
25 MHz to 40 MHz	sine signal	4.0 % of measured value (0.17 dB)
40 MHz to 1 GHz	+18 °C to +28 °C, no zero offset	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)
	two CW carriers with identical power	±2 % of measured value (±0.09 dB)
	EDGE, TETRA	±0.5 % of measured value (±0.02 dB) [6]
Temperature coefficient	25 MHz to 40 MHz	0.40 %/K (0.017 dB/K)
	40 MHz to 1 GHz	0.25 %/K (0.011 dB/K)

[4] Requires adapter cable R&S®FSH-Z101.

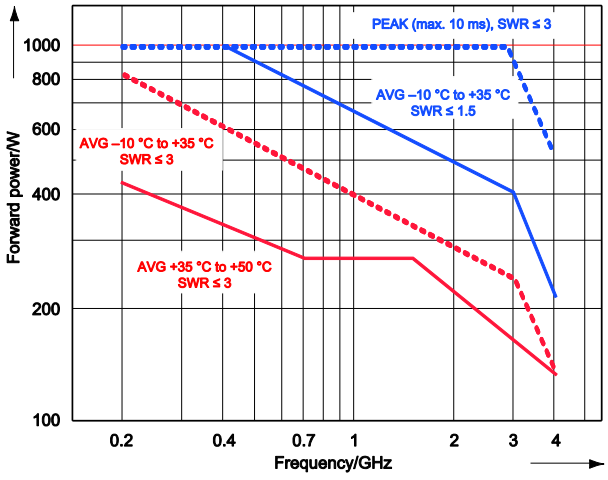
[5] Requires adapter cable R&S®FSH-Z144.

[6] If standard is selected on the R&S®Spectrum Rider.

Max. peak envelope power		
Power measurement range		
Video bandwidth	4 kHz	0.4 W to 300 W
	200 kHz	1 W to 300 W
	600 kHz	2 W to 300 W
Measurement uncertainty	same as for average power plus effect of peak hold circuit	+18 °C to +28 °C
Error limits of peak hold circuit for burst signals		
Duty cycle ≥ 0.1 and repetition rate ≥ 100/s	video bandwidth 4 kHz	±(3 % of measured value + 0.05 W) starting from a burst width of 200 µs
	video bandwidth 200 kHz	±(3 % of measured value + 0.20 W) starting from a burst width of 4 µs
	video bandwidth 600 kHz	±(7 % of measured value + 0.40 W) starting from a burst width of 2 µs
20/s ≤ repetition rate < 100/s		plus ±(1.6 % of measured value + 0.15 W)
0.001 ≤ duty cycle < 0.1		plus ±0.10 W
Temperature coefficient	25 MHz to 40 MHz	0.50 %/K (0.022 dB/K)
	40 MHz to 1 GHz	0.35 %/K (0.015 dB/K)
Load matching		
Matching measurement range		
Return loss		0 dB to 23 dB
VSWR		> 1.15
Minimum forward power	specifications complied with ≥ 0.4 W	0.06 W
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 in)
Weight		0.65 kg (1.43 lb)



Error limits for matching measurements.



Power-handling capacity.

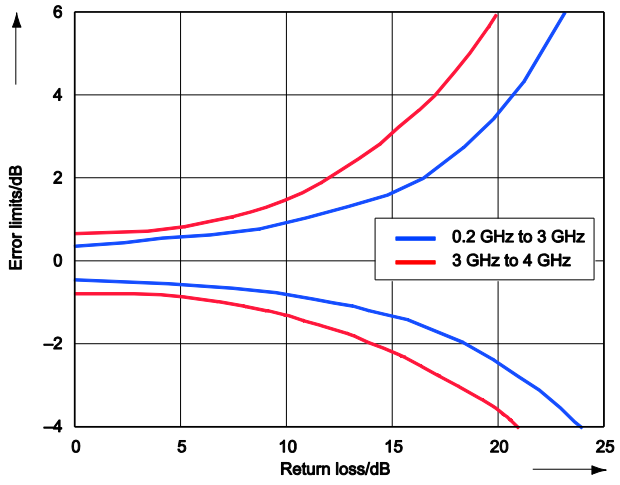
R&S®FSH-Z44 directional power sensor [7]

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 on page 15)	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	CF: ratio of peak envelope power to average power	
	CW, FM, PM, FSK, GMSK	30 mW to 300 W
	LTE, 3GPP WCDMA, cdmaOne, CDMA2000®, DAB, DVB-T	30 mW to 120 W
	other modulated signals	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)
	two 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) [8]
	cdmaOne, DAB	±1 % of measured value (±0.04 dB) [8]
	3GPP WCDMA, CDMA2000®	±2 % of measured value (±0.09 dB) [8]
	DVB-T	±2 % of measured value (±0.09 dB) [8]
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)
Max. peak envelope power		
Power measurement range		
DAB, DVB-T, cdmaOne, CDMA2000®, 3GPP WCDMA		4 W to 300 W
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
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 ≥ 0.1 and repetition rate ≥ 100/s	
	video bandwidth 4 kHz	±(3 % of measured value + 0.05 W) starting from a burst width of 100 µs
	video bandwidth 200 kHz	±(3 % of measured value + 0.20 W) starting from a burst width of 4 µs
	video bandwidth 4 MHz	±(7 % of measured value + 0.40 W) starting from a burst width of 1 µs
	20/s ≤ repetition rate < 100/s	plus ±(1.6 % of measured value + 0.15 W)
	0.001 ≤ duty cycle < 0.1	plus ±0.10 W
	burst width ≥ 0.5 µs	plus ±5 % of measured value
	burst width ≥ 0.2 µs	plus ±10 % of measured value
Range of typical measurement error of peak hold circuit	video bandwidth 4 MHz and standard selected on the R&S®FSH4/8/13/20	
	cdmaOne, DAB	±(5 % of measured value + 0.4 W)
	DVB-T, CDMA2000®, 3GPP WCDMA	±(15 % of measured value + 0.4 W)
Temperature coefficient	200 MHz to 300 MHz	0.50 %/K (0.022 dB/K)
	300 MHz to 4 GHz	0.35 %/K (0.015 dB/K)

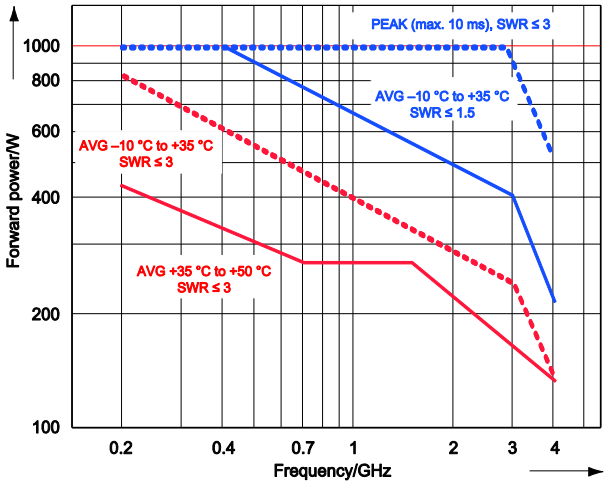
[7] Requires adapter cable R&S®FSH-Z144.

[8] If standard is selected on the R&S®Spectrum Rider.

Load matching		
Matching measurement range		
Return loss	200 MHz to 3 GHz	0 dB to +23 dB
VSWR	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	specifications complied with ≥ 0.2 W	0.03 W
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 in)
Weight		0.65 kg (1.43 lb)



Error limits for matching measurements.



Power-handling capacity.

Ordering information

Designation	Type	Order No.
Handheld Spectrum Analyzer, 5 kHz to 2 GHz	R&S®Spectrum Rider FPH	1321.1111.02
Accessories supplied		
Lithium-ion battery pack, USB cable, AC power supply with country specific adapters for EU, GB, US, AUS, CH, CD-ROM with R&S®Instrument View software and documentation, quick start guide, side strap		

Options

Designation	Type	Order No.
Spectrum Analyzer Frequency Upgrade 2 GHz to 3 GHz	R&S®FPH-B3	1321.0667.02
Spectrum Analyzer Frequency Upgrade 3 GHz to 4 GHz (requires R&S®FPH-B3)	R&S®FPH-B4	1321.0673.02
Spectrum Analyzer Preamplifier	R&S®FPH-B22	1321.0680.02
Analog Modulation Analysis AM/FM	R&S®FPH-K7	1321.0696.02
Power Sensor Support	R&S®FPH-K9	1321.0709.02
Interference Analysis	R&S®FPH-K15	1321.0715.02
Signal Strength Mapping	R&S®FPH-K16	1321.0615.02
Channel Power Meter	R&S®FPH-K19	1321.0721.02
Pulse Measurements with Power Sensor	R&S®FPH-K29	1321.0738.02
Receiver Mode and Channel Scanner	R&S®FPH-K43	1321.0621.02

Accessories

Designation	Type	Order No.
Soft Carrying Bag	R&S®HA-Z220	1309.6175.00
RF Cable (length: 1 m), DC to 8 GHz, armored, N male/N female connectors	R&S®FSH-Z320	1309.6600.00
RF Cable (length: 3 m), DC to 8 GHz, armored, N male/N female connectors	R&S®FSH-Z321	1309.6617.00
Matching Pad, 50/75 Ω, L section	R&S®RAM	0358.5414.02
Matching Pad, 50/75 Ω, series resistor 25 Ω	R&S®RAZ	0358.5714.02
Matching Pad, 50/75 Ω, L section, N to BNC	R&S®FSH-Z38	1300.7740.02
Adapter N (m) – BNC (f)		0118.2812.00
Adapter N (m) – N (m)		0092.6581.00
Adapter N (m) – SMA (f)		4012.5837.00
Adapter N (m) – 7/16 (f)		3530.6646.00
Adapter N (m) – 7/16 (m)		3530.6630.00
Adapter N (m) – FME (f)		4048.9790.00
Adapter BNC (m) – Banana (f)		0017.6742.00
Attenuator, 50 W, 20 dB, 50 Ω, DC to 6 GHz, N (f) – N (m)	R&S®RDL50	1035.1700.52
Attenuator, 100 W, 20 dB, 50 Ω, DC to 2 GHz, N (f) – N (m)	R&S®RBU100	1073.8495.20
Attenuator, 100 W, 30 dB, 50 Ω, DC to 2 GHz, N (f) – N (m)	R&S®RBU100	1073.8495.30
Battery Charger for R&S®HA-Z306 [9]	R&S®HA-Z303	1321.1328.02
Lithium-Ion Battery Pack, 6.4 Ah	R&S®HA-Z306	1321.1334.02
Headphones	R&S®FSH-Z36	1145.5838.02
GSM/UMTS/CDMA Antenna Magnetic Mount 850/900/1800/1900/2100 band, N connector	R&S®TS95A16	1118.6943.16
Logarithmic Periodic OEM Antenna, 700 MHz to 4 GHz	R&S®HA-Z350	1321.1405.02
Compact Probe Set for E and H Near-Field Measurements, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02
Preamplifier 3 GHz, 20 dB, Power Adapter 100 V to 230 V, for R&S®HZ-15	R&S®HZ-16	1147.2720.02
Spare USB Cable	R&S®HA-Z211	1309.6169.00
Spare Ethernet Cable	R&S®HA-Z210	1309.6152.00
Spare Power Supply, incl. mains plug for EU, GB,US, AUS, CH	R&S®HA-Z301	1321.1386.02
USB Adapter Cable for R&S®FSH-Z1/R&S®FSH-Z18	R&S®FSH-Z101	1164.6242.02
USB Adapter Cable for R&S®FSH-Z14/R&S®FSH-Z44	R&S®FSH-Z144	1145.5909.02
GPS receiver for R&S®Spectrum Rider	R&S®HA-Z340	1321.1392.02
Yagi Antenna, 824 MHz to 960 MHz	R&S®HA-Z900	1328.6283.02
Yagi Antenna, 1710 MHz to 1990 MHz	R&S®HA-Z1900	1328.6825.02
RF Cable for Yagi Antennas (length: 1m), DC to 6 GHz, N (m) / N (m)	R&S®HA-Z901	3526.2757.02
Carrying Bag for Yagi Antenna HA-Z900 or HA-Z1900	R&S®HA-Z902	1328.6883.02

[9] The battery charger is dedicated for charging an additional battery outside the instrument. The battery can be charged via the instrument as well.

Designation	Type	Order No.
Handheld Log-Periodic Antenna, 20 MHz to 7.5 GHz [10]	R&S®HL300	4097.3005.02
Active Directional Antenna, 20 MHz to 7.5 GHz, with mechanical compass	R&S®HE300	4067.5900.02
Active Directional Antenna, 20 MHz to 7.5 GHz, with GPS and electronics compass [10]	R&S®HE300	4067.5900.03
Loop Antenna for HE300, 9 kHz to 20 MHz	R&S®HE300HF	4067.6806.02
USB Adapter Cable for R&S®HE300 or R&S®HL300	R&S®HE300USB	4080.9440.02
Portable system for EMVU measurements		
Hard Case for Isotropic Antennas	R&S®TS-EMF	1158.9295.05
Isotropic Antenna, 30 MHz to 3 GHz for R&S®TS-EMF [11]	R&S®TSEMF-B1	1074.5719.02
Isotropic Antenna, 700 MHz to 6 GHz for R&S®TS-EMF [11]	R&S®TSEMF-B2	1074.5702.02
Isotropic Antenna, 9 kHz to 200 MHz for R&S®TS-EMF [11]	R&S®TSEMF-B3	1074.5690.02
USB Adapter Cable for Isotropic Antennas	R&S®TSEMF-CV	1158.9250.02

[10] Requires adapter cable R&S®HE300USB.

[11] Requires adapter cable R&S®TSEMF-CV.

R&S®NRP-Zxx power sensors supported by the R&S®Spectrum Rider [12]

Designation	Type	Order No.
Power Sensor, 10 MHz to 8 GHz	R&S®FSH-Z1	1155.4505.02
Power Sensor, 10 MHz to 18 GHz	R&S®FSH-Z18	1165.1909.02
Directional Power Sensor, 25 MHz to 1 GHz	R&S®FSH-Z14	1120.6001.02
Directional Power Sensor, 200 MHz to 4 GHz	R&S®FSH-Z44	1165.2305.02
Universal Power Sensor, 10 MHz to 8 GHz, 100 mW, 2-path	R&S®NRP-Z211	1417.0409.02
Universal Power Sensor, 10 MHz to 18 GHz, 100 mW, 2-path	R&S®NRP-Z221	1417.0309.02
Universal Power Sensor, 10 MHz to 18 GHz, 2 W	R&S®NRP-Z22	1137.7506.02
Universal Power Sensor, 10 MHz to 18 GHz, 15 W	R&S®NRP-Z23	1137.8002.02
Universal Power Sensor, 10 MHz to 18 GHz, 30 W	R&S®NRP-Z24	1137.8502.02
Universal Power Sensor, 10 MHz to 40 GHz, 100 mW	R&S®NRP-Z41	1171.8801.02
Thermal Power Sensor, 0 Hz to 18 GHz, 100 mW	R&S®NRP-Z51	1138.0005.02
Thermal Power Sensor, 0 Hz to 33 GHz, 100 mW	R&S®NRP-Z52	1138.0505.02
Thermal Power Sensor, 0 Hz to 40 GHz, 100 mW	R&S®NRP-Z55	1138.2008.02
Thermal Power Sensor, 0 Hz to 50 GHz, 100 mW	R&S®NRP-Z56	1171.8201.02
Thermal Power Sensor, 0 Hz to 67 GHz, 100 mW	R&S®NRP-Z57	1171.8401.02
Thermal Power Sensor, 0 Hz to 110 GHz, 100 mW	R&S®NRP-Z58	1173.7031.02
Universal Power Sensor, 10 MHz to 40 GHz, 100 mW	R&S®NRP-Z61	1171.7505.02
Wideband Power Sensor, 50 MHz to 18 GHz, 100 mW	R&S®NRP-Z81	1137.9009.02
Wideband Power Sensor, 50 MHz to 40 GHz, 100 mW (2.92 mm)	R&S®NRP-Z85	1411.7501.02
Wideband Power Sensor, 50 MHz to 40 GHz, 100 mW (2.40 mm)	R&S®NRP-Z86	1417.0109.40
Wideband Power Sensor, 50 MHz to 44 GHz, 100 mW (2.40 mm)	R&S®NRP-Z86	1417.0109.44
Average Power Sensor, 9 kHz to 6 GHz, 200 mW	R&S®NRP-Z91	1168.8004.02
Average Power Sensor, 9 kHz to 6 GHz, 2 W	R&S®NRP-Z92	1171.7005.02
Three-Path Diode Power Sensors, 100 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP8S	1419.0006.02
Three-Path Diode Power Sensors, 100 pW to 200 mW, 10 MHz to 8 GHz, LAN version	R&S®NRP8SN	1419.0012.02
Three-Path Diode Power Sensors, 100 pW to 200 mW, 10 MHz to 18 GHz	R&S®NRP18S	1419.0029.02
Three-Path Diode Power Sensors, 100 pW to 200 mW, 10 MHz to 18 GHz, LAN version	R&S®NRP18SN	1419.0035.02
Three-Path Diode Power Sensors, 100 pW to 200 mW, 10 MHz to 33 GHz	R&S®NRP33S	1419.0064.02
Three-Path Diode Power Sensors, 100 pW to 200 mW, 10 MHz to 33 GHz, LAN version	R&S®NRP33SN	1419.0070.02
R&S®NRP-Zxx power sensors require the following adapter cable for operation on the R&S®Spectrum Rider		
USB Adapter Cable (passive), length: 2 m (78.7 in), to connect R&S®NRP-Zxx S/SN power sensors to the R&S®Spectrum Rider	R&S®NRP-Z4	1146.8001.02
R&S®NRP power sensors require the following adapter cable for operation on the R&S®Spectrum Rider		
USB Interface Cable, length: 1.5 m (59 in), to connect R&S®NRP sensors to the R&S®Spectrum Rider	R&S®NRP-ZKU	1419.0658.03

[12] For average power measurements only.

Service options

Warranty		
Base unit		3 years
All other items		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	

Extended warranty with a term of one to four years (WE1 to WE4)
Repairs carried out during the contract term are free of charge [13]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration (CW1 to CW4)
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [13] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

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For product brochure, see PD 3607.2149.22 and www.rohde-schwarz.com.

[13] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

About Rohde&Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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R&S®Spectrum Rider FPH Handheld Spectrum Analyzer

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