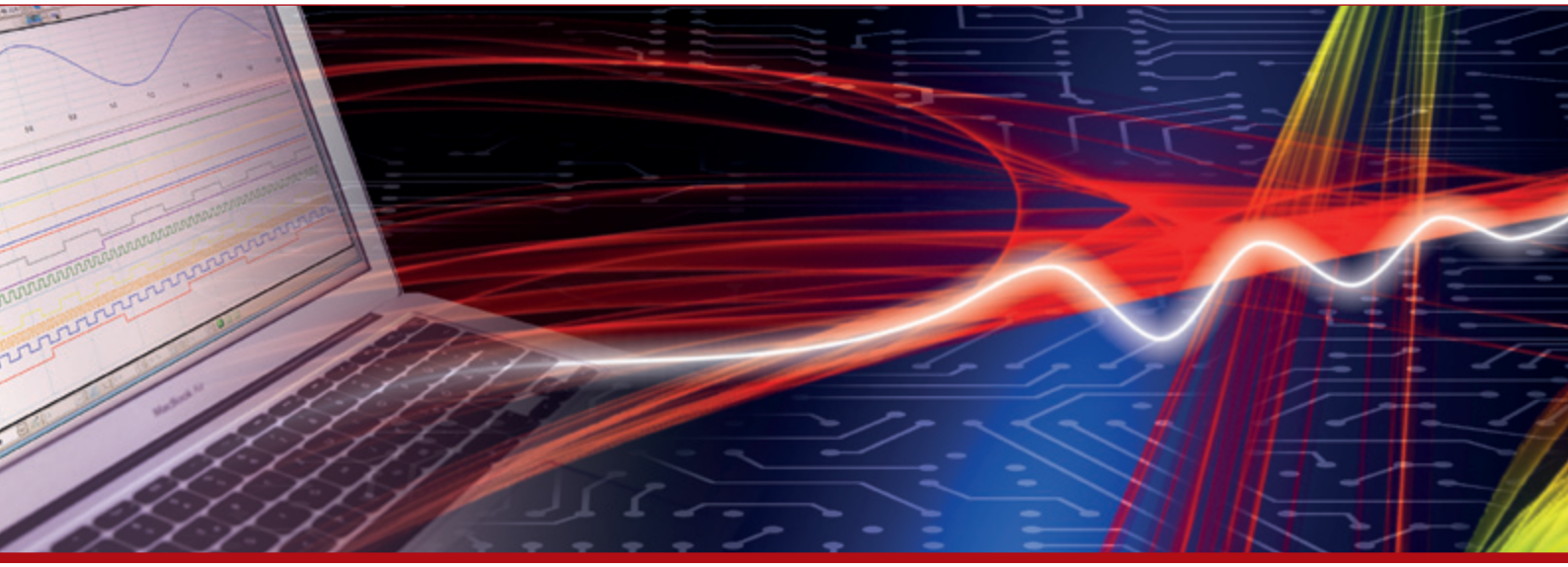
Product Datasheet - Technical Specifications



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R&S®SPECTRUM RIDER FPH HANDHELD SPECTRUM ANALYZER

Specifications

Specifications
Version 20.00

ROHDE&SCHWARZ
Make ideas real

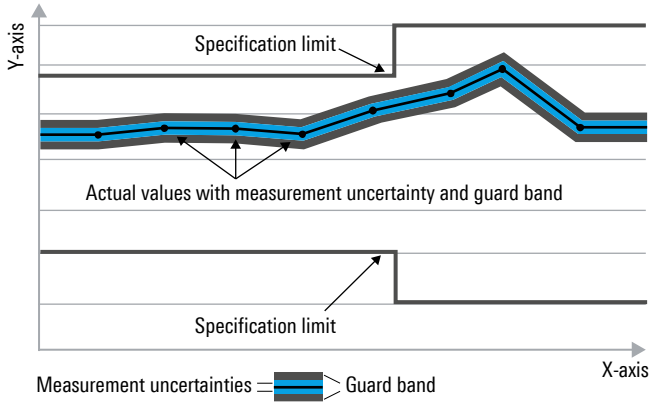
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours of storage at ambient temperature followed by 30 minutes of 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.



Non-traceable specifications with limits (n. trc.)
Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

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 designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

Specifications

Frequency

Frequency range	model .02	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
	model .06	5 kHz to 6 GHz
	with R&S®FPH-B8 option installed	5 kHz to 8 GHz
	models .13/.23 (with tracking generator)	5 kHz to 13.6 GHz
	with R&S®FPH-B20 option installed	5 kHz to 20 GHz
	models .26/.36 (with tracking generator)	5 kHz to 26.5 GHz
	with R&S®FPH-B31 option installed	5 kHz to 31 GHz
	models .44/.54 (with tracking generator)	5 kHz to 44 GHz
	models .06/.13/.26/.23/.36/.44/.54, with R&S®FPH-B29 option installed [1]	from 5 kHz down to 100 Hz
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		0.1 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	selectable	0.1 Hz (low), 0.1 mHz (high)
Count uncertainty	SNR > 25 dB	±(frequency × reference uncertainty + ½ (last digit))
Frequency span		0 Hz, 10 Hz to 2/3/4/6/8/13.6/20/26.5/31/44 GHz
Span uncertainty		1 % (nom.)

Spectral purity	frequency = 500 MHz	
SSB phase noise	models .02/.06/.13/.26	
	carrier offset = 30 kHz	< –88 dBc (1 Hz), –95 dBc (1 Hz) (typ.)
	carrier offset = 100 kHz	< –98 dBc (1 Hz), –105 dBc (1 Hz) (typ.)
	carrier offset = 1 MHz	< –118 dBc (1 Hz), –125 dBc (1 Hz) (typ.)
	models .23/.36/.44/.54	
	carrier offset = 30 kHz	< –88 dBc (1 Hz), –94 dBc (1 Hz) (typ.)
	carrier offset = 100 kHz	< –90 dBc (1 Hz), –96 dBc (1 Hz) (typ.)
	carrier offset = 1 MHz	< –115 dBc (1 Hz), –120 dBc (1 Hz) (typ.)

Sweep time

Sweep time	span = 0 Hz	56.8 µs to 3000 s [4]
	span ≥ 10 Hz, RBW ≤ 10 kHz, FFT [2, 4]	382 µs to 1500 s [3, 4]
	10 Hz ≤ span ≤ 600 MHz, swept [4]	20 ms to 1500 s [4]
	span > 600 MHz, swept [4]	(20 ms × span / 1600 MHz) to 1500 s [4]
Uncertainty	span = 0 Hz	1 % (nom.)
	span ≥ 10 Hz	3 % (nom.)

[1] For serial number ≥ 103100. Not applicable to R&S®Spectrum Rider FPH model .02.

[2] At specific spans and RBW ≤ 10 kHz, the device automatically switches to FFT mode to deliver faster sweep speeds.

[3] Time for data acquisition to perform FFT computation.

Bandwidths

Resolution bandwidths		
Range	–3 dB bandwidths	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	Gaussian type filters	< 5 (nom.)
Video filters		
Range	–3 dB bandwidths	1 Hz to 3 MHz in 1/3 sequence
	zero span [4]	5 MHz additionally

Level

Display range		displayed noise floor to +30 dBm
Maximum rated input level with RF attenuation ≥ 10 dB		
DC voltage		50 V
CW RF power	model .02	33 dBm (= 2 W)
	models .06/.13/.26	27 dBm (= 0.5 W)
	models .23/.36/.44/.54 [5]	25 dBm (= 316 mW)
Peak RF power (duration < 3 s)	model .02	36 dBm (= 4 W)
	models .06/.13/.26/.23/.36/.44/.54	30 dBm (= 1 W)
	models .23/.36/.44/.54 [5]	28 dBm (= 631 mW)
Maximum rated input level with RF attenuation < 10 dB		
DC voltage		50 V
CW RF power	model .02	20 dBm (= 100 mW)
	models .06/.13/.26/.23/.36/.44/.54	20 dBm (= 100 mW)
Peak RF power (duration < 3 s)	model .02	23 dBm (= 200 mW)
	models .06/.13/.26/.23/.36/.44/.54	23 dBm (= 200 mW)
Intermodulation		
Third order intercept (TOI)	intermodulation-free dynamic range, signal level = –20 dBm (both), RF attenuation = 0 dB, RF preamplifier = off	
	model .02	
	f = 1 GHz	+7 dBm (meas.)
	f = 2.4 GHz	+10 dBm (meas.)
	models .06/.13/.26	
	f = 1 GHz	+7 dBm (meas.)
	f = 4.5 GHz, 22 GHz	+8 dBm (meas.)
	f = 9.5 GHz, 26.5 GHz	+10 dBm (meas.)
	f = 12 GHz	+9 dBm (meas.)
	models .23/.36/.44/.54	
	f = 1 GHz	+10 dBm (meas.)
	f = 4.5 GHz, 9.5 GHz, 26.5 GHz, 32 GHz, 40 GHz	+11 dBm (meas.)
	f = 12 GHz	+8 dBm (meas.)
	f = 22 GHz	+9 dBm (meas.)
Second harmonic intercept (SHI)	RF attenuation = 0 dB, RF preamplifier = off, signal level = –40 dBm	
	model .02	
	f_{in} = 20 MHz to 1.5 GHz	–60 dBc (nom.)
	f_{in} = 1.5 GHz to 2 GHz	–80 dBc (nom.)
	models .06/.13/.26	
	f_{in} = 20 MHz to 1.5 GHz	–60 dBc (nom.)
	f_{in} = 1.5 GHz to 14 GHz	–90 dBc (nom.)
	f_{in} = 14 GHz to 15.4 GHz	–85 dBc (nom.)
	models .23/.36/.44/.54	
	f_{in} = 20 MHz to 1.5 GHz	–60 dBc (nom.)
	f_{in} = 1.5 GHz to 22 GHz	–90 dBc (nom.)

[4] Starting from firmware version V2.70.

[5] RF input maximum power level ratings derate to +20 dBm for frequencies below 50 MHz.

Displayed average noise level (DANL)	0 dB RF attenuation, termination 50 Ω, RBW = 1 kHz, VBW = 10 Hz, sample detector, logarithmic scaling, normalized to 1 Hz	
	model .02	
	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.)
	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.)
	models .06/.13/.26	
	preamplifier = off	
	1 MHz to 10 MHz	< –122 dBm, –130 dBm (typ.)
	10 MHz to 25 MHz	< –130 dBm, –135 dBm (typ.)
	25 MHz to 1 GHz	< –140 dBm, –145 dBm (typ.)
	1 GHz to 19 GHz	< –135 dBm, –140 dBm (typ.)
	19 GHz to 27 GHz	< –130 dBm, –138 dBm (typ.)
	27 GHz to 29 GHz	< –125 dBm, –130 dBm (typ.)
	29 GHz to 31 GHz	< –120 dBm, –123 dBm (typ.)
	preamplifier = on	
	1 MHz to 20 MHz	< –147 dBm, –152 dBm (typ.)
	20 MHz to 3 GHz	< –158 dBm, –162 dBm (typ.)
	3 GHz to 4.5 GHz	< –155 dBm, –158 dBm (typ.)
	4.5 GHz to 27 GHz	< –150 dBm, –155 dBm (typ.)
	27 GHz to 29 GHz	< –140 dBm, –145 dBm (typ.)
	29 GHz to 31 GHz	< –130 dBm, –133 dBm (typ.)
	models .23/.36/.44/.54	
	preamplifier = off	
	1 MHz to 10 MHz	< –125 dBm, –130 dBm (typ.)
	10 MHz to 25 MHz	< –130 dBm, –135 dBm (typ.)
	25 MHz to 2.7 GHz	< –140 dBm, –145 dBm (typ.)
	2.7 GHz to 8 GHz	< –135 dBm, –140 dBm (typ.)
	8 GHz to 29 GHz	< –133 dBm, –138 dBm (typ.)
	29 GHz to 38 GHz	< –130 dBm, –135 dBm (typ.)
	38 GHz to 44 GHz	< –125 dBm, –130 dBm (typ.)
	preamplifier = on	
	1 MHz to 20 MHz	< –147 dBm, –152 dBm (typ.)
	20 MHz to 3 GHz	< –157 dBm, –162 dBm (typ.)
	3 GHz to 4.2 GHz	< –150 dBm, –155 dBm (typ.)
	4.2 GHz to 8 GHz	< –153 dBm, –158 dBm (typ.)
	8 GHz to 27.5 GHz	< –145 dBm, –150 dBm (typ.)
	27.5 GHz to 38 GHz	< –140 dBm, –145 dBm (typ.)
	38 GHz to 44 GHz	< –130 dBm, –135 dBm (typ.)

Immunity to interference		
Image frequencies	model .02	
	f_{in} – 2 × 30.15 MHz	–70 dBc (nom.)
	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.)
	models .06/.13/.26	
	f_{in} – 2 × 30.15 MHz	–70 dBc (nom.)
	f_{in} – 2 × 830.15 MHz	–70 dBc (nom.)
	f < 4 GHz, f_{in} + 2 × 5582.35 MHz	–50 dBc (nom.)
	f < 4 GHz, f_{in} + 2 × 7230.15 MHz	–50 dBc (nom.)
	8 GHz ≤ f < 20 GHz, f_{in} + 2 × 4030.15 MHz	–70 dBc (nom.)
	8 GHz ≤ f < 20 GHz, f_{in} + 2 × 5582.35 MHz	–70 dBc (nom.)
	8 GHz ≤ f < 20 GHz, f_{in} + 2 × 7230.15 MHz	–70 dBc (nom.)
	20 GHz ≤ f < 26.5GHz, f_{in} – 2 × 4030.15 MHz	–40 dBc (nom.)
	26.5 GHz ≤ f < 28.5 GHz, f_{in} – 2 × 7230.15 MHz	–60 dBc (nom.)
	models .23/.36/.44/.54	
	f_{in} – 2 × 30.15 MHz	–70 dBc (nom.)
	f_{in} – 2 × 830.15 MHz	–70 dBc (nom.)
	f < 4.2 GHz, f_{in} + 2 × 5582.35 MHz	–70 dBc (nom.)
	f < 4.2 GHz, f_{in} + 2 × 7230.15 MHz	–70 dBc (nom.)
	8 GHz ≤ f < 28 GHz, f_{in} + 2 × 4030.15 MHz	–70 dBc (nom.)
	8 GHz ≤ f < 28 GHz, f_{in} + 2 × 5582.35 MHz	–70 dBc (nom.)
	8 GHz ≤ f < 28 GHz, f_{in} + 2 × 7230.15 MHz	–70 dBc (nom.)
	28 GHz ≤ f < 44 GHz, f_{in} – 2 × 5582.35 MHz	–70 dBc (nom.)
	28 GHz ≤ f < 44 GHz, f_{in} – 2 × 7230.15 MHz	–70 dBc (nom.)
Intermediate frequencies	model .02	
	30.15 MHz, 830.15 MHz, 4042.65 MHz	–60 dBc (nom.)
	models .06/.13/.26	
	30.15 MHz, 830.15 MHz, 4030.15 MHz	–60 dBc (nom.)
	5582.35 MHz	–50 dBc (nom.)
	7230.15 MHz	–40 dBc (nom.)
	models .23/.36/.44/.54	
	30.15 MHz	–50 dBc (nom.)
	830.15 MHz, 4030.15 MHz, 5582.35 MHz, 7230.15 MHz	–60 dBc (nom.)

Other interfering signals, signal level – RF attenuation < –30 dBm	model .02	
	f ≤ 3 GHz, spurious at f_{in} – 2021.325 MHz	–60 dBc (nom.)
	models .06/.13/.26	
	f < 4 GHz, spurious at f_{in} + 2791.175 MHz	–60 dBc (nom.)
	f < 4 GHz, spurious at f_{in} + 3615.075 MHz	–60 dBc (nom.)
	4 GHz ≤ f < 8 GHz, spurious at f_{in} – 415.075 MHz	–60 dBc (nom.)
	8 GHz ≤ f < 20 GHz, spurious at f_{in} + 2015.075 MHz	–60 dBc (nom.)
	8 GHz ≤ f < 20 GHz, spurious at f_{in} + 2791.175 MHz	–60 dBc (nom.)
	8 GHz ≤ f < 20 GHz, spurious at f_{in} + 3615.075 MHz	–60 dBc (nom.)
	20 GHz ≤ f < 26.5 GHz, spurious at f_{in} – 2015.075 MHz	–60 dBc (nom.)
	26.5 GHz ≤ f < 28.5 GHz, spurious at f_{in} – 3615.075 MHz	–60 dBc (nom.)
	models .23/.36/.44/.54	
	f < 4.2 GHz, spurious at f_{in} + 2791.175 MHz	–60 dBc (nom.)
	f < 4.2 GHz, spurious at f_{in} + 3615.075 MHz	–60 dBc (nom.)
	4.2 GHz ≤ f < 8 GHz, spurious at f_{in} – 415.075 MHz	–60 dBc (nom.)
	8 GHz ≤ f < 28 GHz, spurious at f_{in} + 2015.075 MHz	–60 dBc (nom.)
	8 GHz ≤ f < 28 GHz, spurious at f_{in} + 2791.075 MHz	–60 dBc (nom.)
	8 GHz ≤ f < 28 GHz, spurious at f_{in} + 3615.075 MHz	–60 dBc (nom.)
	28 GHz ≤ f < 44 GHz, spurious at f_{in} – 2791.075 MHz	–60 dBc (nom.)
	28 GHz ≤ f < 44 GHz, spurious at f_{in} – 3615.075 MHz	–60 dBc (nom.)
Other interfering signals, related to local oscillators	f = receive frequency	
	model .02	
	$\Delta f \geq 300$ kHz	–60 dBc (nom.)
	models .06/.13/.26	
	$\Delta f \geq 300$ kHz, $\Delta f \leq 1600$ MHz	–60 dBc (nom.) except otherwise stated
	$\Delta f \leq –422.5$ MHz, 21440 MHz ≤ f_{in} < 23400 MHz	–35 dBc (nom.)
	$\Delta f \geq 1115$ MHz, 23400 MHz ≤ f_{in} < 24400 MHz	–40 dBc (nom.)
	models .23/.36/.44/.54	
	$\Delta f \geq 300$ kHz	–60 dBc (nom.) except otherwise stated
	$\Delta f \geq 431$ MHz, 11500 MHz ≤ f_{in} ≤ 12000 MHz	–50 dBc (nom.)
	$\Delta f \leq –230$ MHz, 14000 MHz ≤ f_{in} ≤ 14300 MHz	–50 dBc (nom.)
	$\Delta f \geq 268$ MHz, 14700 MHz ≤ f_{in} ≤ 15500 MHz	–50 dBc (nom.)
	$\Delta f \leq –187$ MHz, 16500 MHz ≤ f_{in} ≤ 17300 MHz	–40 dBc (nom.)
	$\Delta f \leq –937$ MHz, 18900 MHz ≤ f_{in} ≤ 22000 MHz	–40 dBc (nom.)
	$\Delta f \leq –337$ MHz, 29900 MHz ≤ f_{in} ≤ 31000 MHz	–50 dBc (nom.)
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		4 [4]
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	temperature range from +20 °C to +30 °C	< 0.3 dB
Frequency response [6, 7]	temperature range from +20 °C to +30 °C	
	5 kHz ≤ f < 10 MHz	< 1.5 dB (nom.)
	10 MHz ≤ f < 8 GHz [8]	< 1 dB
	8 GHz ≤ f < 20 GHz	< 1.5 dB
	20 GHz ≤ f ≤ 44 GHz	< 2 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 [9]	< 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 < 8 GHz	0.74 dB
	8 GHz ≤ f < 20 GHz	1.04 dB
	20 GHz ≤ f ≤ 44 GHz	1.35 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
Gated trigger		
Mode available		frequency mode, channel mode, spectrogram mode
Gate delay		1 µs to 100 s, min. resolution: 1 µs (or 1 % of delay)
Gate length		1 µs to 100 s, min. resolution: 1 µs (or 1 % of gate length)

[6] For specifications with R&S®FPH-B100 option installed, see section R&S®FPH-B100 N type RF input connector for model .26.

[7] For RBW > 1 MHz, stated frequency responses are nominal values.

[8] 10 MHz to 50 MHz frequency response is < 0.5 dB after alignment with R&S®FPH-K35 option.

[9] For models .23/.36/.44/.54, the display nonlinearity is 0.3 dB (typ.) for –45 dB to –50 dB.

Inputs and outputs

RF input		
Impedance		50 Ω (nom.)
Connector	models .02/.06/.13/.23	type N, female
	models .26/.36	PC 3.5 mm male
	models .44/.54	PC 2.92 mm male
VSWR [6]	model .02	
	100 kHz ≤ f ≤ 1 GHz	< 1.5 (nom.)
	1 GHz < f ≤ 4 GHz	< 2 (nom.)
	models .06/.13/.26	
	100 kHz ≤ f ≤ 100 MHz	< 2 (nom.)
	100 MHz ≤ f ≤ 1 GHz	< 1.5 (nom.)
	1 GHz < f ≤ 31 GHz	< 2 (nom.)
	models .23/.36/.44/.54	
	100 kHz ≤ f < 4.2 GHz	< 1.5 (nom.)
	4.2 GHz ≤ f < 22 GHz	< 1.9 (nom.)
	22 GHz ≤ f < 44 GHz	< 2.2 (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)		adjustable from 0 V to > 100 mV (RMS)
Tracking generator (models .23/.36/.54 only)		
Frequency range		100 kHz to model maximum frequency (usable to 30 kHz)
Port output power	100 kHz ≤ f < 10 MHz	–10 dBm to –30 dBm in 1 dB steps (nom.)
	10 MHz ≤ f < 30 GHz	0 dBm to –25 dBm in 1 dB steps (nom.)
	30 GHz ≤ f < 32 GHz	–10 dBm to –30 dBm in 1 dB steps (nom.)
	32 GHz ≤ f < 40 GHz	0 dBm to –25 dBm in 1 dB steps (nom.)
	40 GHz ≤ f ≤ 44 GHz	–10 dBm to –30 dBm in 1 dB steps (nom.)
VSWR	100 kHz ≤ f < 150 MHz	< 2.0 (nom.)
	150 MHz ≤ f < 8 GHz	< 1.5 (nom.)
	8 GHz ≤ f < 34 GHz	< 1.7 (nom.)
	34 GHz ≤ f ≤ 44 GHz	< 2.0 (nom.)
External reference, external trigger		
Connector		BNC, 50 Ω
Mode		external reference, external 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		10BASE-T/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	not supplied	USB flash drive, USB version 1.1 or 2.0, size ≤ 32 Gbyte
		microSD card, size ≤ 32 Gbyte
Data storage	internal	> 160 instrument settings and traces
	on USB flash drive or microSD card, ≥ 1 Gbyte	> 10000 instrument settings and traces

Temperature range	operating	–10 °C to +55 °C
	storage	–20 °C to +50 °C
	battery charging mode	0 °C to +40 °C
Climatic loading	relative humidity	+25 °C/+55 °C at 95 % relative humidity, in line with EN 60068-2-30
	protection class	IP51
Altitude	operating with battery	15000 m (49210 ft)
	operating with AC to DC adapter	
	normal operation	3000 m (9840 ft)
	with derating [10]	4600 m (15091 ft)
Mechanical resistance		
Vibration	sinusoidal	in line with EN 60068-2-6, MIL-PRF-28800F Class 2
	random	in line with EN 60068-2-64, MIL-PRF-28800F Class 2
Shock		40 g shock spectrum, in line with MIL-STD-810G, method 516.6 procedure I, MIL-PRF-28800F
Power supply		
R&S®HA-Z301 AC power supply	input specifications	100 V to 240 V AC ± 10 %, 50 Hz to 60 Hz, 1.0 A to 0.5 A
	output specifications	15 V, 2.67 A, max. 40 W
	test marks	CE, UL, PSE, TUV
External DC voltage		15 V
Battery		lithium-ion battery
Capacity	R&S®HA-Z306 version E	72 Wh
	R&S®HA-Z306 version F and above	74.5 Wh
Voltage	R&S®HA-Z306 version E	11.25 V (nom.)
	R&S®HA-Z306 version F and above	10.8 V (nom.)
Operating time with new, fully charged battery	R&S®HA-Z306	
	model .02	8 h
	model .06	7 h
	models .13/.26	6 h
	models .23/.36/.44/.54	4.5 h
Charging time	instrument switched off or charge with R&S®HA-Z303 battery charger	3 h
	instrument switched on	5 h
Life time	charging cycles	> 75 % or more of its initial capacity after 300 charges/discharges
Power consumption	model .02	8 W (meas.)
	model .06	10 W (meas.)
	models .13/.26	12 W (meas.)
	models .23/.36/.44/.54	16 W (meas.)
Safety		IEC 61010-1:2010/AMD:2016, EN 61010-1:2010/A1:2019, UL. 61010-1 (third edition), CAN/CSA-C22.2 No. 61010-1:12
Test marks		VDE, cCSAus, KC
EMC	in line with European EMC Directive 2014/30/EU	• EN 61326-1 • EN 61326-1 table 2 (immunity, industrial) • CISPR 11/EN 55011/group 1 Class B (emission)
EU legislation	EU: in line with Data Act – Regulation (EU) 2023/2854	for details, see user documentation
Dimensions	W × H × D	202 mm × 294 mm × 76 mm (8.0 in × 11.6 in × 3 in)
Weight	models .02/.06/.13/.26	2.5 kg (5.5 lb)
	models .23/.36/.44/.54	3.2 kg (7.1 lb)
Recommended calibration interval		1 year

[10] Expected ambient temperature derating for the AC to DC adapter at this altitude.

R&S®FPH-B100 type N RF input connector for model .26

Frequency range	model .26 with R&S® FPH-B100 option (R&S®FPH-B31 option is not available in combination with R&S®FPH-B100 option)	5 kHz to 26.5 GHz
Frequency response	temperature range from +20 °C to +30 °C	
	5 kHz ≤ f < 10 MHz	< 1.5 dB (nom.)
	10 MHz ≤ f < 8 GHz	< 1 dB
	8 GHz ≤ f < 20 GHz	< 2 dB
	20 GHz ≤ f ≤ 26.5 GHz	< 2.5 dB
VSWR	100 kHz ≤ f ≤ 100 MHz	< 2 (nom.)
	100 MHz < f ≤ 1 GHz	< 1.5 (nom.)
	1 GHz < f ≤ 15.7 GHz	< 2 (nom.)
	15.7 GHz < f ≤ 26.5 GHz	< 2.7 (nom.)

R&S®FPH-B29 frequency extension from 5 kHz down to 100 Hz

Frequency range	models .06/.13/.26/.23/.36/.44/.54, with R&S®FPH-B29 option installed [1]	from 5 kHz down to 100 Hz
Frequency response	temperature range from +20 °C to +30 °C	
	100 Hz ≤ f < 5 kHz (only with R&S® FPH-B29 option installed, preamplifier off and attenuator settings ≤ 15 dB)	< 3.0 dB (nom.)
Displayed average noise level (DANL)	models .06/.13/.26	
	preamplifier = off	
	100 Hz to 100 kHz	–45 dBm (nom.)
	100 kHz to 1 MHz	–100 dBm (nom.)
	models .23/.36/.44/.54	
	preamplifier = off	
	100 Hz to 100 kHz	–45 dBm (nom.)
	100 kHz to 1 MHz	–100 dBm (nom.)

R&S®FPH-K7 modulation analysis

Measurement of analog modulation signals (AM, FM)		
Center frequency	model .02	500 kHz to 2 GHz
	with R&S®FPH-B3 option installed	500 kHz to 3 GHz
	with R&S®FPH-B3 and R&S®FPH-B4 options installed	500 kHz to 4 GHz
	model .06	500 kHz to 6 GHz
	with R&S®FPH-B8 option installed	500 kHz to 8 GHz
	models .13/.23 (with tracking generator)	500 kHz to 13.6 GHz
	with R&S®FPH-B20 option installed	500 kHz to 20 GHz
	models .26/.36 (with tracking generator)	500 kHz to 26.5 GHz
	with R&S®FPH-B31 option installed	500 kHz to 31 GHz
	models .44/.54 (with tracking generator)	500 kHz to 44 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, SNR
	FM	carrier power, carrier frequency offset, FM deviation, modulation frequency, THD, SINAD, SNR

Carrier power		
Carrier power measurement accuracy		add 0.2 dB, see level measurement uncertainty on page 14
Display resolution		0.1 dB

AF (modulation frequency) [11]		
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.)
Deemphasis	FM demodulation and demodulation bandwidths 200 kHz and 300 kHz	off, 50 µs, 75 µs (nom.)

AM demodulation [12]		
Measurement range	modulation depth	2 % to 100 % (nom.)
Modulation depth uncertainty		±4 % (nom.)
FM demodulation [13]		
Measurement range	frequency deviation	10 kHz to 400 kHz (nom.), max. 0.4 × demodulation bandwidth
Deviation uncertainty		±(0.04 × (AF + deviation)) (nom.)

Modulation distortion [11, 12, 13]		
Measurement functions		THD, SINAD
Measurement range	THD	–50 dB to 0 dB
	SINAD, AM	0 dB to 50 dB
	SINAD, FM	0 dB to 40 dB
Display resolution		0.1 dB
Measurement uncertainty		1 dB (nom.)
AF frequency range		20 Hz to 100 kHz (nom.)
Measurement of digital modulation signals (ASK, FSK)		
Center frequency	model .02	10 MHz to 2 GHz
	with R&S®FPH-B3 option installed	10 MHz to 3 GHz
	with R&S®FPH-B3 and R&S®FPH-B4 options installed	10 MHz to 4 GHz
	model .06	10 MHz to 6 GHz
	with R&S®FPH-B8 option installed	10 MHz to 8 GHz
	models .13/.23 (with tracking generator)	10 MHz to 13.6 GHz
	with R&S®FPH-B20 option installed	10 MHz to 20 GHz
	models .26/.36 (with tracking generator)	10 MHz to 26.5 GHz
	with R&S®FPH-B31 option installed	10 MHz to 31 GHz
	models .44/.54 (with tracking generator)	10 MHz to 44 GHz
Demodulation bandwidth		400 Hz to 2 MHz, auto-set corresponding to signal and demodulation bandwidth requirements
Display	ASK diagram	eye diagram, symbols, modulation depth, modulation error
	ASK numerical results	carrier power, carrier frequency error, modulation depth and index, modulation error
	FSK diagram	eye diagram, symbols, modulation deviation, modulation error
	FSK numerical results	carrier power, carrier frequency error, frequency deviation, modulation error, magnitude error

[11] Minimum and maximum detectable audio frequency and harmonics depend on the demodulation bandwidth and audio filter settings.

[12] 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.

[13] Modulation frequency: 1 kHz sine, FM deviation = 75 kHz, carrier level: 0 dBm, center frequency = 499 MHz, reference level: 6 dBm, demodulation bandwidth = 300 kHz, SNR > 60 dB, audio filter = 1/10, deemphasis = off.

Demodulation parameters		
Modulation and demodulation filters	transmit filter	root raised cosine (RRC)
		raised cosine (RC)
		Gaussian (GAUSS)
		unfiltered [14]
		(Measurement and reference filters are internally adapted to signal parameters.)
Points/symbol		4, 8, 16, internally adapted to signal parameters
Filter length		internally adapted to signal parameters
Demodulation length		20 symbols to max. 1000 symbols (at 4 points/symbol)

Carrier power		
Carrier power measurement accuracy		add 0.2 dB, see level measurement uncertainty on page 14
Carrier power range		–30 dBm to +20 dBm (nom.)
Display resolution		0.1 dB

ASK demodulation [15]		
Measurement range	symbol rate	1 kHz to 100 kHz (nom.)
	modulation depth	5 % to 95 % (nom.)
Modulation depth uncertainty		±4 % (nom.)
Display resolution		0.1 %

FSK demodulation [16]		
Measurement range	symbol rate	1 kHz to 100 kHz (nom.)
	frequency deviation	1 kHz to 400 kHz (nom.)
	symbol rate	
	1 kHz to 20 kHz	1 ≤ beta [17] ≤ 20
	> 20 kHz to 50 kHz	1 ≤ beta ≤ 8
	> 50 kHz to 100 kHz	1 ≤ beta ≤ 4
Accuracy		±4 % (nom.)
Display resolution		0.1 Hz

R&S®FPH-K19 channel power meter

Frequency range	model .02	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
	model .06	5 kHz to 6 GHz
	with R&S®FPH-B8 option installed	5 kHz to 8 GHz
	models .13/.23 (with tracking generator)	5 kHz to 13.6 GHz
	with R&S®FPH-B20 option installed	5 kHz to 20 GHz
	models .26/.36 (with tracking generator)	5 kHz to 26.5 GHz
	with R&S®FPH-B31 option installed	5 kHz to 31 GHz
	models .44/.54 (with tracking generator)	5 kHz to 44 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

[14] Reference signal is generated with a Gaussian filter, bandwidth time product (BT) = 3.

[15] ASK modulation index: 50 %, symbol rate = 100 kHz, Gaussian BT = 1.0, modulation signal: PSBS.

[16] FSK modulation deviation: 100 kHz, symbol rate = 100 kHz, Gaussian BT = 1.0, modulation signal: PRBS.

[17] Beta is the ratio of frequency deviation to symbol rate.

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

In combination with one of the R&S®NRP-Z81, R&S®NRP-Z85, R&S®NRP-Z86, R&S®NRP18P, R&S®NRP40P or R&S®NRP50P power sensors, the R&S®Spectrum Rider FPH supports measurements on pulsed signals. The achievable RF performance is documented in the specifications of the R&S®NRP-Z81, R&S®NRP-Z85, R&S®NRP-Z86, R&S®NRP18P, R&S®NRP40P and R&S®NRP50P 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 list below shows which measurements are supported by the R&S®FPH-K43.

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

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

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

R&S®FPH-K105 EMF measurement application

The list below shows which measurements are supported by the R&S®FPH-K105.

EMF measurements	R&S®FPH-K105
Mode	Spectrum – channel power (10 MHz)
Sequence of measurements	●
Fixed frequency	●
Set of frequencies	●
Results	
Table of field strengths	●
Total field strength	●
Calculation of exposition	●
EMF limit check	●
ISO antenna measurement	●

The setup of the EMF measurement sequence and the detailed result evaluation is done via the R&S®InstrumentView software.

R&S®FPH-K57 advanced gated trigger measurement

Advanced gated trigger measurements are used for analysis of periodic time domain signal measurements and applicable only to the below mentioned measurement modes.

Measurements	R&S®FPH-K57
Occupied bandwidth (OBW)	●
Spectrum emission mask (SEM)	●
Adjacent channel leakage ratio (ACLR)	●

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

Frequency range		see basic instrument
Resolution bandwidths	–3 dB bandwidths	30 kHz to 3 MHz in 1/3 sequence
Video bandwidths		30 kHz to 3 MHz in 1/3 sequence
Detectors		see basic instrument
Auto gate detection	minimum distance, high level to low level	10 dB

R&S®HA-Z350 log-periodic OEM antenna

Frequency range		700 MHz to 4 GHz
Gain		4 dBi (typ.)
Impedance		50 Ω
VSWR		< 1:2 (nom.)
Connector type		SMA (f)
Dimensions	W × H × 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-Z14 directional power sensor [18]

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 18)	100 W to 1000 W
Insertion loss		≤ 0.06 dB, typ. ≤ 0.04 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) [19]
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)

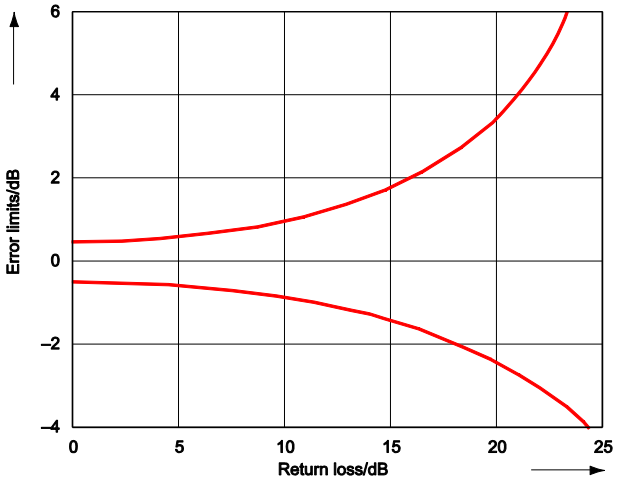
Maximum peak envelope power		
Power measurement range		
Video bandwidths	4 kHz	0.4 W to 300 W
	200 kHz	1 W to 300 W
	600 kHz	2 W to 300 W
Measurement uncertainty	same as for average power plus effect of peak hold circuit	+18 °C to +28 °C
Error limits of peak hold circuit for burst signals	duty cycle ≥ 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	±(7 % 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)

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

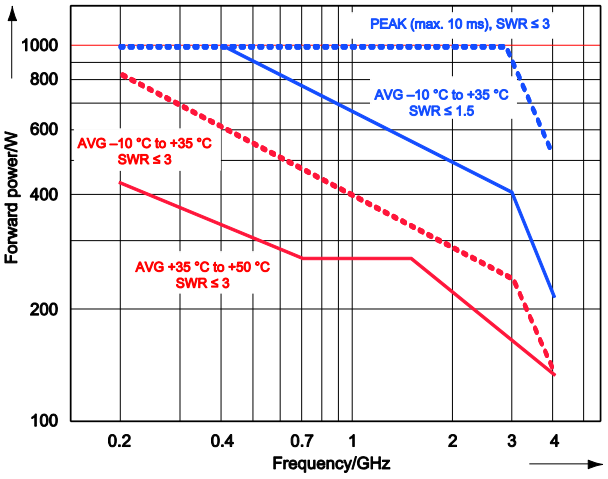
[19] If standard is selected on the R&S®Spectrum Rider FPH.

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 and weight		
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 [20]

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 20)	120 W to 1000 W
Insertion loss	200 MHz to 1.5 GHz	≤ 0.06 dB, typ. ≤ 0.04 dB
	1.5 GHz to 4 GHz	≤ 0.10 dB, typ. ≤ 0.07 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) [21]
	cdmaOne, DAB	±1 % of measured value (±0.04 dB) [21]
	3GPP WCDMA, CDMA2000	±2 % of measured value (±0.09 dB) [21]
	DVB-T	±2 % of measured value (±0.09 dB) [21]
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)

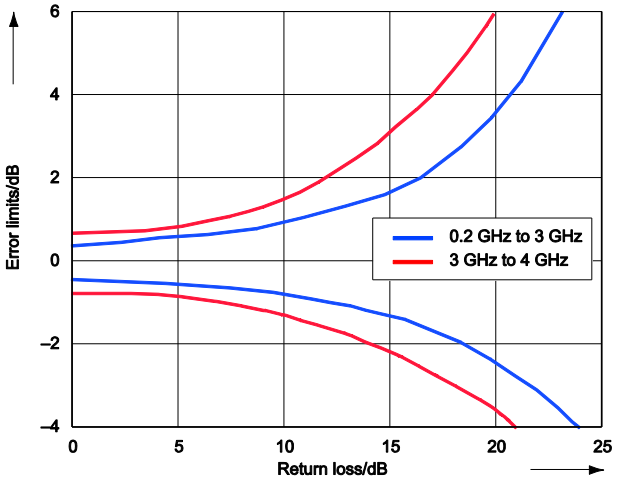
Maximum peak envelope power		
Power measurement range		
DAB, DVB-T, cdmaOne, CDMA2000, 3GPP WCDMA		4 W to 300 W
Other signals at video bandwidth	4 kHz	0.4 W to 300 W
	200 kHz	1 W to 300 W
	4 MHz	2 W to 300 W
Measurement uncertainty	+18 °C to +28 °C	same as for average power plus effect of peak hold circuit
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®FPH4/8/13/20	
	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)

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

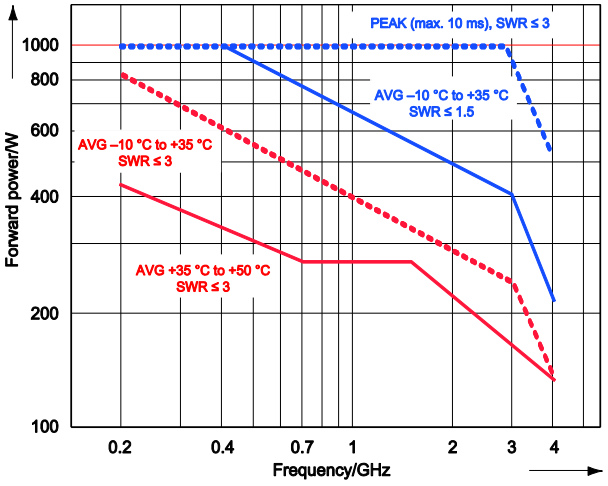
[21] If standard is selected on the R&S®Spectrum Rider FPH.

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 and weight		
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

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

- The specifications for part number 1321.1111.02 are equivalent to part number 1321.1111.52 and 1321.1111P01.
- The specifications for part number 1321.1111.06 are equivalent to part number 1321.1111.56 and 1321.1111P04.
- The specifications for part number 1321.1111.13 are equivalent to part number 1321.1111.63 and 1321.1111P06.
- The specifications for part number 1321.1111.26 are equivalent to part number 1321.1111.76 and 1321.1111P08.
- The specifications for part number 1321.1711.23 are equivalent to part number 1321.1711P02.
- The specifications for part number 1321.1711.36 are equivalent to part number 1321.1711P04.
- The specifications for part number 1321.1711.44 are equivalent to part number 1321.1711P06.
- The specifications for part number 1321.1711.36 are equivalent to part number 1321.1711P07.

Ordering information

Designation	Type	Order No.
Handheld spectrum analyzer, 5 kHz to 2 GHz	R&S®Spectrum Rider FPH	1321.1111.02
Handheld spectrum analyzer, 5 kHz to 6 GHz	R&S®Spectrum Rider FPH	1321.1111.06
Handheld spectrum analyzer, 5 kHz to 13.6 GHz	R&S®Spectrum Rider FPH	1321.1111.13
Handheld spectrum analyzer, 5 kHz to 26.5 GHz	R&S®Spectrum Rider FPH	1321.1111.26
Handheld spectrum analyzer, 5 kHz to 44 GHz	R&S®Spectrum Rider FPH	1321.1711.44
Handheld spectrum analyzer, 5 kHz to 13.6 GHz, with tracking generator	R&S®Spectrum Rider FPH	1321.1711.23
Handheld spectrum analyzer, 5 kHz to 26.5 GHz, with tracking generator	R&S®Spectrum Rider FPH	1321.1711.36
Handheld spectrum analyzer, 5 kHz to 44 GHz, with tracking generator	R&S®Spectrum Rider FPH	1321.1711.54
Accessories supplied		
Lithium-ion battery pack, USB cable, AC power supply with country specific adapters for EU, GB, US, AUS, CH, documentation, quick start guide, side strap		

Options

Designation	Type	Order No.
Spectrum analyzer frequency upgrade, 2 GHz to 3 GHz [22]	R&S®FPH-B3	1321.0667.02
Spectrum analyzer frequency upgrade, 3 GHz to 4 GHz [22] (requires R&S®FPH-B3)	R&S®FPH-B4	1321.0673.02
Spectrum analyzer frequency upgrade, 6 GHz to 8 GHz [23]	R&S®FPH-B8	1321.0767.02
Spectrum analyzer frequency upgrade, 13.6 GHz to 20 GHz [24]	R&S®FPH-B20	1321.0773.02
Spectrum analyzer frequency upgrade, 26.5 GHz to 31 GHz [25, 26]	R&S®FPH-B31	1321.0780.02
Spectrum analyzer preamplifier, 5 kHz to 4 GHz [22]	R&S®FPH-B22	1321.0680.02
Spectrum analyzer preamplifier, 5 kHz to 8 GHz [23]	R&S®FPH-B23	1321.0867.02
Spectrum analyzer preamplifier, 5 kHz to 20 GHz [24]	R&S®FPH-B24	1321.0850.02
Spectrum analyzer preamplifier, 5 kHz to 31 GHz [25]	R&S®FPH-B25	1321.0873.02
Spectrum analyzer preamplifier, 5 kHz to 44 GHz [27]	R&S®FPH-B26	1334.6600.02
Type N RF input connector, for model .26 (factory installed) [26]	R&S®FPH-B100	1321.0596.02
Spectrum analyzer 100 Hz frequency extension, from 5 kHz down to 100 Hz [28]	R&S®FPH-B29	1334.8532.02
Analog modulation analysis AM, FM, ASK, FSK	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
Advanced gated trigger measurements	R&S®FPH-K57	1321.1586.02
EMF measurement	R&S®FPH-K105	1334.6946.02

[22] Applicable only to base unit with order no. 1321.1111.02.
[23] Applicable only to base unit with order no. 1321.1111.06.
[24] Applicable only to base unit with order no. 1321.1111.13 and 1321.1711.23.
[25] Applicable only to base unit with order no. 1321.1111.26 and 1321.1711.36.
[26] R&S®FPH-B31 option is not available in combination with R&S®FPH-B100 option.
[27] Applicable only to base unit with order no. 1321.1711.44 and 1321.1711.54.
[28] For serial number ≥ 103100. Not applicable to R&S®Spectrum Rider FPH model .02.

Extras

Designation	Type	Order No.
Battery charger for R&S®HA-Z306 [29, 30]	R&S®HA-Z303	1321.1328.02
Battery charger [29]	R&S®HA-Z403	1321.1486.02
Lithium-ion battery pack, 6.4 Ah	R&S®HA-Z306	1321.1334.02
Spare power supply, incl. mains plug for EU, GB, US, AUS, CH	R&S®HA-Z301	1321.1386.02
Car adapter	R&S®HA-Z302	1321.1340.02
Carrying holster	R&S®HA-Z322	1321.1370.02
Rainproof carrying holster	R&S®HA-Z322	1321.1370.03
Soft carrying bag	R&S®HA-Z220	1309.6175.00
Hardcase	R&S®HA-Z321	1321.1357.02
Hard shell protective carrying case	R&S®RTH-Z4	1326.2774.02
Headphones	R&S®FSH-Z36	1145.5838.02
Spare USB cable	R&S®HA-Z211	1309.6169.00
Spare Ethernet cable	R&S®HA-Z210	1309.6152.00

Antennas and antenna accessories

Designation	Type	Order No.
Yagi antenna, 1710 MHz to 1990 MHz	R&S®HA-Z1900	1328.6825.02
Yagi antenna, 824 MHz to 960 MHz	R&S®HA-Z900	1328.6283.02
Telescopic antenna	R&S®CS-ZANT	4500.7470.00
RF cable, length: 1 m, DC to 6 GHz, type N (m) to type N (m) connectors	R&S®HA-Z901	3626.2757.02
Carrying bag, for R&S®HA-Z900 or R&S®HA-Z1900 Yagi antenna	R&S®HA-Z902	1328.6883.02
Basic handheld directional antenna (antenna handle)	R&S®HE400BC	4104.6000.04
RF cable, for R&S®HE400BC	R&S®HE400-KB	4104.7770.04
Handheld directional antenna (antenna handle)	R&S®HE400	4104.6000.02
Microwave handheld directional antenna (antenna handle)	R&S®HE400MW	4104.6000.03
Cable set, for R&S®HE400 and R&S®HE400MW (requires R&S®HE300USB)	R&S®HE400-K	4104.7770.02
HF antenna module, 8.3 kHz to 30 MHz	R&S®HE400HF	4104.8002.02
VHF antenna module, 20 MHz to 200 MHz	R&S®HE400VHF	4104.8202.02
UWB antenna module, 30 MHz to 6 GHz	R&S®HE400UWB	4104.6900.02
Log-periodic antenna module, 450 MHz to 8 GHz	R&S®HE400LP	4104.8402.02
Cellular antenna module, 700 MHz to 2500 MHz	R&S®HE400CEL	4104.7306.02
S band and C band antenna module, 1.7 GHz to 6 GHz	R&S®HE400SCB	4104.7606.02
SHF antenna module, 5 GHz to 20 GHz (with R&S®HE400BC and R&S®HE400MW antenna handle)	R&S®HE400SHF	4104.8602.02
USB adapter, for R&S®HE400 handheld directional antenna	R&S®HE300USB	4080.9440.02
Log-periodic OEM antenna, 700 MHz to 4 GHz	R&S®HA-Z350	1321.1405.02
Handheld directional antenna, with preamplifier	R&S®HE800-PA	4115.6006.02
Transport case, for R&S®HE800-PA	R&S®HE800Z1	4115.7660.02
RF cable, length: 1 m, DC to 8 GHz, armored, type N (m) to type N (f) connectors	R&S®FSH-Z320	1309.6600.00
RF cable, length: 3 m, DC to 8 GHz, armored, type N (m) to type N (f) connectors	R&S®FSH-Z321	1309.6617.00
GPS receiver, for R&S®Spectrum Rider FPH	R&S®HA-Z340	1321.1392.02
Portable EMF measurement system, hard case	R&S®TS-EMF	1158.9295.05
Isotropic antenna, 30 MHz to 3 GHz, for R&S®TS-EMF	R&S®TSEMF-B1	1074.5719.02
Isotropic antenna, 700 MHz to 6 GHz, for R&S®TS-EMF	R&S®TSEMF-B2	1074.5702.02
Isotropic antenna, 700 MHz to 8 GHz, for R&S®TS-EMF	R&S®TSEMF-B2E	1074.5702.03
Isotropic antenna, 9 kHz to 200 MHz, for R&S®TS-EMF	R&S®TSEMF-B3	1074.5690.02
Converter cable	R&S®TSEMF-CV	1158.9250.02
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, type N to BNC	R&S®FSH-Z38	1300.7740.02
Adapter type N (m) to BNC (f)		0118.2812.00
Adapter type N (m) to type N (m)		0092.6581.00
Adapter type N (m) to SMA (f)		4012.5837.00
Adapter type N (f) to SMA (f)		3692.7660.00

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

[30] Product to be discontinued and replaced by R&S®HA-Z403.

Designation	Type	Order No.
Adapter type N (m) to 7/16 (f)		3530.6646.00
Adapter type N (m) to 7/16 (m)		3530.6630.00
Adapter type N (m) to FME (f)		4048.9790.00
Adapter BNC (m) to banana (f)		0017.6742.00
Attenuator, 50 W, 20 dB, 50 Ω, DC to 6 GHz, type N (f) to type N (m)	R&S®RDL50	1035.1700.52
Attenuator, 100 W, 20 dB, 50 Ω, DC to 2 GHz, type N (f) to type N (m)	R&S®RBU100	1073.8495.20
Attenuator, 100 W, 30 dB, 50 Ω, DC to 2 GHz, type N (f) to type N (m)	R&S®RBU100	1073.8495.30
Compact probe set, for E and H near field measurements, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02
Near field probe set, H field	R&S®HZ-17	1339.4141.02
Preamplifier (3 GHz, 20 dB), power adapter (100 V to 230 V), for R&S®HZ-15	R&S®HZ-16	1147.2720.02
Omnidirectional antenna, for circular right-hand polarization, 18 GHz to 26.5 GHz	R&S®AC004R1	0749.3000.03
Omnidirectional antenna, for circular left-hand polarization, 18 GHz to 26.5 GHz	R&S®AC004L1	4078.4000.02
Omnidirectional antenna, for circular right-hand polarization, 26.5 GHz to 40 GHz	R&S®AC004R2	0749.3251.03
Omnidirectional antenna, for circular left-hand polarization, 26.5 GHz to 40 GHz	R&S®AC004L2	4078.5006.02
Broadband omnidirectional antenna, 800 MHz to 26.5 GHz	R&S®HF907OM	4070.3279.02
Standard gain horn antenna, 26 GHz to 40 GHz, mid band gain 20 dB, WR 28	R&S®FH-SG-40	3629.2393.02
Standard gain horn antenna adapter	R&S®HA-Z370	1334.8432.02
Mast and tripod adapter	R&S®KM011Z8	4090.4006.02
Wooden tripod	R&S®HZ-1	0837.2310.02
Test port cable, 0 Hz to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), length: 635 mm	R&S®ZV-Z93	1301.7595.25
Test port cable, 0 Hz to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), length: 965 mm	R&S®ZV-Z93	1301.7595.38
Test port cable, 0 Hz to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), length: 610 mm	R&S®ZV-Z193	1306.4520.24
Test port cable, 0 Hz to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), length: 914 mm	R&S®ZV-Z193	1306.4520.36
Test port cable, 0 Hz to 26.5 GHz, 3.5 mm (f) to 3.5 mm (m), length: 1524 mm	R&S®ZV-Z193	1306.4520.60
Test port cable, 0 Hz to 40 GHz, 2.92 mm (f) to 2.92 mm (m), length: 635 mm	R&S®ZV-Z95	1301.7608.25
Test port cable, 0 Hz to 40 GHz, 2.92 mm (f) to 2.92 mm (m), length: 965 mm	R&S®ZV-Z95	1301.7608.38
Test port cable, 0 Hz to 40 GHz, 2.92 mm (f) to 2.92 mm (m), length: 610 mm	R&S®ZV-Z195	1306.4536.24
Test port cable, 0 Hz to 40 GHz, 2.92 mm (f) to 2.92 mm (m), length: 914 mm	R&S®ZV-Z195	1306.4536.36

Power sensors supported by the R&S®FPH-K9 option [31]

Designation	Type	Order No.
Directional power sensors		
30 mW to 300 W, 25 MHz to 1 GHz	R&S®FSH-Z14	1444.0029.02
30 mW to 300 W, 200 MHz to 4 GHz	R&S®FSH-Z44	1444.0035.02
Universal power sensors		
1 nW to 100 mW, 10 MHz to 8 GHz, two-path	R&S®NRP-Z211	1417.0409.02
1 nW to 100 mW, 10 MHz to 18 GHz, two-path	R&S®NRP-Z221	1417.0309.02
Thermal power sensors		
300 nW to 100 mW, DC to 18 GHz	R&S®NRP18T	1424.6115.02
300 nW to 100 mW, DC to 33 GHz	R&S®NRP33T	1424.6138.02
300 nW to 100 mW, DC to 40 GHz	R&S®NRP40T	1424.6150.02
300 nW to 100 mW, DC to 50 GHz	R&S®NRP50T	1424.6173.02
300 nW to 100 mW, DC to 67 GHz	R&S®NRP67T	1424.6196.02
300 nW to 100 mW, DC to 110 GHz	R&S®NRP110T	1424.6215.02
Average power sensors		
100 pW to 200 mW, 8 kHz to 6 GHz	R&S®NRP6A	1424.6796.02
100 pW to 200 mW, 8 kHz to 18 GHz	R&S®NRP18A	1424.6815.02
Three-path diode power sensors		
100 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP8S	1419.0006.02
100 pW to 200 mW, 10 MHz to 18 GHz	R&S®NRP18S	1419.0029.02
100 pW to 200 mW, 10 MHz to 33 GHz	R&S®NRP33S	1419.0064.02
100 pW to 200 mW, 10 MHz to 40 GHz	R&S®NRP40S	1419.0041.02
100 pW to 200 mW, 10 MHz to 50 GHz	R&S®NRP50S	1419.0087.02
Pulse power sensors [32]		
1 nW to 100 mW, 50 MHz to 18 GHz	R&S®NRP18P	1444.1190.02
1 nW to 100 mW, 50 MHz to 40 GHz, 2.92 mm	R&S®NRP40P	1444.1290.02
1 nW to 100 mW, 50 MHz to 50 GHz, 2.40 mm	R&S®NRP50P	1444.1390.02
Wideband power sensors [32]		
1 nW to 100 mW, 50 MHz to 18 GHz [33]	R&S®NRP-Z81	1137.9009.02
1 nW to 100 mW, 50 MHz to 40 GHz, 2.92 mm [33]	R&S®NRP-Z85	1411.7501.02
1 nW to 100 mW, 50 MHz to 40 GHz, 2.40 mm [33]	R&S®NRP-Z86	1417.0109.40
1 nW to 100 mW, 50 MHz to 44 GHz, 2.40 mm [33]	R&S®NRP-Z86	1417.0109.44
R&S®NRP-Zxx power sensors require the following adapter cable for operation on the R&S®Spectrum Rider FPH		
USB adapter cable, for R&S®FSH-Z14/R&S®FSH-Z44 power sensors	R&S®FSH-Z144	1145.5909.02
USB adapter cable (passive), length: 2 m, to connect R&S®NRP-Zxx S/SN power sensors to the R&S®Spectrum Rider FPH	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 FPH		
USB interface cable, length: 1.5 m, to connect R&S®NRP sensors to the R&S®Spectrum Rider FPH	R&S®NRP-ZKU	1419.0658.03

Optical power sensors and accessories

Designation	Type	Order No.
OEM USB, optical power meter (Germanium)	R&S®HA-Z360	1334.5162.00
OEM USB, optical power meter (filtered InGaAs)	R&S®HA-Z361	1334.5179.00
SC adapter, for optical power meter	R&S®HA-Z362	1334.5185.00
LC adapter, for optical power meter	R&S®HA-Z363	1334.5191.00
2.5 mm universal adapter, for optical power meter	R&S®HA-Z364	1334.5204.00
1.25 mm universal adapter, for optical power meter	R&S®HA-Z365	1334.5210.00
Patch cord SC-LC SM, SX, length: 1 m	R&S®HA-Z366	1334.5227.00
Patch cord SC-SC SM, SX, length: 1 m	R&S®HA-Z367	1334.5233.00

[31] For average power measurements only.

[32] Peak power measurements supported by the R&S®FPH-K29 option.

[33] Product discontinued.

Warranty and service

Warranty		
Base unit		3 years
All other items		1 year
Service options		
	Service plans	**On demand**
Calibration	up to five years [34]	pay per calibration
Warranty and repair	up to five years [34]	standard price repair
Contact your Rohde & Schwarz sales office for further details.		

[34] For extended periods, contact your Rohde & Schwarz sales office.

Service at Rohde&Schwarz
You're in great hands

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

Rohde&Schwarz

The Rohde&Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test&measurement, technology systems and networks&cybersecurity. Founded more than 90 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and 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
Data without tolerance limits is not binding | Subject to change