

# R&S® SPECTRUM RIDER FPH HANDHELD SPECTRUM ANALYZER

## Specifications

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Specifications  
Version 21.00

**ROHDE & SCHWARZ**

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# 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  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , 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.



## 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           |
| Frequency resolution | 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 <sup>1</sup> | from 5 kHz down to 100 Hz |
| Frequency resolution |                                                                                    | 1 Hz                      |

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

|                                   |             |                                                                                                                                                                                     |
|-----------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency readout                 |             |                                                                                                                                                                                     |
| Marker resolution                 |             | 0.1 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      | selectable  | 0.1 Hz (low), 0.1 mHz (high)                                                                                                                                                        |
| 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 2/3/4/6/8/13.6/20/26.5/31/44 GHz                                                                                                                                     |
| Span uncertainty                  |             | 1 % (nom.)                                                                                                                                                                          |

|                 |                          |                                           |
|-----------------|--------------------------|-------------------------------------------|
| Spectral purity |                          |                                           |
| SSB phase noise | frequency = 500 MHz      |                                           |
|                 | 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 $\mu$ s to 3000 s <sup>4</sup>              |
|             | span $\geq$ 10 Hz, RBW $\leq$ 10 kHz, FFT <sup>2, 4</sup> | 382 $\mu$ s to 1500 s <sup>3, 4</sup>            |
|             | 10 Hz $\leq$ span $\leq$ 600 MHz, swept <sup>4</sup>      | 20 ms to 1500 s <sup>4</sup>                     |
|             | span > 600 MHz, swept <sup>4</sup>                        | (20 ms × span / 1600 MHz) to 1500 s <sup>4</sup> |
| Uncertainty | span = 0 Hz                                               | 1 % (nom.)                                       |
|             | span $\geq$ 10 Hz                                         | 3 % (nom.)                                       |

<sup>1</sup> For serial number  $\geq$  103100. Not applicable to R&S®Spectrum Rider FPH model .02.

<sup>2</sup> At specific spans and RBW  $\leq$  10 kHz, the device automatically switches to FFT mode to deliver faster sweep speeds.

<sup>3</sup> 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     | $1 \text{ Hz} \leq \text{RBW} \leq 300 \text{ kHz}$ | < 5 % (nom.)                  |
|                        | $300 \text{ kHz} < \text{RBW} \leq 1 \text{ MHz}$   | < 10 % (nom.)                 |
| Selectivity 60 dB:3 dB | Gaussian type filters                               | < 5 (nom.)                    |
| Video filters          |                                                     |                               |
| Range                  | –3 dB bandwidths                                    | 1 Hz to 3 MHz in 1/3 sequence |
|                        | zero span <sup>4</sup>                              | 5 MHz additionally            |

## Level

| Display range                                                      |                                                                                                                    | displayed noise floor to +30 dBm |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Maximum rated input level with RF attenuation $\geq 10 \text{ dB}$ |                                                                                                                    |                                  |
| 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 <sup>5</sup>                                                                                | 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 <sup>5</sup>                                                                                | 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),<br>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,<br>32 GHz, 40 GHz                                                                  | +11 dBm (meas.)                  |
|                                                                    | f = 12 GHz                                                                                                         | +8 dBm (meas.)                   |
|                                                                    | f = 22 GHz                                                                                                         | +9 dBm (meas.)                   |
|                                                                    | RF attenuation = 0 dB, RF preamplifier = off, signal level = –40 dBm                                               |                                  |
|                                                                    | model .02                                                                                                          |                                  |
|                                                                    | f <sub>in</sub> = 20 MHz to 1.5 GHz                                                                                | –60 dBc (nom.)                   |
|                                                                    | f <sub>in</sub> = 1.5 GHz to 2 GHz                                                                                 | –80 dBc (nom.)                   |
| Second harmonic intercept (SHI)                                    | models .06/.13/.26                                                                                                 |                                  |
|                                                                    | f <sub>in</sub> = 20 MHz to 1.5 GHz                                                                                | –60 dBc (nom.)                   |
|                                                                    | f <sub>in</sub> = 1.5 GHz to 14 GHz                                                                                | –90 dBc (nom.)                   |
|                                                                    | f <sub>in</sub> = 14 GHz to 15.4 GHz                                                                               | –85 dBc (nom.)                   |
|                                                                    | models .23/.36/.44/.54                                                                                             |                                  |
|                                                                    | f <sub>in</sub> = 20 MHz to 1.5 GHz                                                                                | –60 dBc (nom.)                   |
|                                                                    | f <sub>in</sub> = 1.5 GHz to 22 GHz                                                                                | –90 dBc (nom.)                   |

<sup>4</sup> Starting from firmware version V2.70.

<sup>5</sup> 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 $\Omega$ , 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 30.4 GHz                                                                                                                | < -130 dBm, -133 dBm (typ.) |
|                                      | 30.4 GHz to 31 GHz                                                                                                                | < -127 dBm, -130 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                                                                                |                |
|                          | $f_{in} - 2 \times 30.15 \text{ MHz}$                                                    | -70 dBc (nom.) |
|                          | $f_{in} - 2 \times 830.15 \text{ MHz}$                                                   | -70 dBc (nom.) |
|                          | $f < 3 \text{ GHz}, f_{in} - 2 \times 4042.65 \text{ MHz}$                               | -60 dBc (nom.) |
|                          | $f \geq 3 \text{ GHz}, f_{in} + 2 \times 830.15 \text{ MHz}$                             | -60 dBc (nom.) |
|                          | models .06/.13/.26                                                                       |                |
|                          | $f_{in} - 2 \times 30.15 \text{ MHz}$                                                    | -70 dBc (nom.) |
|                          | $f_{in} - 2 \times 830.15 \text{ MHz}$                                                   | -70 dBc (nom.) |
|                          | $f < 4 \text{ GHz}, f_{in} + 2 \times 5582.35 \text{ MHz}$                               | -50 dBc (nom.) |
|                          | $f < 4 \text{ GHz}, f_{in} + 2 \times 7230.15 \text{ MHz}$                               | -50 dBc (nom.) |
|                          | $8 \text{ GHz} \leq f < 20 \text{ GHz},$<br>$f_{in} + 2 \times 4030.15 \text{ MHz}$      | -70 dBc (nom.) |
|                          | $8 \text{ GHz} \leq f < 20 \text{ GHz},$<br>$f_{in} + 2 \times 5582.35 \text{ MHz}$      | -70 dBc (nom.) |
|                          | $8 \text{ GHz} \leq f < 20 \text{ GHz},$<br>$f_{in} + 2 \times 7230.15 \text{ MHz}$      | -70 dBc (nom.) |
|                          | $20 \text{ GHz} \leq f < 26.5 \text{ GHz},$<br>$f_{in} - 2 \times 4030.15 \text{ MHz}$   | -40 dBc (nom.) |
|                          | $26.5 \text{ GHz} \leq f < 28.5 \text{ GHz},$<br>$f_{in} - 2 \times 7230.15 \text{ MHz}$ | -60 dBc (nom.) |
|                          | models .23/.36/.44/.54                                                                   |                |
|                          | $f_{in} - 2 \times 30.15 \text{ MHz}$                                                    | -70 dBc (nom.) |
|                          | $f_{in} - 2 \times 830.15 \text{ MHz}$                                                   | -70 dBc (nom.) |
|                          | $f < 4.2 \text{ GHz}, f_{in} + 2 \times 5582.35 \text{ MHz}$                             | -70 dBc (nom.) |
|                          | $f < 4.2 \text{ GHz}, f_{in} + 2 \times 7230.15 \text{ MHz}$                             | -70 dBc (nom.) |
|                          | $8 \text{ GHz} \leq f < 28 \text{ GHz},$<br>$f_{in} + 2 \times 4030.15 \text{ MHz}$      | -70 dBc (nom.) |
|                          | $8 \text{ GHz} \leq f < 28 \text{ GHz},$<br>$f_{in} + 2 \times 5582.35 \text{ MHz}$      | -70 dBc (nom.) |
|                          | $8 \text{ GHz} \leq f < 28 \text{ GHz},$<br>$f_{in} + 2 \times 7230.15 \text{ MHz}$      | -70 dBc (nom.) |
|                          | $28 \text{ GHz} \leq f < 44 \text{ GHz},$<br>$f_{in} - 2 \times 5582.35 \text{ MHz}$     | -70 dBc (nom.) |
|                          | $28 \text{ GHz} \leq f < 44 \text{ GHz},$<br>$f_{in} - 2 \times 7230.15 \text{ MHz}$     | -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,<br>5582.35 MHz, 7230.15 MHz                                     | -60 dBc (nom.) |

|                                                                       |                                                                                                                                                |                                        |
|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Other interfering signals,<br>signal level – RF attenuation < –30 dBm | model .02                                                                                                                                      |                                        |
|                                                                       | $f \leq 3 \text{ GHz}$ , spurious at $f_{in} - 2021.325 \text{ MHz}$                                                                           | –60 dBc (nom.)                         |
|                                                                       | models .06/.13/.26                                                                                                                             |                                        |
|                                                                       | $f < 4 \text{ GHz}$ , spurious at $f_{in} + 2791.175 \text{ MHz}$                                                                              | –60 dBc (nom.)                         |
|                                                                       | $f < 4 \text{ GHz}$ , spurious at $f_{in} + 3615.075 \text{ MHz}$                                                                              | –60 dBc (nom.)                         |
|                                                                       | $4 \text{ GHz} \leq f < 8 \text{ GHz}$ , spurious at $f_{in} - 415.075 \text{ MHz}$                                                            | –60 dBc (nom.)                         |
|                                                                       | $8 \text{ GHz} \leq f < 20 \text{ GHz}$ , spurious at $f_{in} + 2015.075 \text{ MHz}$                                                          | –60 dBc (nom.)                         |
|                                                                       | $8 \text{ GHz} \leq f < 20 \text{ GHz}$ , spurious at $f_{in} + 2791.175 \text{ MHz}$                                                          | –60 dBc (nom.)                         |
|                                                                       | $8 \text{ GHz} \leq f < 20 \text{ GHz}$ , spurious at $f_{in} + 3615.075 \text{ MHz}$                                                          | –60 dBc (nom.)                         |
|                                                                       | $20 \text{ GHz} \leq f < 26.5 \text{ GHz}$ , spurious at $f_{in} - 2015.075 \text{ MHz}$                                                       | –60 dBc (nom.)                         |
|                                                                       | $26.5 \text{ GHz} \leq f < 28.5 \text{ GHz}$ , spurious at $f_{in} - 3615.075 \text{ MHz}$                                                     | –60 dBc (nom.)                         |
|                                                                       | models .23/.36/.44/.54                                                                                                                         |                                        |
|                                                                       | $f < 4.2 \text{ GHz}$ , spurious at $f_{in} + 2791.175 \text{ MHz}$                                                                            | –60 dBc (nom.)                         |
|                                                                       | $f < 4.2 \text{ GHz}$ , spurious at $f_{in} + 3615.075 \text{ MHz}$                                                                            | –60 dBc (nom.)                         |
|                                                                       | $4.2 \text{ GHz} \leq f < 8 \text{ GHz}$ , spurious at $f_{in} - 415.075 \text{ MHz}$                                                          | –60 dBc (nom.)                         |
|                                                                       | $8 \text{ GHz} \leq f < 28 \text{ GHz}$ , spurious at $f_{in} + 2015.075 \text{ MHz}$                                                          | –60 dBc (nom.)                         |
|                                                                       | $8 \text{ GHz} \leq f < 28 \text{ GHz}$ , spurious at $f_{in} + 2791.075 \text{ MHz}$                                                          | –60 dBc (nom.)                         |
|                                                                       | $8 \text{ GHz} \leq f < 28 \text{ GHz}$ , spurious at $f_{in} + 3615.075 \text{ MHz}$                                                          | –60 dBc (nom.)                         |
|                                                                       | $28 \text{ GHz} \leq f < 44 \text{ GHz}$ , spurious at $f_{in} - 2791.075 \text{ MHz}$                                                         | –60 dBc (nom.)                         |
|                                                                       | $28 \text{ GHz} \leq f < 44 \text{ GHz}$ , spurious at $f_{in} - 3615.075 \text{ MHz}$                                                         | –60 dBc (nom.)                         |
| Other interfering signals, related to local oscillators               | $f = \text{receive frequency}$                                                                                                                 |                                        |
|                                                                       | model .02                                                                                                                                      |                                        |
|                                                                       | $\Delta f \geq 300 \text{ kHz}$                                                                                                                | –60 dBc (nom.)                         |
|                                                                       | models .06/.13/.26                                                                                                                             |                                        |
|                                                                       | $\Delta f \geq 300 \text{ kHz}$ , $\Delta f \leq 1600 \text{ MHz}$                                                                             | –60 dBc (nom.) except otherwise stated |
|                                                                       | $\Delta f \leq -422.5 \text{ MHz}$ ,<br>$21440 \text{ MHz} \leq f_{in} < 23400 \text{ MHz}$                                                    | –35 dBc (nom.)                         |
|                                                                       | $\Delta f \geq 1115 \text{ MHz}$ ,<br>$23400 \text{ MHz} \leq f_{in} < 24400 \text{ MHz}$                                                      | –40 dBc (nom.)                         |
|                                                                       | models .23/.36/.44/.54                                                                                                                         |                                        |
|                                                                       | $\Delta f \geq 300 \text{ kHz}$                                                                                                                | –60 dBc (nom.) except otherwise stated |
|                                                                       | $\Delta f \geq 431 \text{ MHz}$ ,<br>$11500 \text{ MHz} \leq f_{in} \leq 12000 \text{ MHz}$                                                    | –50 dBc (nom.)                         |
|                                                                       | $\Delta f \leq -230 \text{ MHz}$ ,<br>$14000 \text{ MHz} \leq f_{in} \leq 14300 \text{ MHz}$                                                   | –50 dBc (nom.)                         |
|                                                                       | $\Delta f \geq 268 \text{ MHz}$ ,<br>$14700 \text{ MHz} \leq f_{in} \leq 15500 \text{ MHz}$                                                    | –50 dBc (nom.)                         |
|                                                                       | $\Delta f \leq -187 \text{ MHz}$ ,<br>$16500 \text{ MHz} \leq f_{in} \leq 17300 \text{ MHz}$                                                   | –40 dBc (nom.)                         |
|                                                                       | $\Delta f \leq -937 \text{ MHz}$ ,<br>$18900 \text{ MHz} \leq f_{in} \leq 22000 \text{ MHz}$                                                   | –40 dBc (nom.)                         |
|                                                                       | $\Delta f \leq -337 \text{ MHz}$ ,<br>$29900 \text{ MHz} \leq f_{in} \leq 31000 \text{ MHz}$                                                   | –50 dBc (nom.)                         |
| Residual spurious response                                            | input matched with $50 \Omega$ ,<br>without input signal, $\text{RBW} \leq 30 \text{ kHz}$ ,<br>$f \geq 3 \text{ MHz}$ , RF attenuation = 0 dB |                                        |
|                                                                       | –90 dBm (nom.)                                                                                                                                 |                                        |

|                                        |                                                                                                                 |                                                  |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| <b>Level display</b>                   |                                                                                                                 |                                                  |
| 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 <sup>4</sup>                                   |
| 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                            |
| <b>Level measurement uncertainty</b>   |                                                                                                                 |                                                  |
| Absolute level uncertainty at 100 MHz  | temperature range from +20 °C to +30 °C                                                                         | < 0.3 dB                                         |
| Frequency response <sup>6, 7</sup>     | temperature range from +20 °C to +30 °C                                                                         |                                                  |
|                                        | 5 kHz ≤ f < 10 MHz                                                                                              | < 1.5 dB (nom.)                                  |
|                                        | 10 MHz ≤ f < 8 GHz <sup>8</sup>                                                                                 | < 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 <sup>9</sup>                                             | < 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

|                                  |                       |                                                              |
|----------------------------------|-----------------------|--------------------------------------------------------------|
| <b>Trigger</b>                   |                       |                                                              |
| 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                                                        |
| <b>Gated trigger</b>             |                       |                                                              |
| 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) |

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

<sup>7</sup> For RBW > 1 MHz, stated frequency responses are nominal values.

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

<sup>9</sup> For models .23/.36/.44/.54, the display nonlinearity is 0.3 dB (typ.) for −45 dB to −50 dB.

## Inputs and outputs

|                                                     |                                   |                                                       |
|-----------------------------------------------------|-----------------------------------|-------------------------------------------------------|
| <b>RF input</b>                                     |                                   |                                                       |
| Impedance                                           |                                   | 50 $\Omega$ (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 <sup>6</sup>                                   | model .02                         |                                                       |
|                                                     | 100 kHz $\leq f \leq$ 1 GHz       | < 1.5 (nom.)                                          |
|                                                     | 1 GHz < f $\leq$ 4 GHz            | < 2 (nom.)                                            |
|                                                     | models .06/.13/.26                |                                                       |
|                                                     | 100 kHz $\leq f \leq$ 100 MHz     | < 2 (nom.)                                            |
|                                                     | 100 MHz $\leq f \leq$ 1 GHz       | < 1.5 (nom.)                                          |
|                                                     | 1 GHz < f $\leq$ 31 GHz           | < 2 (nom.)                                            |
|                                                     | models .23/.36/.44/.54            |                                                       |
|                                                     | 100 kHz $\leq f <$ 4.2 GHz        | < 1.5 (nom.)                                          |
|                                                     | 4.2 GHz $\leq f <$ 22 GHz         | < 1.9 (nom.)                                          |
|                                                     | 22 GHz $\leq f <$ 44 GHz          | < 2.2 (nom.)                                          |
| Input attenuator                                    | RF input only                     | 0 dB to 40 dB, in 5 dB steps                          |
| <b>AF output</b>                                    |                                   |                                                       |
| AF demodulation types                               |                                   | AM and FM                                             |
| Connector                                           |                                   | 3.5 mm mini jack                                      |
| Output impedance                                    |                                   | 32 $\Omega$ (nom.)                                    |
| Voltage (open circuit)                              |                                   | adjustable from 0 V to > 100 mV (RMS)                 |
| <b>Tracking generator (models .23/.36/.54 only)</b> |                                   |                                                       |
| Frequency range                                     |                                   | 100 kHz to model maximum frequency (usable to 30 kHz) |
| Port output power                                   | 100 kHz $\leq f <$ 10 MHz         | –10 dBm to –30 dBm in 1 dB steps (nom.)               |
|                                                     | 10 MHz $\leq f <$ 30 GHz          | 0 dBm to –25 dBm in 1 dB steps (nom.)                 |
|                                                     | 30 GHz $\leq f <$ 32 GHz          | –10 dBm to –30 dBm in 1 dB steps (nom.)               |
|                                                     | 32 GHz $\leq f <$ 40 GHz          | 0 dBm to –25 dBm in 1 dB steps (nom.)                 |
|                                                     | 40 GHz $\leq f \leq$ 44 GHz       | –10 dBm to –30 dBm in 1 dB steps (nom.)               |
| VSWR                                                | 100 kHz $\leq f <$ 150 MHz        | < 2.0 (nom.)                                          |
|                                                     | 150 MHz $\leq f <$ 8 GHz          | < 1.5 (nom.)                                          |
|                                                     | 8 GHz $\leq f <$ 34 GHz           | < 1.7 (nom.)                                          |
|                                                     | 34 GHz $\leq f \leq$ 44 GHz       | < 2.0 (nom.)                                          |
| <b>External reference, external trigger</b>         |                                   |                                                       |
| Connector                                           |                                   | BNC, 50 $\Omega$                                      |
| Mode                                                |                                   | external reference, external trigger                  |
| External reference                                  | required level                    | 0 dBm                                                 |
|                                                     | frequency                         | 10 MHz                                                |
| External trigger threshold                          | low $\rightarrow$ high transition | 2.4 V                                                 |
|                                                     | high $\rightarrow$ low transition | 0.7 V                                                 |

## General data

|                         |                                                    |                                                                                                                           |
|-------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Manual operation</b> |                                                    |                                                                                                                           |
| Languages               |                                                    | Chinese, Chinese Traditional, English, French, German, Italian, Hungarian, Japanese, Korean, Portuguese, Russian, Spanish |
| <b>Remote control</b>   |                                                    |                                                                                                                           |
| Command set             |                                                    | SCPI 1997.0                                                                                                               |
| LAN interface           |                                                    | 10BASE-T/100BASE-T, RJ-45                                                                                                 |
| USB                     |                                                    | mini B plug, version 2.0                                                                                                  |
| <b>Display</b>          |                                                    |                                                                                                                           |
| Resolution              |                                                    | WVGA, 800 $\times$ 480 pixel                                                                                              |
| <b>Audio</b>            |                                                    |                                                                                                                           |
| Speaker                 |                                                    | internal, external headphone supported                                                                                    |
| <b>USB interface</b>    |                                                    | type A plug, version 2.0                                                                                                  |
|                         | number of interfaces                               | 2                                                                                                                         |
| <b>Mass memory</b>      | not supplied                                       | USB flash drive, USB version 1.1 or 2.0, size $\leq$ 32 Gbyte                                                             |
|                         |                                                    | microSD card, size $\leq$ 32 Gbyte                                                                                        |
| Data storage            | internal                                           | > 160 instrument settings and traces                                                                                      |
|                         | on USB flash drive or microSD card, $\geq$ 1 Gbyte | > 10000 instrument settings and traces                                                                                    |

|                                                |                                                                    |                                                                                                                                                                       |
|------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Temperature range</b>                       | operating                                                          | –10 °C to +55 °C                                                                                                                                                      |
|                                                | storage                                                            | –20 °C to +50 °C                                                                                                                                                      |
|                                                | battery charging mode                                              | 0 °C to +40 °C                                                                                                                                                        |
| <b>Climatic loading</b>                        | relative humidity                                                  | +25 °C/+55 °C at 95 % relative humidity, in line with EN 60068-2-30                                                                                                   |
|                                                | protection class                                                   | IP51                                                                                                                                                                  |
|                                                | with R&S®HA-Z322 carrying holster and rain cap                     | IP54                                                                                                                                                                  |
| <b>Altitude</b>                                | operating with battery                                             | 15000 m (49210 ft)                                                                                                                                                    |
|                                                | operating with AC to DC adapter                                    |                                                                                                                                                                       |
|                                                | normal operation                                                   | 3000 m (9840 ft)                                                                                                                                                      |
|                                                | with derating <sup>10</sup>                                        | 4600 m (15091 ft)                                                                                                                                                     |
| <b>Mechanical resistance</b>                   |                                                                    |                                                                                                                                                                       |
| 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                                                                              |
| <b>Power supply</b>                            |                                                                    |                                                                                                                                                                       |
| 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                                                                                                                                                                   |
| Charging time                                  | models .23/.36/.44/.54                                             | 4.5 h                                                                                                                                                                 |
|                                                | instrument switched off or charge with R&S®HA-Z303 battery charger | 3 h                                                                                                                                                                   |
| Life time                                      | instrument switched on                                             | 5 h                                                                                                                                                                   |
|                                                | 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                     | <ul style="list-style-type: none"> <li>EN 61326-1</li> <li>EN 61326-1 table 2 (immunity, industrial)</li> <li>CISPR 11/EN 55011/group 1 Class B (emission)</li> </ul> |
| 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)                                                                                                                                                       |
| <b>Recommended calibration interval</b>        |                                                                    | 1 year                                                                                                                                                                |

<sup>10</sup> 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<br>(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,<br>with R&S®FPH-B29 option installed <sup>1</sup>                            | from 5 kHz down to 100 Hz |
| Frequency response                   | temperature range from +20 °C to +30 °C                                                                          |                           |
|                                      | 100 Hz ≤ f < 5 kHz<br>(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<br>preamplifier = off                                                                         |                           |
|                                      | 100 Hz to 100 kHz                                                                                                | −45 dBm (nom.)            |
|                                      | 100 kHz to 1 MHz                                                                                                 | −100 dBm (nom.)           |
|                                      | models .23/.36/.44/.54<br>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        |

|                                    |  |                                                          |
|------------------------------------|--|----------------------------------------------------------|
| <b>Carrier power</b>               |  |                                                          |
| Carrier power measurement accuracy |  | add 0.2 dB, see level measurement uncertainty on page 14 |
| Display resolution                 |  | 0.1 dB                                                   |

|                                                |                                                                 |                                                      |
|------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------|
| <b>AF (modulation frequency) <sup>11</sup></b> |                                                                 |                                                      |
| Range                                          | AM                                                              | 20 Hz to 100 kHz (nom.)                              |
|                                                | FM                                                              | 20 Hz to 200 kHz (nom.)                              |
| Resolution                                     |                                                                 | 1 Hz                                                 |
| Measurement uncertainty                        | $1 \text{ kHz} \leq \text{AF} \leq 200 \text{ kHz}$             | $\pm(1 \% \text{ of measured value}) \text{ (nom.)}$ |
|                                                | $20 \text{ Hz} \leq \text{AF} < 1 \text{ kHz}$                  | $\pm 1 \text{ Hz (nom.)}$                            |
| <b>AF filters</b>                              |                                                                 |                                                      |
| Lowpass                                        | audio decimation                                                | bypass, 1/10, 1/30, 1/100 (nom.)                     |
| Deemphasis                                     | FM demodulation and demodulation bandwidths 200 kHz and 300 kHz | off, 50 $\mu\text{s}$ , 75 $\mu\text{s}$ (nom.)      |

|                                      |                     |                                                                              |
|--------------------------------------|---------------------|------------------------------------------------------------------------------|
| <b>AM demodulation <sup>12</sup></b> |                     |                                                                              |
| Measurement range                    | modulation depth    | 2 % to 100 % (nom.)                                                          |
| Modulation depth uncertainty         |                     | $\pm 4 \% \text{ (nom.)}$                                                    |
| <b>FM demodulation <sup>13</sup></b> |                     |                                                                              |
| Measurement range                    | frequency deviation | 10 kHz to 400 kHz (nom.),<br>max. $0.4 \times \text{demodulation bandwidth}$ |
| Deviation uncertainty                |                     | $\pm(0.04 \times (\text{AF} + \text{deviation})) \text{ (nom.)}$             |

|                                                             |                                                  |                                                                                                |
|-------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Modulation distortion <sup>11, 12, 13</sup></b>          |                                                  |                                                                                                |
| 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.)                                                                        |
| <b>Measurement of digital modulation signals (ASK, FSK)</b> |                                                  |                                                                                                |
| 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,<br>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 |

<sup>11</sup> Minimum and maximum detectable audio frequency and harmonics depend on the demodulation bandwidth and audio filter settings.

<sup>12</sup> 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.

<sup>13</sup> 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 <sup>14</sup>                                                         |
|                                     |                 | (Measurement and reference filters are internally adapted to signal parameters.) |
| Points/symbol                       |                 | 4, 8, 16,<br>internally adapted to signal parameters                             |
| Filter length                       |                 | internally adapted to signal parameters                                          |
| Demodulation length                 |                 | 20 symbols to max. 1000 symbols<br>(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 <sup>15</sup> |                  |                         |
|--------------------------------|------------------|-------------------------|
| 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 <sup>16</sup> |                     |                             |
|--------------------------------|---------------------|-----------------------------|
| 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     | $1 \leq \beta^{17} \leq 20$ |
|                                | > 20 kHz to 50 kHz  | $1 \leq \beta \leq 8$       |
|                                | > 50 kHz to 100 kHz | $1 \leq \beta \leq 4$       |
| 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                                      |

<sup>14</sup> Reference signal is generated with a Gaussian filter, bandwidth time product (BT) = 3.

<sup>15</sup> ASK modulation index: 50 %, symbol rate = 100 kHz, Gaussian BT = 1.0, modulation signal: PSBS.

<sup>16</sup> FSK modulation deviation: 100 kHz, symbol rate = 100 kHz, Gaussian BT = 1.0, modulation signal: PRBS.

<sup>17</sup> 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        | •                                 |
| <b>Results</b>            |                                   |
| 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<br>(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 <sup>18</sup>**

|                                |                                                                   |                                     |
|--------------------------------|-------------------------------------------------------------------|-------------------------------------|
| Frequency range                |                                                                   | 25 MHz to 1 GHz                     |
| Power measurement range        |                                                                   | 30 mW to 300 W                      |
| VSWR referenced to 50 $\Omega$ |                                                                   | < 1.06                              |
| Power handling capacity        | depending on temperature and matching<br>(see diagram on page 18) | 100 W to 1000 W                     |
| Insertion loss                 |                                                                   | $\leq 0.06$ dB, typ. $\leq 0.04$ dB |
| Directivity                    |                                                                   | > 30 dB                             |

**Average power**

|                                                       |                                                      |                                                              |
|-------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------|
| Power measurement range                               |                                                      |                                                              |
| CW, FM, PM, FSK, GMSK                                 | CF: ratio of peak envelope<br>power to average power | 30 mW to 300 W                                               |
| Modulated signals                                     |                                                      | 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                                        | $\pm 4$ mW                                                   |
| Range of typical measurement error<br>with modulation | FM, PM, FSK, GMSK                                    | 0 % of measured value (0 dB)                                 |
|                                                       | AM (80 %)                                            | $\pm 3$ % of measured value ( $\pm 0.13$ dB)                 |
|                                                       | two CW carriers with identical power                 | $\pm 2$ % of measured value ( $\pm 0.09$ dB)                 |
|                                                       | EDGE, TETRA                                          | $\pm 0.5$ % of measured value ( $\pm 0.02$ dB) <sup>19</sup> |
| 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)                                        |

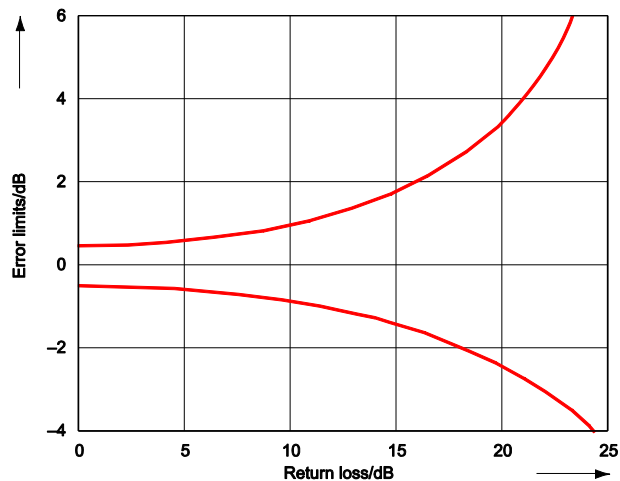
**Maximum peak envelope power**

|                                                        |                                                               |                                                                                      |
|--------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 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<br>peak hold circuit | +18 °C to +28 °C                                                                     |
| Error limits of peak hold circuit for burst<br>signals | duty cycle $\geq 0.1$ and repetition rate $\geq 100$ /s       |                                                                                      |
|                                                        | video bandwidth: 4 kHz                                        | $\pm(3$ % of measured value + 0.05 W),<br>starting from a burst width of 200 $\mu$ s |
|                                                        | video bandwidth: 200 kHz                                      | $\pm(7$ % of measured value + 0.20 W),<br>starting from a burst width of 4 $\mu$ s   |
|                                                        | video bandwidth: 600 kHz                                      | $\pm(7$ % of measured value + 0.40 W),<br>starting from a burst width of 2 $\mu$ s   |
|                                                        | 20/s $\leq$ repetition rate < 100/s                           | plus $\pm(1.6$ % of measured value + 0.15 W)                                         |
| Temperature coefficient                                | 0.001 $\leq$ duty cycle < 0.1                                 | plus $\pm 0.10$ W                                                                    |
|                                                        | 25 MHz to 40 MHz                                              | 0.50 %/K (0.022 dB/K)                                                                |
|                                                        | 40 MHz to 1 GHz                                               | 0.35 %/K (0.015 dB/K)                                                                |

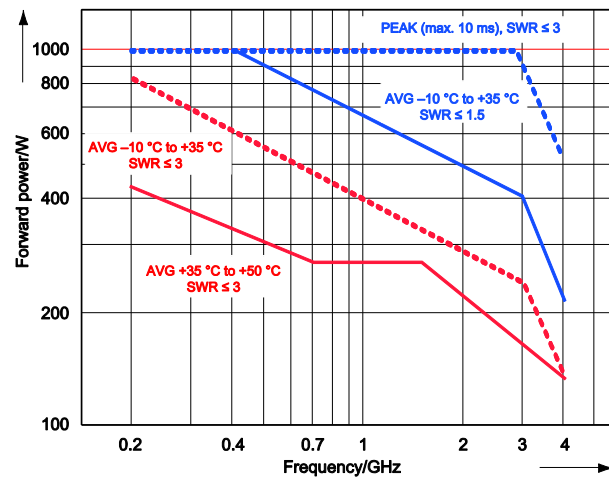
<sup>18</sup> Requires R&S®FSH-Z144 adapter cable.<sup>19</sup> If standard is selected on the R&S®Spectrum Rider FPH.

| Load matching              |                                           |               |
|----------------------------|-------------------------------------------|---------------|
| Matching measurement range |                                           |               |
| Return loss                |                                           | 0 dB to 23 dB |
| VSWR                       |                                           | > 1.15        |
| Minimum forward power      | specifications complied with $\geq 0.4$ W | 0.06 W        |

| Dimensions and weight |                  |                                                         |
|-----------------------|------------------|---------------------------------------------------------|
| Dimensions            | W × H × D        | 120 mm × 95 mm × 39 mm<br>(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 <sup>20</sup>

|                                |                                                                   |                                                                            |
|--------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------|
| Frequency range                |                                                                   | 200 MHz to 4 GHz                                                           |
| Power measurement range        |                                                                   | 30 mW to 300 W                                                             |
| VSWR referenced to 50 $\Omega$ | 200 MHz to 3 GHz<br>3 GHz to 4 GHz                                | < 1.07<br>< 1.12                                                           |
| Power handling capacity        | depending on temperature and matching<br>(see diagram on page 20) | 120 W to 1000 W                                                            |
| Insertion loss                 | 200 MHz to 1.5 GHz<br>1.5 GHz to 4 GHz                            | $\leq 0.06$ dB, typ. $\leq 0.04$ dB<br>$\leq 0.10$ dB, typ. $\leq 0.07$ dB |
| Directivity                    | 200 MHz to 3 GHz<br>3 GHz to 4 GHz                                | > 30 dB<br>> 26 dB                                                         |

|                                                    |                                                   |                                                              |
|----------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------|
| <b>Average power</b>                               |                                                   |                                                              |
| 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                                     | $\pm 4$ mW                                                   |
| Range of typical measurement error with modulation | FM, PM, FSK, GMSK                                 | 0 % of measured value (0 dB)                                 |
|                                                    | AM (80 %)                                         | $\pm 3$ % of measured value ( $\pm 0.13$ dB)                 |
|                                                    | two CW carriers with identical power              | $\pm 2$ % of measured value ( $\pm 0.09$ dB)                 |
|                                                    | $\pi/4$ -DQPSK                                    | $\pm 2$ % of measured value ( $\pm 0.09$ dB)                 |
|                                                    | EDGE                                              | $\pm 0.5$ % of measured value ( $\pm 0.02$ dB) <sup>21</sup> |
|                                                    | cdmaOne, DAB                                      | $\pm 1$ % of measured value ( $\pm 0.04$ dB) <sup>21</sup>   |
|                                                    | 3GPP WCDMA, CDMA2000                              | $\pm 2$ % of measured value ( $\pm 0.09$ dB) <sup>21</sup>   |
|                                                    | DVB-T                                             | $\pm 2$ % of measured value ( $\pm 0.09$ dB) <sup>21</sup>   |
| 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)                                        |

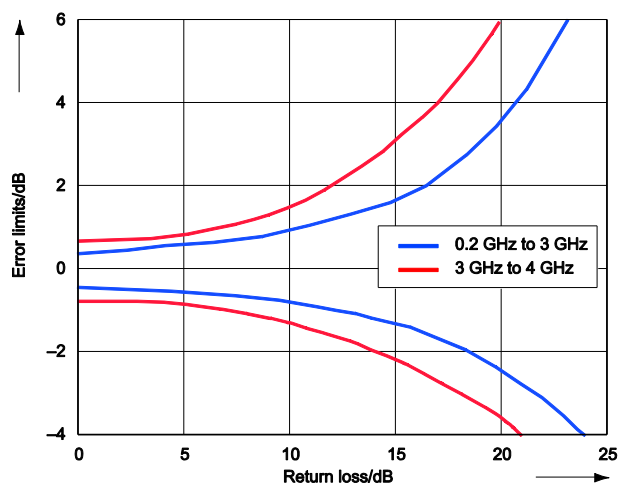
|                                                         |                                                                     |                                                                                     |
|---------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Maximum peak envelope power</b>                      |                                                                     |                                                                                     |
| Power measurement range                                 |                                                                     |                                                                                     |
| DAB, DVB-T, cdmaOne, CDMA2000, 3GPP WCDMA               |                                                                     | 4 W to 300 W                                                                        |
| Other signals at video bandwidth                        | 4 kHz<br>200 kHz<br>4 MHz                                           | 0.4 W to 300 W<br>1 W to 300 W<br>2 W to 300 W                                      |
| Measurement uncertainty                                 | +18 °C to +28 °C                                                    | same as for average power plus effect of peak hold circuit                          |
| Error limits of peak hold circuit for burst signals     | duty cycle $\geq 0.1$ and repetition rate $\geq 100$ /s             |                                                                                     |
|                                                         | video bandwidth 4 kHz                                               | $\pm(3$ % of measured value + 0.05 W)<br>starting from a burst width of 100 $\mu$ s |
|                                                         | video bandwidth 200 kHz                                             | $\pm(3$ % of measured value + 0.20 W)<br>starting from a burst width of 4 $\mu$ s   |
|                                                         | video bandwidth 4 MHz                                               | $\pm(7$ % of measured value + 0.40 W)<br>starting from a burst width of 1 $\mu$ s   |
|                                                         | 20/s $\leq$ repetition rate < 100/s                                 | plus $\pm(1.6$ % of measured value + 0.15 W)                                        |
|                                                         | 0.001 $\leq$ duty cycle < 0.1                                       | plus $\pm 0.10$ W                                                                   |
|                                                         | burst width $\geq 0.5$ $\mu$ s                                      | plus $\pm 5$ % of measured value                                                    |
|                                                         | burst width $\geq 0.2$ $\mu$ s                                      | plus $\pm 10$ % 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                                                        | $\pm(5$ % of measured value + 0.4 W)                                                |
|                                                         | DVB-T, CDMA2000, 3GPP WCDMA                                         | $\pm(15$ % 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)                                                               |

<sup>20</sup> Requires R&S®FSH-Z144 adapter cable.

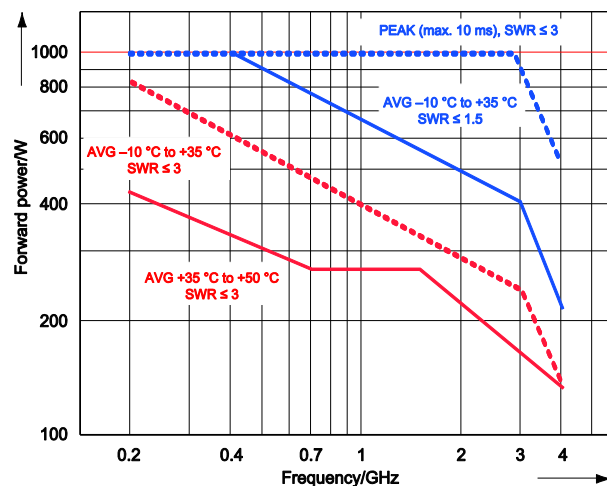
<sup>21</sup> If standard is selected on the R&S®Spectrum Rider FPH.

| 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 $\geq 0.2$ W | 0.03 W         |

| Dimensions and weight |                  |                                                         |
|-----------------------|------------------|---------------------------------------------------------|
| Dimensions            | W × H × D        | 120 mm × 95 mm × 39 mm<br>(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,<br>with tracking generator                                                                                 | R&S®Spectrum Rider FPH | 1321.1711.23 |
| Handheld spectrum analyzer, 5 kHz to 26.5 GHz,<br>with tracking generator                                                                                 | R&S®Spectrum Rider FPH | 1321.1711.36 |
| Handheld spectrum analyzer, 5 kHz to 44 GHz,<br>with tracking generator                                                                                   | R&S®Spectrum Rider FPH | 1321.1711.54 |
| <b>Accessories supplied</b>                                                                                                                               |                        |              |
| 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 <sup>22</sup>                          | R&S®FPH-B3   | 1321.0667.02 |
| Spectrum analyzer frequency upgrade, 3 GHz to 4 GHz <sup>22</sup><br>(requires R&S®FPH-B3) | R&S®FPH-B4   | 1321.0673.02 |
| Spectrum analyzer frequency upgrade, 6 GHz to 8 GHz <sup>23</sup>                          | R&S®FPH-B8   | 1321.0767.02 |
| Spectrum analyzer frequency upgrade, 13.6 GHz to 20 GHz <sup>24</sup>                      | R&S®FPH-B20  | 1321.0773.02 |
| Spectrum analyzer frequency upgrade, 26.5 GHz to 31 GHz <sup>25, 26</sup>                  | R&S®FPH-B31  | 1321.0780.02 |
| Spectrum analyzer preamplifier, 5 kHz to 4 GHz <sup>22</sup>                               | R&S®FPH-B22  | 1321.0680.02 |
| Spectrum analyzer preamplifier, 5 kHz to 8 GHz <sup>23</sup>                               | R&S®FPH-B23  | 1321.0867.02 |
| Spectrum analyzer preamplifier, 5 kHz to 20 GHz <sup>24</sup>                              | R&S®FPH-B24  | 1321.0850.02 |
| Spectrum analyzer preamplifier, 5 kHz to 31 GHz <sup>25</sup>                              | R&S®FPH-B25  | 1321.0873.02 |
| Spectrum analyzer preamplifier, 5 kHz to 44 GHz <sup>27</sup>                              | R&S®FPH-B26  | 1334.6600.02 |
| Type N RF input connector, for model .26 (factory installed) <sup>26</sup>                 | R&S®FPH-B100 | 1321.0596.02 |
| Spectrum analyzer 100 Hz frequency extension,<br>from 5 kHz down to 100 Hz <sup>28</sup>   | 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 |

<sup>22</sup> Applicable only to base unit with order no. 1321.1111.02.

<sup>23</sup> Applicable only to base unit with order no. 1321.1111.06.

<sup>24</sup> Applicable only to base unit with order no. 1321.1111.13 and 1321.1711.23.

<sup>25</sup> Applicable only to base unit with order no. 1321.1111.26 and 1321.1711.36.

<sup>26</sup> R&S®FPH-B31 option is not available in combination with R&S®FPH-B100 option.

<sup>27</sup> Applicable only to base unit with order no. 1321.1711.44 and 1321.1711.54.

<sup>28</sup> For serial number  $\geq 103100$ . Not applicable to R&S®Spectrum Rider FPH model .02.

## Extras

| Designation                                                  | Type        | Order No.    |
|--------------------------------------------------------------|-------------|--------------|
| Battery charger for R&S®HA-Z306 <sup>29, 30</sup>            | R&S®HA-Z303 | 1321.1328.02 |
| Battery charger <sup>29</sup>                                | 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 |

<sup>29</sup> The battery charger is dedicated for charging an additional battery outside the instrument. The battery can be charged via the instrument as well.

<sup>30</sup> 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,<br>type N (f) to type N (m)              | R&S®RDL50    | 1035.1700.52 |
| Attenuator, 100 W, 20 dB, 50 Ω, DC to 2 GHz,<br>type N (f) to type N (m)             | R&S®RBU100   | 1073.8495.20 |
| Attenuator, 100 W, 30 dB, 50 Ω, DC to 2 GHz,<br>type N (f) to type N (m)             | R&S®RBU100   | 1073.8495.30 |
| Compact probe set, for E and H near field measurements,<br>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),<br>for R&S®HZ-15        | R&S®HZ-16    | 1147.2720.02 |
| Omnidirectional antenna, for circular right-hand polarization,<br>18 GHz to 26.5 GHz | R&S®AC004R1  | 0749.3000.03 |
| Omnidirectional antenna, for circular left-hand polarization,<br>18 GHz to 26.5 GHz  | R&S®AC004L1  | 4078.4000.02 |
| Omnidirectional antenna, for circular right-hand polarization,<br>26.5 GHz to 40 GHz | R&S®AC004R2  | 0749.3251.03 |
| Omnidirectional antenna, for circular left-hand polarization,<br>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,<br>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,<br>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,<br>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,<br>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,<br>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,<br>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,<br>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,<br>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,<br>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,<br>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 <sup>31</sup>

| Designation                                                                                                              | Type         | Order No.    |
|--------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| <b>Directional power sensors</b>                                                                                         |              |              |
| 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 |
| <b>Universal power sensors</b>                                                                                           |              |              |
| 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 |
| <b>Thermal power sensors</b>                                                                                             |              |              |
| 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 |
| <b>Average power sensors</b>                                                                                             |              |              |
| 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 |
| <b>Three-path diode power sensors</b>                                                                                    |              |              |
| 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 |
| <b>Pulse power sensors <sup>32</sup></b>                                                                                 |              |              |
| 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 |
| <b>Wideband power sensors <sup>32</sup></b>                                                                              |              |              |
| 1 nW to 100 mW, 50 MHz to 18 GHz <sup>33</sup>                                                                           | R&S®NRP-Z81  | 1137.9009.02 |
| 1 nW to 100 mW, 50 MHz to 40 GHz, 2.92 mm <sup>33</sup>                                                                  | R&S®NRP-Z85  | 1411.7501.02 |
| 1 nW to 100 mW, 50 MHz to 40 GHz, 2.40 mm <sup>33</sup>                                                                  | R&S®NRP-Z86  | 1417.0109.40 |
| 1 nW to 100 mW, 50 MHz to 44 GHz, 2.40 mm <sup>33</sup>                                                                  | R&S®NRP-Z86  | 1417.0109.44 |
| <b>R&amp;S®NRP-Zxx power sensors require the following adapter cable for operation on the R&amp;S®Spectrum Rider FPH</b> |              |              |
| 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 |
| <b>R&amp;S®NRP power sensors require the following adapter cable for operation on the R&amp;S®Spectrum Rider FPH</b>     |              |              |
| 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 |

<sup>31</sup> For average power measurements only.

<sup>32</sup> Peak power measurements supported by the R&S®FPH-K29 option.

<sup>33</sup> 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 <sup>34</sup> | pay per calibration   |
| Warranty and repair                                            | up to five years <sup>34</sup> | standard price repair |
| Contact your Rohde & Schwarz sales office for further details. |                                |                       |

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<sup>34</sup> For extended periods, contact your Rohde & Schwarz sales office.



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