

R&S® Spectrum Rider FPH Handheld Spectrum Analyzer Specifications



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Definitions

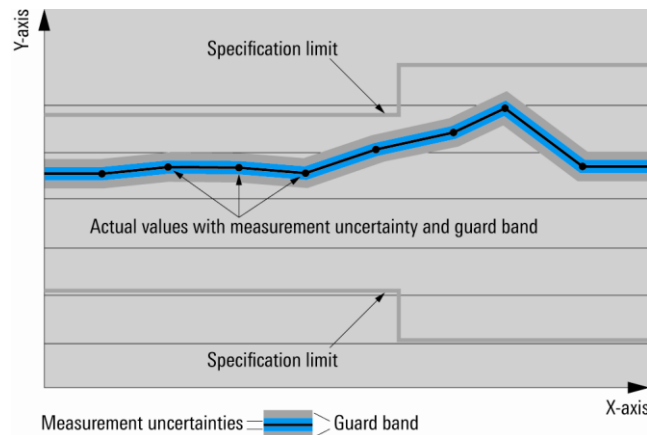
General

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 $<$, \leq , $>$, \geq , \pm , 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		$\pm(\text{marker frequency} \times \text{reference uncertainty} + 10\% \times \text{resolution bandwidth} + \frac{1}{2}(\text{span}/(\text{sweep points} - 1) + 1 \text{ Hz}))$
Number of sweep (trace) points		711
Marker tuning frequency step size		span/710
Frequency counter resolution		0.1 Hz
Count uncertainty	SNR > 25 dB	$\pm(\text{frequency} \times \text{reference uncertainty} + \frac{1}{2}(\text{last digit}))$
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		
Carrier offset		f = 500 MHz
	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
	$10 \text{ Hz} \leq \text{span} \leq 600 \text{ MHz}$	20 ms to 1000 s
	span > 600 MHz	$20 \text{ ms} \times \text{span} / 1600 \text{ MHz}$ 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	$1 \text{ Hz} \leq \text{RBW} \leq 300 \text{ kHz}$	< 5 % (nom.)
	$300 \text{ kHz} < \text{RBW} \leq 1 \text{ MHz}$	< 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 μ s	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	$f_{in} - 2 \times 30.15$ MHz	< -70 dBc (nom.)
	$f_{in} - 2 \times 830.15$ MHz	< -70 dBc (nom.)
	f < 3 GHz, $f_{in} - 2 \times 830.15$ MHz	< -70 dBc (nom.)
	f < 3 GHz, $f_{in} - 2 \times 4042.65$ MHz	-60 dBc (nom.)
	f \geq 3 GHz, $f_{in} + 2 \times 830.15$ 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 \leq 3 GHz, spurious at $f_{in} - 2021.325$ MHz	< -60 dBc (nom.)
Other interfering signals, related to local oscillators	$\Delta f \geq 300$ kHz	< -60 dBc (nom.)
	f = receive frequency	
Residual spurious response	input matched with 50 Ω , without input signal, RBW \leq 30 kHz, f \geq 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, dB μ V, 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 x H x D	202 mm x 294 mm x 76 mm (8.0 in x 11.6 in x 3 in)
Weight		2.5 kg (5.5 lb)
Recommended calibration interval		1 year

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®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 x 200 mm x 25 mm (13.3 in x 7.9 in x 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	

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
Power Sensor Support	R&S®FPH-K9	1321.0709.02
Channel Power Meter	R&S®FPH-K19	1321.0721.02
Pulse Measurements with Power Sensor	R&S®FPH-K29	1321.0738.02

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 ¹	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

¹ The battery charger is dedicated for charging an additional battery outside the instrument. The battery can be charged via the instrument as well.

R&S®NRP-Zxx power sensors supported by the R&S®Spectrum Rider ²

Designation	Type	Order No.
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

Service options

Service 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 ³. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

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 ⁶ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

For product brochure, see PD 5214.0482.12 and www.rohde-schwarz.com.

² For average power measurements only.

³ 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, this independent company has an extensive sales and service network and is present in more than 70 countries. The electronics group is among the world market leaders in its established business fields. The company is headquartered in Munich, Germany. It also has regional headquarters in Singapore and Columbia, Maryland, USA, to manage its operations in these regions.

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

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