

R&S® Cable Rider ZPH Cable and Antenna Analyzer Expect fast, expect efficient

3
year
warranty



R&S® Cable Rider ZPH Cable and Antenna Analyzer At a glance

The R&S® Cable Rider ZPH has all the essential basic measurement capabilities required for installing and maintaining antenna systems in the field. Its unique features ensure fast and efficient cable and antenna measurements and spectrum analysis. The easy-to-use analyzer features a touchscreen and large keypad designed for field use.

With its short boot and warm-up times and fast measurement speed, the R&S® Cable Rider ZPH gets down to analyzing extremely fast. Measurement setups can be predrawn and settings preconfigured. Thanks to the wizard function, fast and accurate measurements are performed in a single step. Generating measurement reports is easy with the R&S® InstrumentView software.

There is no need to calibrate the analyzer before use. It is reliably and accurately calibrated before leaving the factory. Should calibration be needed to eliminate the effects of additional cables or adapters used to connect the analyzer to the device under test (DUT), the R&S® ZN-Z103 automatic calibration unit performs the calibration in just one step.

The battery lasts up to an entire work day on just one charge. The keypad is illuminated to facilitate working in dim environments. The leading-edge capacitive touchscreen of the R&S® Cable Rider ZPH is changing the way users interact with an analyzer – simply touch the screen to add markers and change settings. These features and the ergonomic design make the R&S® Cable Rider ZPH ideal for fast and efficient on-site measurements.

Two different R&S® ZPH models are available to suit different needs, a pure one-port cable and antenna analyzer and a two-port model with additional spectrum analysis and tracking generator features.

Key facts

- Frequency range in cable and antenna analyzer mode from 2 MHz to 3 GHz or 4 GHz, upgrade via keycode
- Frequency range in spectrum analyzer mode from 5 kHz to 3 GHz or 4 GHz, upgrade via keycode
- One-port model features: DTF, return loss, VSWR and cable loss measurements
- Two-port model additionally features:
 - Two-port transmission measurement
 - Spectrum analysis
 - Interference analysis
 - Signal strength mapping
 - Modulation analysis
- Ideal for field use: up to 9-hour battery life, 2.5 kg (5.5 lb), backlit keypad, fast boot time, non-reflective display, small form factor, ruggedized housing (IP51)
- Large color touchscreen
- Measurement wizard to speed up measurements and eliminate human errors
- Easy and cost-efficient upgrades of all options via software keycode

[Backlit keypad for operation in dim environments](#)



R&S® Cable Rider ZPH Cable and Antenna Analyzer

Benefits and key features

Fast

- ▮ Change settings quickly and easily
- ▮ Fastest measurement speed
- ▮ Fastest boot and warm-up times
- ▮ Fast measurements – no calibration required
- ▮ Fast deployment with the wizard function

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Efficient

- ▮ Single charge lasts entire work day
- ▮ Buy what you need when you need it
- ▮ One-step calibration
- ▮ Simplify measurements with the wizard function
- ▮ Remote control with Android or iOS apps

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Standard measurement modes

- ▮ Distance-to-fault measurement
- ▮ Distance-to-fault measurement and return loss: combined measurement
- ▮ Voltage standing wave ratio (VSWR) measurement
- ▮ One-port cable loss measurement
- ▮ Phase display
- ▮ Smith chart display

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Optional measurement modes

- ▮ Power measurements with power sensors
- ▮ Channel power meter
- ▮ Pulse measurements with power sensors

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Model-specific measurement modes

- ▮ Spectrum analysis
- ▮ Tracking generator measurements
- ▮ Bias tee
- ▮ Signal generator
- ▮ Modulation analysis
- ▮ Interference analysis and signal strength mapping

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Model selection guide		
Feature	One-port model .02	Two-port model .12
Frequency upgrade to 4 GHz	•	•
Measurement wizard	•	•
R&S®InstrumentView support	•	•
R&S®MobileView support	•	•
DTF	•	•
Return loss and VSWR	•	•
Cable loss	•	•
Transmission (S_{21})	–	•
Spectrum analysis, 5 kHz to 3 GHz or 4 GHz	–	•
Tracking generator capability	–	•
Signal generator capability	–	•
Internal bias tee	–	•
Ideal for cable and antenna measurement and troubleshooting	•	•
Ideal for verifying signal transmission	–	•
Ideal for interference hunting	–	•

Fast

Change settings quickly and easily

Thanks to its hybrid design, the analyzer can be operated as usual via the keys and rotary knob or alternatively via the touchscreen. The keys are large and widely spaced. This makes the analyzer ideal for operation with gloves and also minimizes the big finger problem.

The R&S®CableRider ZPH offers a new kind of user experience with its built-in sensitive capacitive touchscreen:

- ▀ Directly interact with the elements on the screen
- ▀ Access menus faster
- ▀ Change frequency and span
- ▀ Add/move/delete markers
- ▀ Change other settings, etc.

Fastest measurement speed

The R&S®CableRider ZPH has extremely fast synthesizers that yield the shortest measurement time per data point (0.3 ms/point) for reflection measurements. The measurement speed is so fast that the measurement time is not compromised even when you set more data points to see details. With 2001 data points set, for example, the measurement time is only 0.6 s whereas other analyzers can take anywhere from 1.4 s to 30 s.

Fastest boot and warm-up times

Waiting a long time for an analyzer to boot and warm up can be frustrating. The R&S®CableRider ZPH boots up in less than 15 s and only needs 1 minute to warm up. This helps alleviate the frustration of waiting for the analyzer in order to start the first measurement.



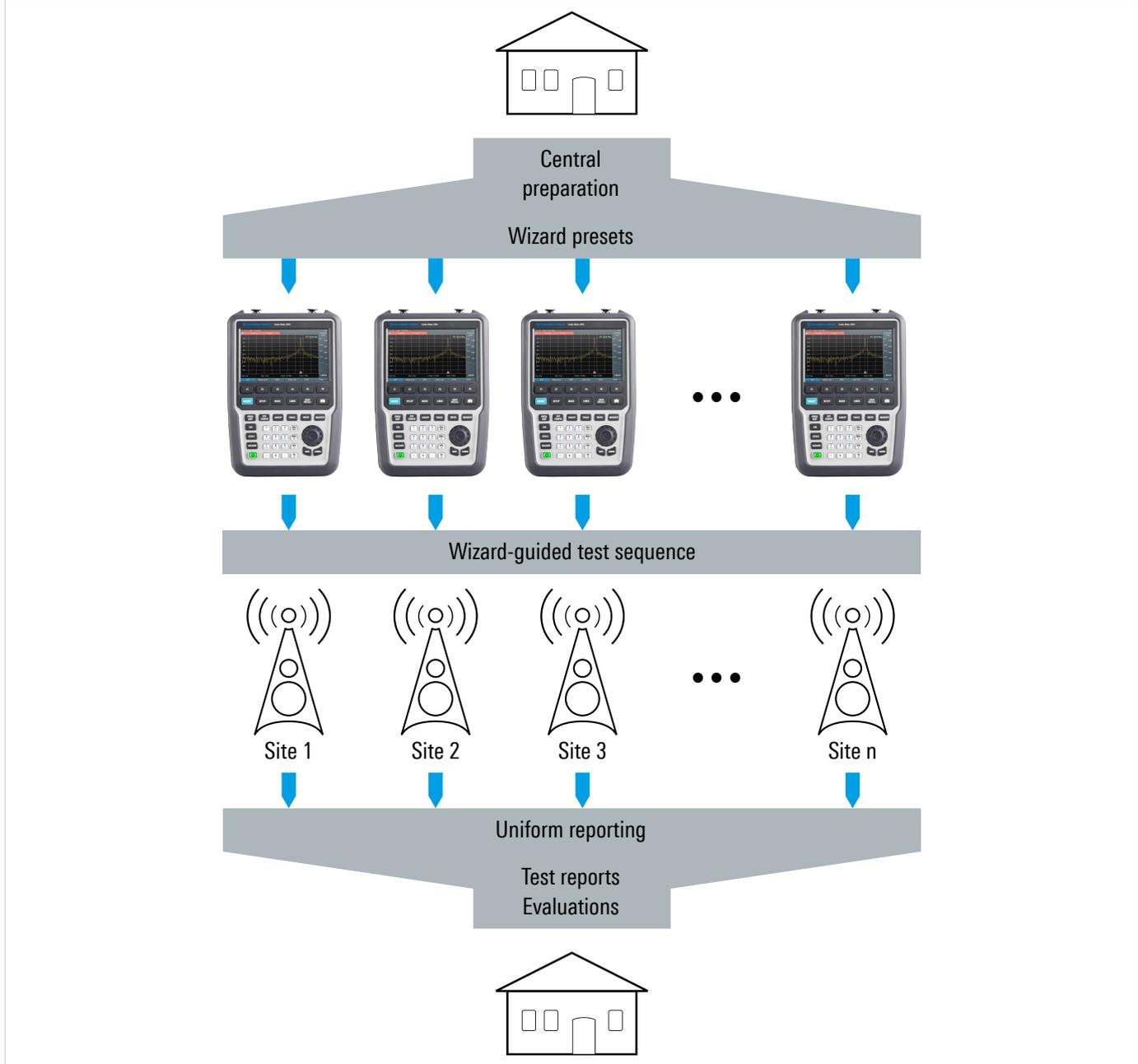
Fast measurements – no calibration required

Understanding the need to perform measurements quickly, the R&S®CableRider ZPH is factory-precalibrated over the supported frequency and temperature ranges. The factory calibration removes the drift error, which can be a hassle when you have to keep calibrating because the measured frequency and operating temperature change. No calibration reminder will pop up on the screen and interrupt measurements. The Rohde&Schwarz calibration lab performs stringent calibration during production to minimize measurement errors and provide reliable measurement results. A calibration certificate is included with the analyzer. When the calibration interval has lapsed, the analyzer can be sent back to Rohde&Schwarz for recalibration.

Fast deployment with the wizard function

For fast deployment, all settings and measurement steps can be preconfigured using the wizard function. The field technician only needs to execute the test sequences as shown on the display. The measurement instructions can be in pictorial form with short descriptions to provide clear step-by-step guidance for the field technician. The settings for each test sequence are preconfigured, eliminating the need to provide special dedicated operational training for the field technician. Since there is no need to change settings for different measurements, test time is reduced during installation and maintenance. For the same measurement at multiple sites, simply load the measurement set to all analyzers – fast deployment thanks to the wizard function.

Typical deployment setup with measurement preparation and postprocessing



Efficient

Single charge lasts the entire work day

With a single full charge, the R&S®CableRider ZPH will keep going an entire work day. Simply charge it for approximately 4 hours and the lithium-ion battery pack lasts up to 9 hours. The advantages of having a long-lasting battery are obvious – no need to bring an extra battery with additional weight when climbing up a mast or tower, no frustration due to the battery power ending in the middle of the measurement.

Buy what you need when you need it

The base unit supports frequencies from 2 MHz to 3 GHz in cable and antenna analyzer mode and 5 kHz to 3 GHz in spectrum analyzer mode. When you need frequencies up to 4 GHz, simply purchase the R&S®ZPH-B4 frequency upgrade option and enter the keycode into the analyzer. The supported frequency range is instantly extended to 4 GHz. It is not necessary to send the analyzer to the service lab for an upgrade or recalibration. No downtime and no need to buy a new analyzer just for frequency upgrading.

One-step calibration

Typically, calibration is not required if the DUT is connected directly to the analyzer. However, if there are additional cables or adapters connected between the analyzer and the device under test (DUT), calibration is recommended to eliminate any influences. During calibration, the analyzer calibrates with the open, short and load standard. For convenient, one-step calibration, the R&S®ZN-Z103 calibration unit automatically switches internally between open, short and load. This saves time and eliminates the hassle of physically changing the different calibration standards in the field.

Simplify measurements with the wizard function

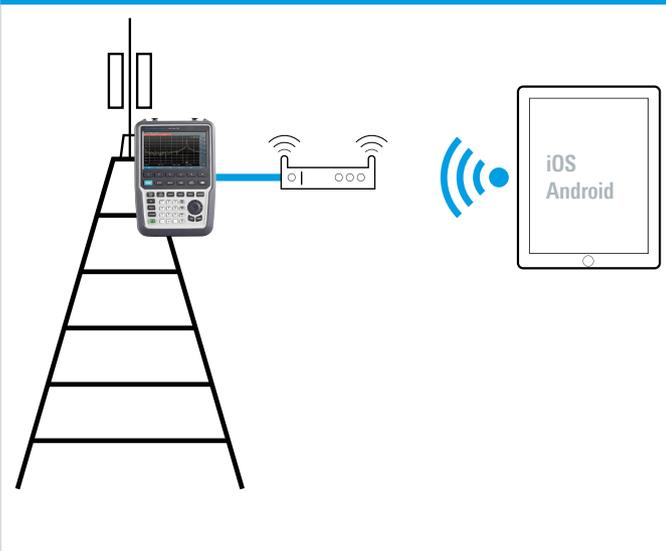
The measurement wizard simplifies measurements by automating, standardizing and optimizing test sequences. A sequence of standardized and recurring measurements can be performed quickly and easily without mistakes. The proven wizard function helps eliminate human errors and helps the user make correct measurements from the beginning.

Remote control with Android or iOS apps

Not all qualified engineers are qualified climbers. An engineer on the ground might have to give the climber on the mast or tower instructions for every measurement step. Remote control of the R&S®CableRider ZPH solves this problem. Simply connect a commercially available wireless router¹⁾ to the analyzer and use the apps on the phone or tablet to remote control the analyzer and fully control the measurements.

¹⁾ The wireless router is not provided by Rohde&Schwarz.

Application example of wireless remote operation via tablet



Three simple steps to work with the measurement wizard

A

Project manager/expert creates the test sequences

B

Operator uses the wizard to execute the test sequences

C

Operator shows the measurement result to the project manager/expert and documents it

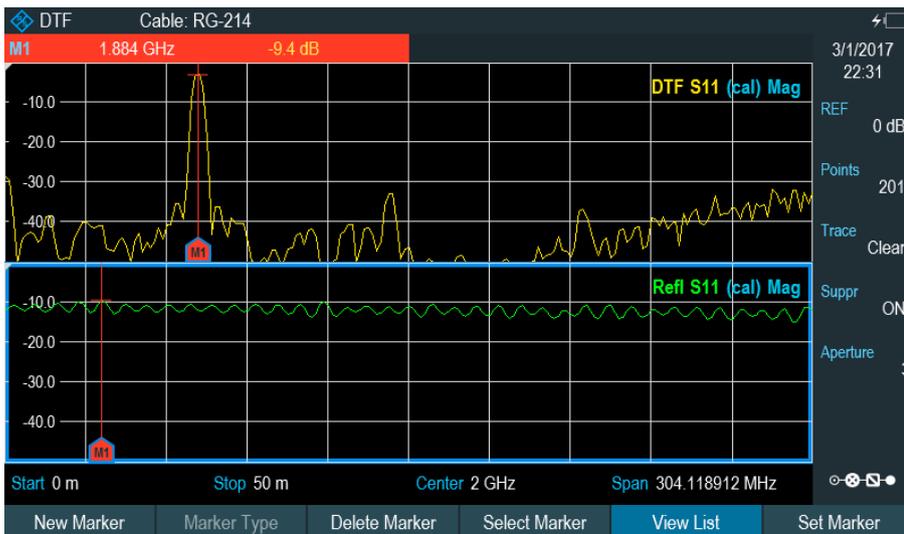
Front view



Standard measurement modes



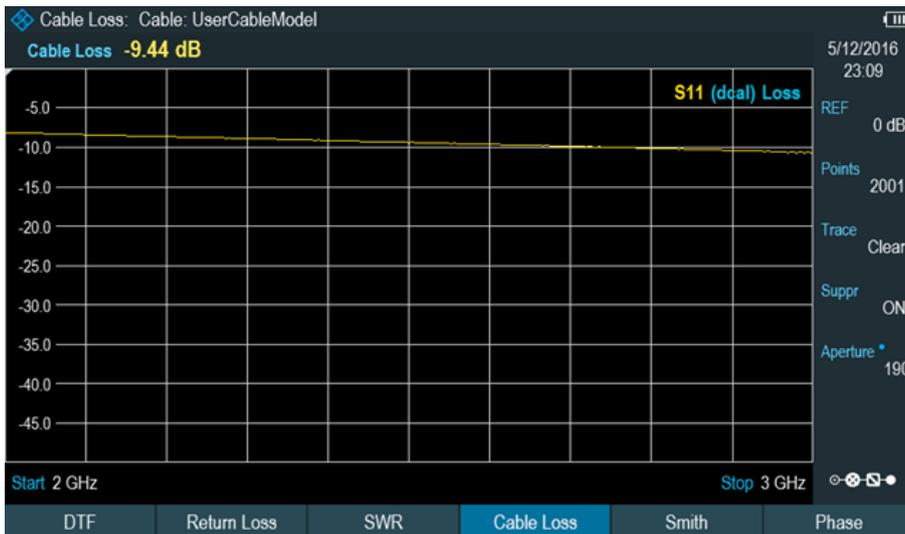
Distance-to-fault measurement



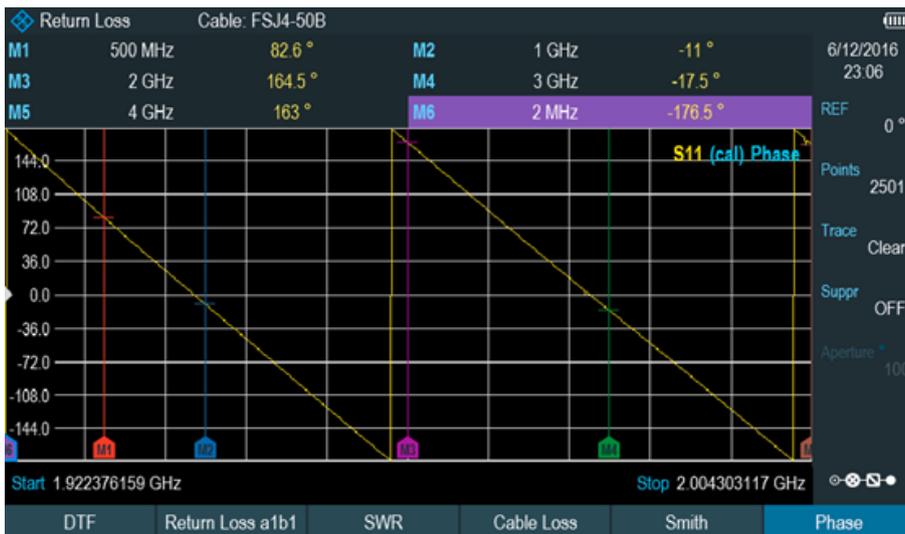
Distance-to-fault measurement and return loss: combined measurement



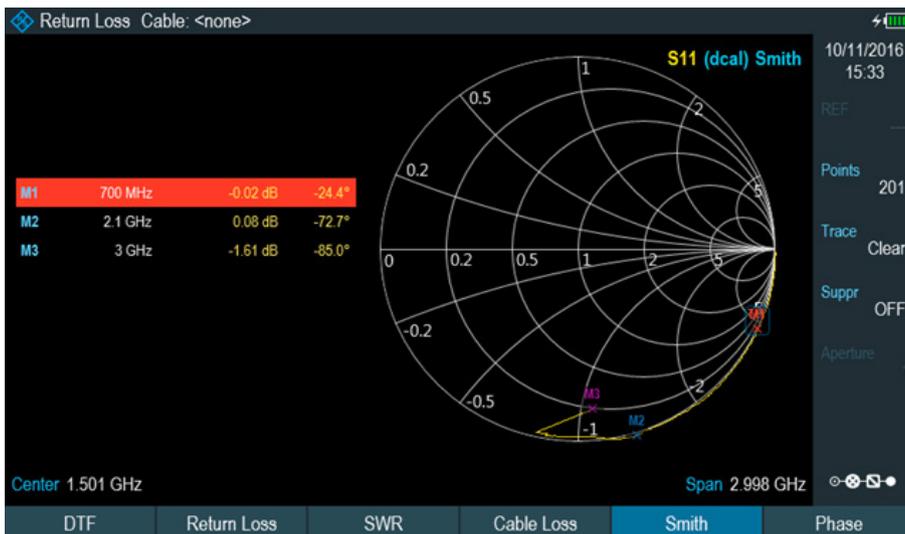
VSWR measurement



One-port cable loss measurement



Phase display



Smith chart display

Optional measurement modes

Power measurements with power sensors

Some applications require very high accuracy to measure and align transmitting power. The R&S®ZPH-K9 option allows the R&S®Cable Rider ZPH to perform power measurements together with the R&S®NRP-Zxx power sensor series, with a measurement range of -67 dBm to +45 dBm and covering frequencies up to 110 GHz.

Channel power meter

The R&S®ZPH-K19 channel power meter option converts the analyzer into a portable power meter with a level measurement accuracy of typically 0.5 dB. This option makes it possible to achieve power measurement results quickly and easily without needing a power sensor or the spectrum analyzer mode. This can help in applications such as checking power levels along the signal path of a field transmitter or verifying the power level of a design in the lab.

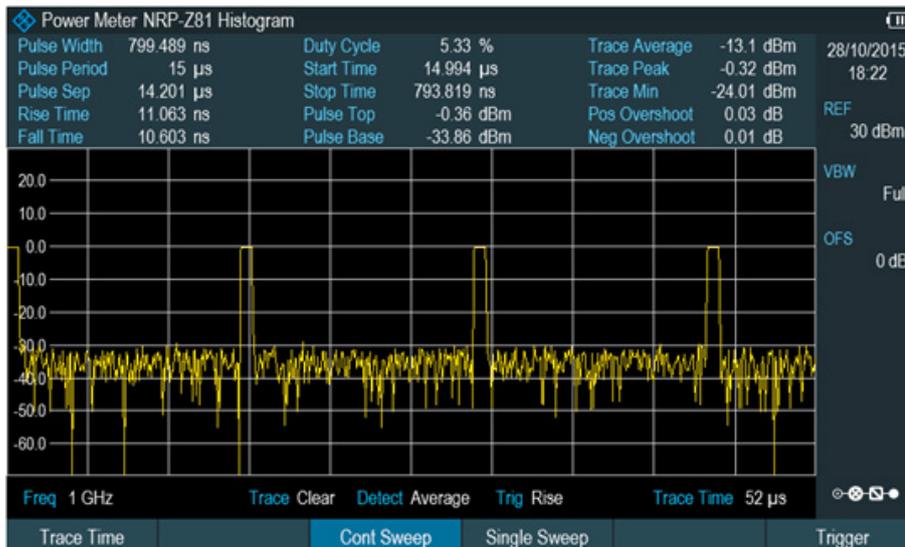
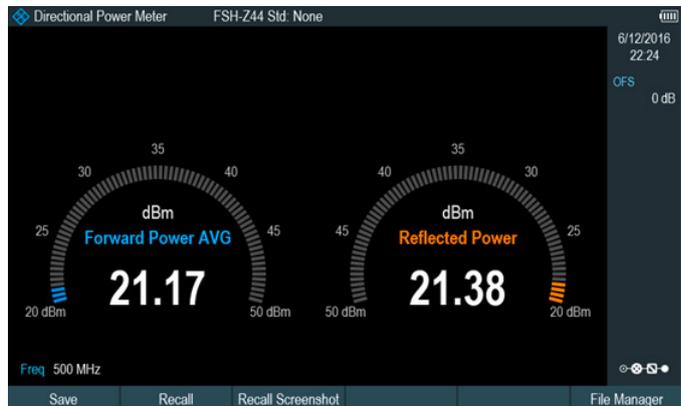
Pulse measurements with power sensors

The R&S®ZPH-K29 option enables precise pulse and peak power measurements using the R&S®ZPH Cable Rider together with a Rohde&Schwarz wideband power sensor. The wideband power sensors measure pulses with a resolution of up to 50 ns and support frequencies up to 44 GHz. This option is useful when the R&S®Cable Rider ZPH is used to install and maintain radar transmitter systems.

R&S®ZPH-K19 channel power meter



R&S®ZPH-K9 power sensor support



R&S®ZPH-K29 pulse measurement

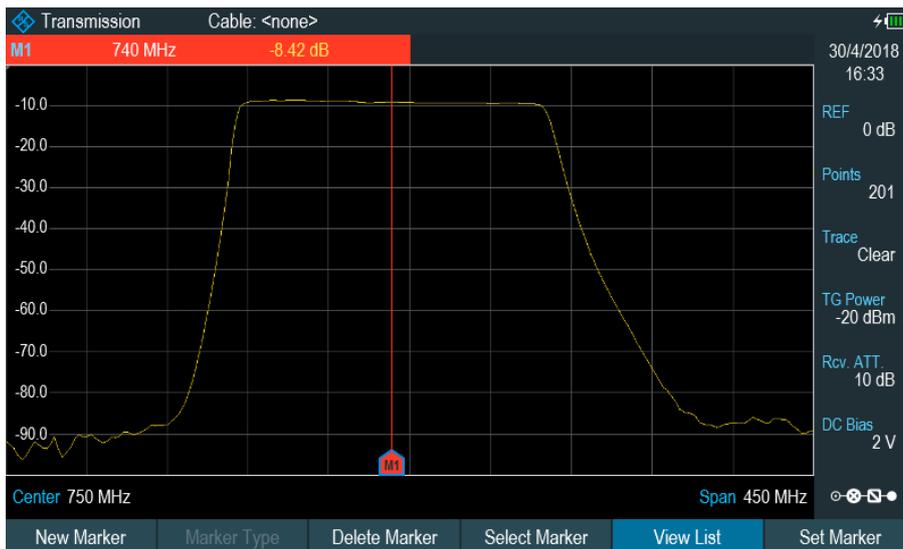
Model-specific measurement modes (two-port combi model)

In many cases, field engineers need multiple instruments to complete their tasks: a cable and antenna analyzer, a spectrum analyzer, a signal generator and a bias source. The two-port combi model R&S®CableRider ZPH now combines all of these instruments into one powerful box.

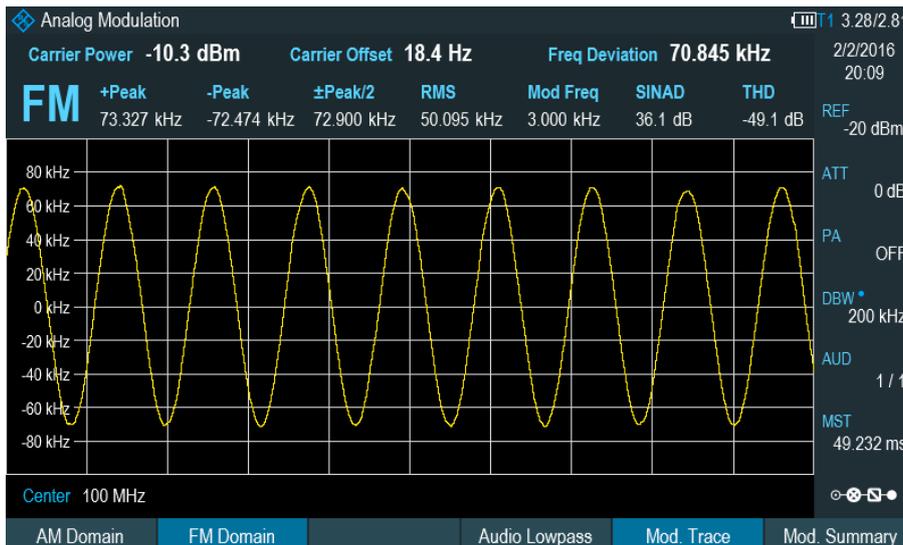
Spectrum analysis performance including tracking generator

With its high sensitivity (DANL of typ. < -146 dBm up to 3 GHz), the R&S®CableRider ZPH is a powerful and easy-to-use spectrum analyzer for RF diagnostics in the field, e.g. on antenna RF feed signals. The DANL can be further improved to typ. -163 dBm with the optional R&S®ZPH-B22 preamplifier. The R&S®ZPH features tracking generator functionality, which makes scalar transmission measurements possible, e.g. frequency response measurements on RF filters. Bias tees broaden the functionality even further, e.g. for measuring tower mounted amplifiers (TMA).

The R&S®ZPH can even utilize its unique independent signal source to operate as a continuous wave (CW) signal generator or as an independent tracking source for frequency conversion measurements.



Filter transmission measurement with the R&S®ZPH-K1 option



Analysis of a frequency-modulated signal with the R&S®ZPH-K7 modulation analysis option

Modulation analysis

The R&S®ZPH-K7 option converts the R&S®CableRider ZPH into a modulation analyzer to measure the quality of amplitude or frequency modulated signals. The analog modulation display shows the waveform as well as measurement parameters such as carrier power, carrier offset, modulation index (depth) for AM signals, frequency deviation for FM signals, SINAD and THD. The modulation summary display provides user-definable limits for each measurement. This feature is especially useful for installation and maintenance of AM/FM radio stations.

Basic digital modulation formats are used in many applications, e.g. near-field communications. The R&S®ZPH supports both ASK and FSK analysis. The digital modulation displays include trace, eye diagram, modulation error and symbol analysis. Specialized configuration presets for Bluetooth® Low Energy (Bluetooth® LE) and tire pressure monitoring systems (TPMS) are available, too. The R&S®ZPH-K7 option lets

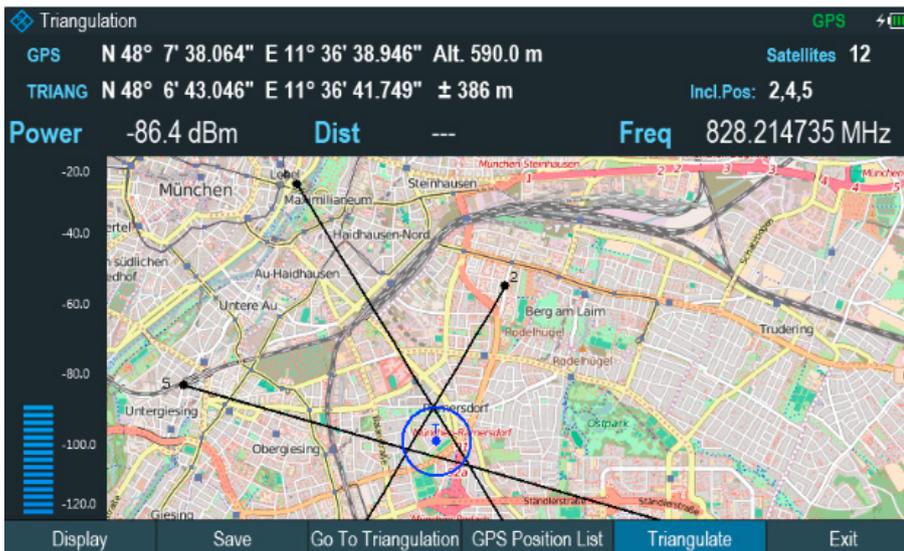
users easily verify the quality of the basic modulated signals

Interference analysis and signal strength mapping

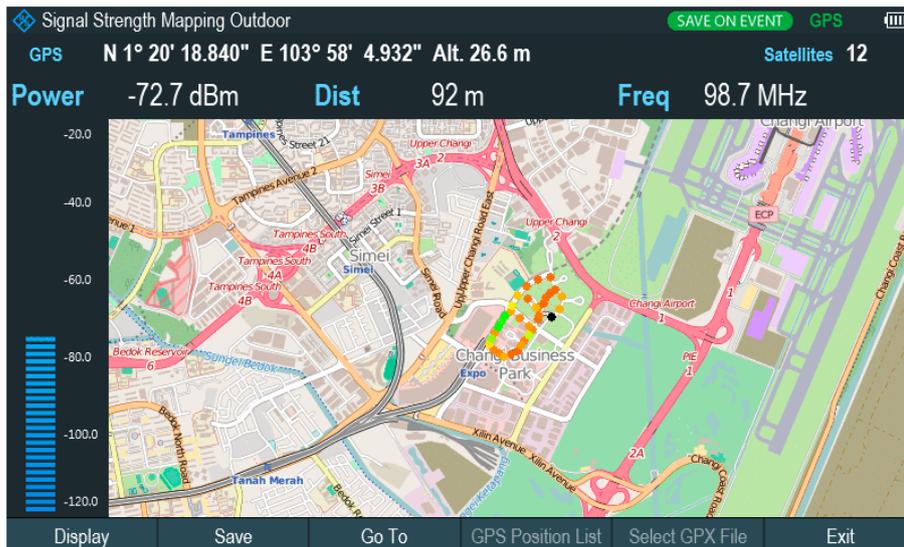
The R&S®ZPH-K15 interference analysis and R&S®ZPH-K16 signal strength mapping options are great tools for analyzing and locating ambiguous signals or interferers.

Long-term spectrogram recording allows up to 999 hours of on-air activity to be captured; the recording duration depends on the recording interval setting. The recorded data can be analyzed on the R&S®ZPH or with the R&S®InstrumentView software.

Signal strength mapping displays a pictorial view of the signal power level on an indoor or outdoor map. The color indicator provides a good estimation of the signal coverage in a particular area or where the interferer or intended signal is most likely located.



Locating a signal with the R&S®ZPH-K15 interference analysis option and the R&S®HE400 series directional antenna



Display of the interferer signal strength on the map with the R&S®ZPH-K16 signal strength mapping option

Specifications

Frequency

Frequency range	R&S®Cable Rider ZPH	2 MHz to 3 GHz
	with R&S®ZPH-B4 option installed	2 MHz to 4 GHz
Frequency resolution		1 Hz

Reference frequency, internal		
Total reference accuracy		$\pm(\text{time since last adjustment} \times \text{aging rate})$ + temperature drift + calibration accuracy
Aging per year		$\pm 1 \times 10^{-6}$
Temperature drift	0 °C to +30 °C	$\pm 1 \times 10^{-6}$
	+30 °C to +50 °C	$\pm 3 \times 10^{-6}$
Achievable initial calibration accuracy		$\pm 5 \times 10^{-7}$

Measurements

Individual		reflection (S_{11})
		1-port cable loss
		distance-to-fault
	model .12	transmission (S_{21})
Measurement wizard		
Guides the user through a sequence of individual measurements. Uses the R&S®Instrument View PC software to configure the measurement sequence including hints displayed on the screen. R&S®Instrument View is also used to combine the measurement results into user-configurable reports.		

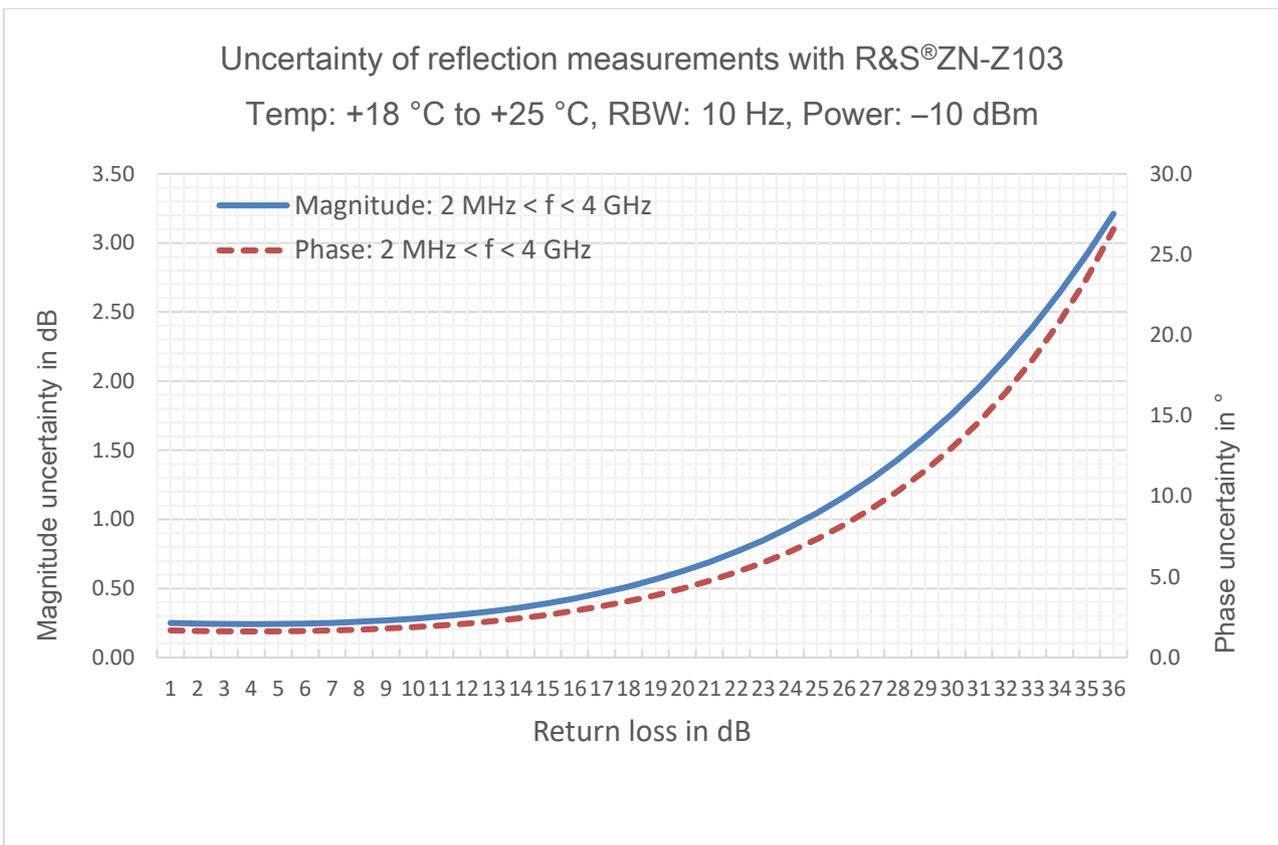
Measurement setup		
Port output power	model .02	-10 dBm (nom.)
	model .12	-3 dBm to -30 dBm step 1 dB (nom.)
Data points	selectable	101 to 2501
Measurement bandwidth	reflection measurement (S_{11})	10 kHz
	transmission measurement (S_{21})	10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz
Trace modes		clear/write, average

Reflection measurement S_{11}		
Result formats		magnitude, SWR, magnitude and distance-to-fault, SWR and distance-to-fault, smith chart, phase
Magnitude		
Range		1/2/3/5/10/20/30/50/100/120/130/150 dB, linear 100 %
Resolution		0.1 dB
SWR		
Range	selectable	1 to 1.1/1.5/2/3/6/11/21/71
Measurement speed		0.3 ms per point
Corrected directivity with R&S®ZN-Z103	$2 \text{ MHz} \leq f \leq 4 \text{ GHz}$	> 42 dB (nom.)
Corrected test port match with R&S®ZN-Z103	$2 \text{ MHz} \leq f \leq 4 \text{ GHz}$	> 36 dB (nom.)
Measurement uncertainty with R&S®ZN-Z103		see figure Uncertainty of reflection measurement

1-port cable loss measurement		
Result format		magnitude
Range	selectable	1/2/5/10/20/50/100 dB
Resolution		0.1 dB

Distance-to-fault analysis		
Result formats		return loss, SWR, split screen DTF and SWR, split screen DTF and return loss
Return loss		
Range		1/2/3/5/10/20/30/50/100/120/130/150 dB, linear 100 %
Resolution		0.01 dB
SWR		
Range	selectable	1 to 1.1/1.5/2/3/6/11/21/71
Fault resolution		$(1.5 \times 10^8 \times \text{velocity factor}/\text{span}) \text{ m}$
Maximum cable length	depending on cable loss	1500 m (nom.)

Immunity to interference		
Maximum permissible spurious signal	measurement = reflection (S_{11})/1-port cable loss/distance-to-fault analysis	
		+17 dBm (nom.)



Uncertainty of reflection measurement with R&S®ZN-Z103 calibration unit.

Accuracy of reflection measurements		
2 MHz to 4 GHz	0 dB to -15 dB	< 0.3 dB or < 2.1°
	-15 dB to -25 dB	< 1.0 dB or < 7.5°
	-25 dB to -35 dB	< 3.1 dB or < 26°

Dynamic of transmission measurements (model .12 only)		
RF Attenuation = 5 dB, tracking generator level = -3 dBm, RBW = 10k kHz	100 kHz ≤ f < 20 MHz	> 60 dB (nom.)
	20 MHz ≤ f < 1.5 GHz	> 90 dB (nom.)
	1.5 GHz ≤ f < 2.5 GHz	> 70 dB (nom.)
	2.5 GHz ≤ f < 4 GHz	> 60 dB (nom.)

Spectrum Analyzer (R&S®ZPH-K1 option, only model .12)

Frequency range	R&S®Spectrum Rider	5 kHz to 3 GHz
	with R&S®ZPH-B4 installed	5 kHz to 4 GHz
Frequency resolution		1 Hz

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

Frequency readout		
Marker resolution		1 Hz
Uncertainty		$\pm(\text{marker frequency} \times \text{reference uncertainty} + 10\% \times \text{resolution bandwidth} + \frac{1}{2}(\text{span}/(\text{sweep points} - 1) + 1 \text{ Hz}))$
Number of sweep (trace) points		711
Marker tuning frequency step size		span/710
Frequency counter resolution		0.1 Hz
Count uncertainty	SNR > 25 dB	$\pm(\text{frequency} \times \text{reference uncertainty} + \frac{1}{2}(\text{last digit}))$
Frequency span		0 Hz, 10 Hz to 3 GHz
	with R&S®ZPH-B4 option installed	0 Hz, 10 Hz to 4 GHz
Span uncertainty		1 % (nom.)

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

Sweep time

Sweep time	span = 0 Hz	1 ms to 1000 s
	$10 \text{ Hz} \leq \text{span} \leq 600 \text{ MHz}$	20 ms to 1000 s
	span > 600 MHz	$20 \text{ ms} \times \text{span} / 1600 \text{ MHz}$ to 1000 s
Uncertainty	span = 0 Hz	1 % (nom.)
	span ≥ 10 Hz	3 % (nom.)

Bandwidths

Resolution bandwidths		
Range	-3 dB bandwidth	1 Hz to 3 MHz in 1/3 sequence
Bandwidth accuracy	$1 \text{ Hz} \leq \text{RBW} \leq 300 \text{ kHz}$	< 5 % (nom.)
	$300 \text{ kHz} < \text{RBW} \leq 1 \text{ MHz}$	< 10 % (nom.)
Selectivity 60 dB:3 dB		< 5 (nom.), (Gaussian type filters)
Video filters		
Range	-3 dB bandwidth	1 Hz to 3 MHz in 1/3 sequence

Level

Display range		displayed noise floor to +30 dBm
Maximum rated input level		
DC voltage		50 V
CW RF power		33 dBm (= 2 W)
Peak RF power	duration < 3 s	36 dBm (= 4 W)
Max. pulse voltage		150 V
Max. pulse energy	pulse width 10 μ s	10 mWs
Intermodulation		
Third-order intercept (TOI)	intermodulation-free dynamic range, signal level 2 x -20 dBm, RF attenuation = 0 dB, RF preamplifier = off	
	f = 1 GHz	+7 dBm (meas.)
	f = 2.4 GHz	+10 dBm (meas.)
Second-harmonic intercept (SHI)	RF attenuation = 0 dB, RF preamplifier = off, signal level = -40 dBm	
	f_{in} = 20 MHz to 1.5 GHz	-60 dBc (nom.)
	f_{in} = 1.5 GHz to 2 GHz	-80 dBc (nom.)
Displayed average noise level		
	0 dB RF attenuation, termination 50 Ω , RBW = 1 kHz, VBW = 10 Hz, sample detector, log scaling, normalized to 1 Hz	
	frequency	preamplifier = off
	1 MHz to 10 MHz	< -130 dBm, -135 dBm (typ.)
	10 MHz to 1 GHz	< -142 dBm, -146 dBm (typ.)
	1 GHz to 4 GHz	< -140 dBm, -144 dBm (typ.)
	frequency	preamplifier = on
	1 MHz to 10 MHz	< -150 dBm, -160 dBm (typ.)
	10 MHz to 3 GHz	< -158 dBm, -163 dBm (typ.)
	3 GHz to 4 GHz	< -156 dBm, -161 dBm (typ.)

Immunity to interference, nominal values

Image frequencies	$f_{in} - 2 \times 30.15$ MHz	< -70 dBc (nom.)
	$f_{in} - 2 \times 830.15$ MHz	< -70 dBc (nom.)
	$f < 3$ GHz, $f_{in} - 2 \times 830.15$ MHz	< -70 dBc (nom.)
	$f < 3$ GHz, $f_{in} - 2 \times 4042.65$ MHz	-60 dBc (nom.)
	$f \geq 3$ GHz, $f_{in} + 2 \times 830.15$ MHz	-60 dBc (nom.)
Intermediate frequencies	30.15 MHz, 830.15 MHz, 4042.65 MHz	< -60 dBc (nom.)
Other interfering signals, signal level - RF attenuation < -30 dBm	$f \leq 3$ GHz, spurious at $f_{in} - 2021.325$ MHz	< -60 dBc (nom.)
Other interfering signals, related to local oscillators	$\Delta f \geq 300$ kHz	< -60 dBc (nom.)
	f = receive frequency	
Residual spurious response	input matched with 50 Ω , without input signal, RBW ≤ 30 kHz, $f \geq 3$ MHz, RF attenuation = 0 dB	< -90 dBm (nom.)

Level display

Logarithmic level axis		1/2/3/5/10/20/30/50/100/120/150 dB, 10 divisions
Linear level axis		0 % to 100 %, 10 divisions
Number of traces		2
Trace detectors		max. peak, min. peak, auto peak, sample, RMS
Trace functions		clear/write, max. hold, min. hold, average, view
Setting range of reference level		-130 dBm to +30 dBm
Units of level axis		dBm, dBmV, dB μ V, V, W

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

Trigger functions

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

R&S® ZPH-K7 analog modulation analysis AM/FM (model .12 only)

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

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

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

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

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

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

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

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

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

Channel power meter (R&S®ZPH-K19 option, model .02 only)

Frequency range		2 MHz to 3 GHz
	with R&S®ZPH-B4 option installed	2 MHz to 4 GHz
Measurement range		-20 dBm to +30 dBm
Measurement accuracy	+20 °C to +30 °C, 2 MHz ≤ f < 10 MHz	< 2 dB (nom.)
	+20 °C to +30 °C, 10 MHz ≤ f ≤ 4 GHz	< 0.8 dB
	-20 °C to +50 °C, 10 MHz ≤ f ≤ 4 GHz	< 1.2 dB

Channel power meter (R&S®ZPH-K19 option, model .12 only)

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

Maximum rated input levels

Maximum rated input level		
DC voltage		50 V
CW RF power	port 1 (power meter input)	30 dBm (= 1 W)
	port 2 (reflectometer input)	23 dBm (= 0.2 W)
Peak RF power	< 3 s duration, port 1	33 dBm (= 2 W)
	< 3 s duration, port 2	26 dBm (= 0.4 W)
Max. pulse voltage		150 V
Max. pulse energy	pulse width 10 μs	10 mWs

Inputs and outputs

Port 1:		
Impedance		50 Ω
Connector		N female
VSWR	2 MHz ≤ f ≤ 4 GHz (model .02)	< 1.2 (nom.)
	100 kHz ≤ f ≤ 1 GHz (model .12)	< 1.5 (nom.)
	1 GHz < f ≤ 4 GHz (model .12)	< 2 (nom.)
Port 2: Reflectometer		
Impedance		50 Ω
Connector		N female
VSWR	2 MHz ≤ f ≤ 4 GHz (model .02)	< 1.5 (nom.)
	2 MHz ≤ f < 100 MHz (model .12)	< 2.0 (nom.)
	100 MHz ≤ f ≤ 4 GHz (model .12)	< 1.5 (nom.)
DC bias (model .12 only)		
Mode		N- type or BNC
Output port		port 2
Output voltage	mode: internal	+2 V to +32 V in 0.1 V steps (nom.)
Accuracy	< +3V	< 1 V (nom)
	≥ +3V	< 0.5 V (nom)
Maximum output power	mode: internal	
	operated with battery	7 W
	operated with AC mains	7 W
Maximum continuous output current	mode: internal	650 mA

Built-in GPS receiver (R&S®ZPH-B10 option, model .02 only)

GPS location indication		latitude, longitude, height
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General data

Manual operation		
Languages		Chinese, Chinese Traditional, English, French, German, Italian, Hungarian, Japanese, Korean, Portuguese, Russian, Spanish
Remote control		
Command set		SCPI 1997.0
LAN interface		10/100BASE-T, RJ-45
USB		mini B plug, version 2.0
Display		
Resolution		WVGA, 800 × 480 pixel
Audio		
Speaker		internal
USB interface		type A plug, version 2.0
	number of interfaces	2
Mass memory		
Mass memory		USB stick/microSD card (not supplied) size ≤ 32 Gbyte, USB version 1.1 or 2.0
Data storage	internal	> 160 instrument settings and traces
	on USB stick or microSD Card, ≥ 1 Gbyte	> 10000 instrument settings and traces
Temperature	operating temperature range	-20 °C to +50 °C
	storage temperature range	-40 °C to +70 °C
	battery charging mode	0 °C to +40 °C
Climatic loading	relative humidity	+25 °/+55 °C at 95 % relative humidity (EN 60068-2-30)
	class of protection	IP51

Mechanical resistance		
Vibration	sinusoidal	EN 60068-2-6, MIL-PRF-28800F class 2
	random	EN 60068-2-64, MIL-PRF-28800F class 2
Shock		40 g shock spectrum, in line with MIL-STD-810F, method 516.4 procedure 1, MIL-PRF-28800F

Power supply		
R&S®HA-Z301 AC power supply	input specifications	100 V to 240 V AC, 50 Hz to 60 Hz, 1.0 A to 0.5 A
	output specifications	15 V, 2.67 A, max. 40 W
	operating temperature range	-30 °C to +60 °C
	storage temperature range	-40 °C to +85 °C
	test mark	CE, UL, PSE, TUV
External DC voltage		14.65 V to 15.45 V
Battery	R&S®HA-Z306	lithium-ion battery
Capacity		72 Wh
Voltage		11.25 V (nom.)
Operating time with new, fully charged battery	model .02	9 h
	model .12 (default mode)	6.5 h
	model .12 (spectrum analyzer mode)	9 h
	instrument switched off or charge with R&S®HA-Z203 battery charger	3.5 h
	instrument switched on	4.5 h
Life time	charging cycles	> 80 % of more of its initial capacity after 300 charge/discharge cycles
Power consumption		8 W (meas.) (R&S®Cable Rider ZPH model .02)
		11 W (meas.) (R&S®Cable Rider ZPH model .12 – default mode)
		8 W (meas.) (R&S®Cable Rider ZPH model .12 – spectrum analyzer mode)
Safety		IEC 61010-1, EN 61010-1, UL 61010-1 (Third Edition), CAN/CSA-C22.2 No. 61010.1-12
Test mark		VDE, CSA, CSA-NRTL

EMC		in line with European EMC Directive 2014/30/EU including EN 61326-1 class B (emission) CISPR 11/EN 55011/group 1 class B (emission) EN 61326-1 table 2 (immunity, industrial)
Dimensions	W x H x D	202 mm x 294 mm x 76 mm (8.0 in x 11.6 in x 3 in)
Weight		2.5 kg (5.5 lb)
Recommended calibration interval		1 year

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

The specifications for part number 1321.1211.02 are equivalent to part number 1321.1211.52 and 1321.1211P01.

Ordering information

Designation	Type	Order No.
Handheld cable and antenna analyzer, 2 MHz to 3 GHz	R&S®Cable Rider ZPH	1321.1211.02
Handheld cable and antenna analyzer, 2 MHz to 3 GHz	R&S®Cable Rider ZPH	1321.1211.12
Accessories supplied		
Lithium-ion battery pack, USB cable, AC power supply with country specific adapters for EU, GB, US, AUS, CH, getting started manual, side strap		

Options

Designation	Type	Order No.
Cable and antenna analyzer frequency upgrade from 3 GHz to 4 GHz	R&S®ZPH-B4	1321.0380.02
Spectrum analyzer (model .12 only)	R&S®ZPH-K1	1334.5604.02
GPS support (model .02 only)	R&S®ZPH-B10	1321.0396.02
Spectrum analyzer preamplifier (model .12 only)	R&S®ZPH-B22 ⁴	1334.5627.02
Analog modulation analysis AM/FM (model .12 only)	R&S®ZPH-K7 ⁴	1334.5633.02
Power sensor support	R&S®ZPH-K9	1321.0415.02
Interference analysis (model .12 only)	R&S®ZPH-K15 ⁴	1334.5640.02
Signal strength mapping (model .12 only)	R&S®ZPH-K16 ⁴	1334.5656.02
Channel power meter	R&S®ZPH-K19	1321.0409.02
Pulse measurements with power sensor	R&S®ZPH-K29	1321.0421.02

Accessories

Designation	Type	Order No.
Calibration unit	R&S®ZN-Z103	1321.1828.02
Combined open/short/50 Ω load calibration standard, for calibrating the VSWR and DTF measurements, DC to 3.6 GHz	R&S®FSH-Z29	1300.7510.03
Battery charger for R&S®HA-Z306 ⁵	R&S®HA-Z303	1321.1328.02
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
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
Soft carrying bag	R&S®HA-Z211	R&S®HA-Z211
Hard Case	R&S®HA-Z321	1321.1357.02
Hard shell protective carrying case	R&S®RTH-Z4	1326.2774.02
Carrying holster	R&S®HA-Z322	1321.1370.02
Rainproof carrying holster	R&S®HA-Z322	1321.1370.03

Antennas and antenna accessories

Designation	Type	Order No.
Handheld directional antenna (with antenna handle)	R&S®HE400BC	4104.6000.04
Cable set for R&S®HE400BC (R&S®HE300USB required)	R&S®HE400-KB	4104.7770.04
Handheld directional antenna (with antenna handle)	R&S®HE400	4104.6000.02
Cable set for R&S®HE400 (R&S®HE300USB required)	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
USB adapter	R&S®HE300USB	4080.9440.02
Log-periodic OEM antenna, 700 MHz to 4 GHz	R&S®HA-Z350	1321.1405.02
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
Portable EMF measurement system, hardcase	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, 9 kHz to 200 MHz, for R&S®TS-EMF	R&S®TSEMF-B3	1074.5690.02

⁴ Additional ZPH-K1 option is required to activate this option.

⁵ The battery charger is dedicated for charging an additional battery outside the instrument. The battery can be charged via the instrument as well.

Designation	Type	Order No.
Converter cable	R&S®TSEMF-CV	1158.9250.02
RF cable (length: 1 m), DC to 6 GHz, N male/N male 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
Compact probe set for E and H near-field measurements, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02
Near-field probe set H field	R&S®HZ-17	1339.4141.02
Preamplifier (3 GHz, 20 dB), power adapter (100 V to 230 V), for R&S®HZ-15	R&S®HZ-16	1147.2720.02
RF cable (length: 1 m), DC to 8 GHz, armored, N male/N female connectors	R&S®FSH-Z320	1309.6600.00
RF cable (length: 3 m), DC to 8 GHz, armored, N male/N female connectors	R&S®FSH-Z321	1309.6617.00
Matching pad, 50/75 Ω, L section	R&S®RAM	0358.5414.02
Matching pad, 50/75 Ω, series resistor 25 Ω	R&S®RAZ	0358.5714.02
Matching pad, 50/75 Ω, L section, N to BNC	R&S®FSH-Z38	1300.7740.02
Adapter N (m) – BNC (f)		0118.2812.00
Adapter N (m) – N (m)		0092.6581.00
Adapter N (m) – SMA (f)		4012.5837.00
Adapter N (m) – 7/16 (f)		3530.6646.00
Adapter N (m) – 7/16 (m)		3530.6630.00
Adapter N (m) – FME (f)		4048.9790.00
Adapter BNC (m) – Banana (f)		0017.6742.00
Attenuator, 50 W, 20 dB, 50 Ω, DC to 6 GHz, N (f) – N (m)	R&S®RDL50	1035.1700.52
Attenuator, 100 W, 20 dB, 50 Ω, DC to 2 GHz, N (f) – N (m)	R&S®RBU100	1073.8495.20
Attenuator, 100 W, 30 dB, 50 Ω, DC to 2 GHz, N (f) – N (m)	R&S®RBU100	1073.8495.30

Power sensors supported by the R&S®Cable Rider ZPH ⁶

Designation	Type	Order No.
Directional power sensor, 25 MHz to 1 GHz	R&S®FSH-Z14	1120.6001.02
Directional power sensor, 200 MHz to 4 GHz	R&S®FSH-Z44	1165.2305.02
Universal power sensor, 10 MHz to 8 GHz, 100 mW, 2-path	R&S®NRP-Z211	1417.0409.02
Universal power sensor, 10 MHz to 18 GHz, 100 mW, 2-path	R&S®NRP-Z221	1417.0309.02
Wideband power sensor, 50 MHz to 18 GHz, 100 mW	R&S®NRP-Z81	1137.9009.02
Wideband power sensor, 50 MHz to 40 GHz, 100 mW (2.92 mm)	R&S®NRP-Z85	1411.7501.02
Wideband power sensor, 50 MHz to 40 GHz, 100 mW (2.40 mm)	R&S®NRP-Z86	1417.0109.40
Wideband power sensor, 50 MHz to 44 GHz, 100 mW (2.40 mm)	R&S®NRP-Z86	1417.0109.44
Three-path diode power sensors, 100 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP8S	1419.0006.02
Three-path diode power sensors, 100 pW to 200 mW, 10 MHz to 18 GHz	R&S®NRP18S	1419.0029.02
Three-path diode power sensors, 100 pW to 200 mW, 10 MHz to 33 GHz	R&S®NRP33S	1419.0064.02
Three-path diode power sensors, 100 pW to 200 mW, 50 MHz to 40 GHz	R&S®NRP40S	1419.0041.02
Three-path diode power sensors, 100 pW to 200 mW, 50 MHz to 50 GHz	R&S®NRP50S	1419.0087.02
Thermal power sensor, 300 nW to 100 mW, DC to 18 GHz	R&S®NRP18T	1424.6115.02
Thermal power sensor, 300 nW to 100 mW, DC to 33 GHz	R&S®NRP33T	1424.6138.02
Thermal power sensor, 300 nW to 100 mW, DC to 40 GHz	R&S®NRP40T	1424.6150.02
Thermal power sensor, 300 nW to 100 mW, DC to 50 GHz	R&S®NRP50T	1424.6173.02
Thermal power sensor, 300 nW to 100 mW, DC to 67 GHz	R&S®NRP67T	1424.6196.02
Thermal power sensor, 300 nW to 100 mW, DC to 110 GHz	R&S®NRP110T	1424.6215.02
Average power sensor, 100 pW to 200 mW, 8 kHz to 6 GHz	R&S®NRP6A	1424.6796.02
Average power sensor, 100 pW to 200 mW, 8 kHz to 18 GHz	R&S®NRP18A	1424.6815.02
R&S®NRP-Zxx power sensors require the following adapter cable for operation on the R&S®Cable Rider ZPH		
USB adapter cable for R&S®FSH-Z14/R&S®FSH-Z44 power sensors	R&S®FSH-Z144	1145.5909.02
USB adapter cable (passive), length: 2 m, to connect R&S®NRP-Zxx S/SN power sensors to the R&S®Spectrum Rider FPH	R&S®NRP-Z4	1146.8001.02
R&S®FSH-Z14 and R&S®FSH-Z44 power sensors require the following adapter cable for operation on the R&S®Cable Rider ZPH		
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

⁶ For average power measurements only.

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

Service options

Warranty		
Base unit		3 years
All other items ⁷		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with calibration coverage, one year	R&S®CW1	
Extended Warranty with calibration coverage, two years	R&S®CW2	

Extended warranty with a term of one and two years (WE1 and WE2)

Repairs carried out during the contract term are free of charge ⁸. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs ⁸ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

⁷ For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

⁸ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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R&S® Cable Rider ZPH Cable and Antenna Analyzer

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