

R&S®ZNL

Vector Network Analyzer

The 3-in-1 allrounder



R&S®ZNL Vector Network Analyzer At a glance

Measurement equipment for RF applications must fulfill high quality standards. Instruments should be easy to use and offer a high versatility. Fast measurements and reliable performance are crucial. With the R&S®ZNL, Rohde & Schwarz exceeds these expectations and offers even more: vector network analysis, spectrum analysis and power meter measurements are unified in one single, compact instrument making the R&S®ZNL a universal all-rounder.

Offering frequency ranges from 5 kHz to 3 GHz or 6 GHz the R&S®ZNL is well suited for various RF component measurement applications in industrial electronics and wireless communications.

Ever changing measurement tasks in research laboratories can be demanding. The R&S®ZNL helps to reduce investment costs due to its unique concept of options. The base unit can be extended with a fully integrated spectrum analyzer option¹⁾. Moreover, the R&S®ZNL can be used as a RF power meter²⁾.

Instead of investing in different instruments, research labs, service centers, universities and production facilities can use one single instrument that offers even higher measurement speeds and RF performance than other instruments in comparable classes.

Vector network analysis and spectrum analysis measurements can be displayed on the 10.1" multitouch screen in parallel. Clear menu structures and numerous wizards help the user to configure the measurement conveniently.

Although the R&S®ZNL unifies a variety of different functionalities, it is a very compact instrument with an attractive form factor. Weighing only 6 to 8 kg, offering a carrying handle and a battery option, the R&S®ZNL is fully portable and can be operated, wherever needed.

¹⁾ Requires R&S®ZNL3-B1 option.

²⁾ Requires R&S®NRP-Zxx external power sensor, R&S®FPL1-K9 option and R&S®ZNL3-B1 option.



R&S®ZNL

Vector Network Analyzer

Benefits and key features

Key features

- Frequency range from 5 kHz to 3 GHz (R&S®ZNL3) or 5 kHz to 6 GHz (R&S®ZNL6)
- Two-port vector network analyzer for bidirectional measurements
- Universal instrument concept:
 - Vector network analyzer
 - Fully integrated spectrum analyzer option (for R&S®ZNL3)
- Display of power meter measurements
- Wide dynamic range of typ. 130 dB
- Output power range from –40 dBm to typ. + 3 dBm
- Measurement bandwidths from 1 Hz to 500 kHz
- Fast measurements, i.e. 16.7 ms for 401 points (100 kHz IFBW, 200 MHz Span, 2-port TOSM (SOLT))
- Compact size and low weight (6 kg to 8 kg)
- Optional battery pack available
- Windows 10® operating system

The 3-in-1 analyzer: compact vector network analyzer

- Solid RF performance
 - Versatile features, like calibration unit support, for production and lab
 - Time domain and distance to fault
 - Compact 3 in 1 instrument
 - Remote controllable with LAN and GPIB option
- ▷ [page 4](#)

The 3-in-1 analyzer: fully integrated spectrum analyzer

- Integrated hardware for solid RF performance
 - Spectrum mode
 - Analog demodulation
 - Digital demodulation
- ▷ [page 6](#)

The 3-in-1 analyzer: RF power meter

- Precise power measurements
- ▷ [page 7](#)

User interface with multi-touch screen

- Clear menu structures for efficient operation
 - Wide 10.1" display for convenient operation
 - Integrated PC
 - All-in-one display of different measurement modes with MultiView feature
- ▷ [page 10](#)

Fully portable – go anywhere

- Battery and DC supply to power the instrument where needed
 - Accessories to prepare the instrument for usage in the field
- ▷ [page 11](#)

The 3-in-1 analyzer: compact vector network analyzer

The R&S®ZNL combines the functionality of a vector network analyzer, a spectrum analyzer and a power meter in a single box. It is an all-in-one test bench and good for use where test requirements are constantly changing such as development, production and service facilities.

Solid RF performance

Vector network analyzers such as the R&S®ZNL can characterize electronic networks in the frequency domain, e.g. by measuring the magnitude and phase of S-parameters. Moreover, components can be analyzed in the time domain with the R&S®ZNL-K2 option.

High dynamic range

The R&S®ZNL features a wide dynamic range of up to 130 dB (typ.; at 10 Hz IFBW) and an output power of typ. 3 dBm. With this, the R&S®ZNL can be used for measurements on high rejection filters where the demands on wide dynamic range are high.

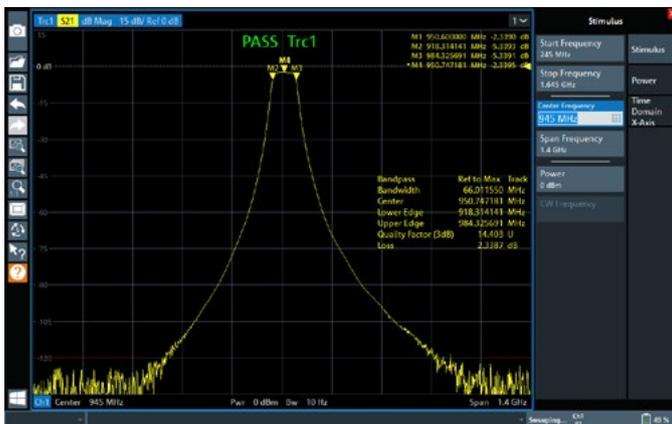
Low trace noise for high accuracy

The R&S®ZNL offers a low trace noise of less than 0.0005 dB (typ.; at 10 kHz IFBW). This allows for stable repeatable measurements at high accuracies even with larger IF bandwidths. Using larger measurement bandwidths, the R&S®ZNL can perform faster measurements whilst still maintaining the stability that is normally only available with smaller measurement bandwidths.

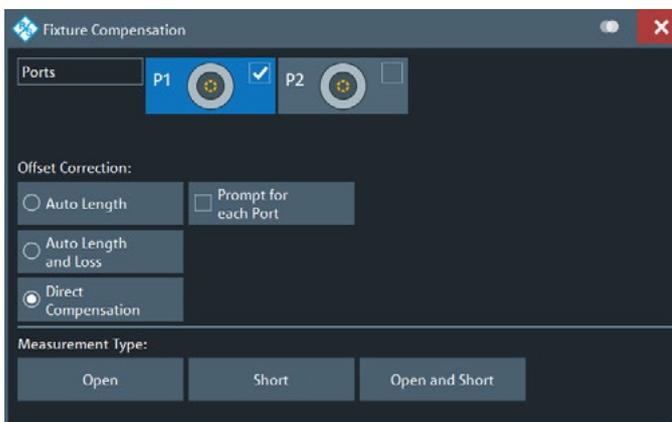
Fast measurements for high throughput

With measurement times of 16.7 ms for 401 points (full two port calibration, 200 MHz Span, 100 kHz IFBW), high-speed data processing and fast LAN or IEC/IEEE data transfer, the R&S®ZNL is a reliable instrument for applications within the production environment. Throughput can be maximized with the segmented sweep functionality, where the frequency axis is divided into segments. Sweep parameters such as output power, IF bandwidth and number of points can be defined separately for each segment to optimally match the DUT characteristics. This increases measurement speed without any loss in accuracy.

Filter measurement on a high high-rejection bandpass filter using the bandfilter analysis.



The fixture compensation menu, showing all compensation methods that are available.



Versatile features, like calibration unit support for production and lab

Versatile calibration features and calibration unit support

The R&S®ZNL calibration wizard guides you through the calibration process. Manual calibration kits and automatic calibration units are supported. The use of an automatic calibration unit minimizes the time needed to perform a full system error correction. The calibration unit is ready for use right after it is connected to the R&S®ZNL. It only takes a few steps to calibrate the setup. This is especially an advantage in production environments, helping you save time and maximize throughput. With the “Start Auto Cal” button and an automatic calibration unit it is possible to perform a one click calibration.

De-/embedding and fixture compensation

In the production environment, it is often necessary to characterize a single component which is specified together with the networks that match them to the impedance of the surrounding circuit. The R&S®ZNL can embed the DUT into virtual matching networks to provide realistic conditions by simulating the DUT installed in its operational environment. The R&S®ZNL offers a choice of predefined matching network topologies. In addition touchstone files can be read into the R&S®ZNL and used for embedding/deembedding. The fixture compensation feature can be used to correct the measurement results for unwanted effects of a test fixture or adapter placed after the reference plane.

Remote controllable with LAN and GPIB option

The R&S®ZNL can be remote controlled via the integrated LAN interface. The optional GPIB interface lets you connect a controller to remotely control the R&S®ZNL.

Data is transmitted bidirectionally on the 8-bit parallel bus. The data measured during a sweep is transferred to the controller while the next sweep is in progress. As a result, the R&S®ZNL has a virtually negligible data transfer time.

Time domain measurements and distance to fault

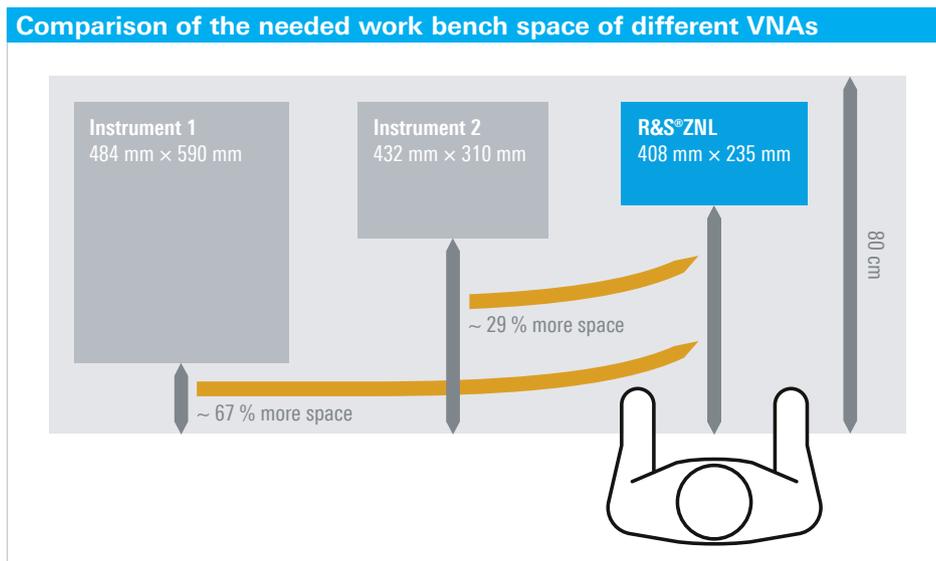
The R&S®ZNL offers powerful time domain analysis option, R&S®ZNL-K2, to measure components such as filters or high-speed digital data cables in the frequency and time domain. With 100 001 points per trace, the R&S®ZNL can measure electrically long DUTs such as long cables without any limitations.

The R&S®ZNL's gating function makes it easy to locate cable faults and analyze them in detail. With the low start frequency of 5 kHz it is possible to get an even more accurate measurement for time domain as the gap to DC is reduced and thus the values that need to be estimated are reduced. The R&S®ZNL-K3 option allows the detection of cable faults and connectors, which is important for antenna installation, for example. All common cable types can be selected and are predefined with velocity factor and frequency-dependent attenuation.

Compact 3-in-1 instrument

Featuring an instrument depth of less than 24 cm and weighing only 6 kg to 8 kg, the R&S®ZNL is the most compact instrument in its class. The user can profit from more space on his work bench than with any other comparable benchtop analyzer.

If the R&S®ZNL3-B1 spectrum analyzer option is included even more space is saved as the instrument is still just as compact, but offers the functionality of two, or even three instruments: network analyzer, spectrum analyzer and power meter.



The 3-in-1 analyzer: fully integrated spectrum analyzer

Different modes of operation make the R&S®ZNL vector network analyzer to a versatile multipurpose instrument. Including the R&S®ZNL3-B1 hardware option adds a fully integrated spectrum analyzer on a dedicated hardware board to the base unit. There is no need to reboot the instrument to switch between different modes.

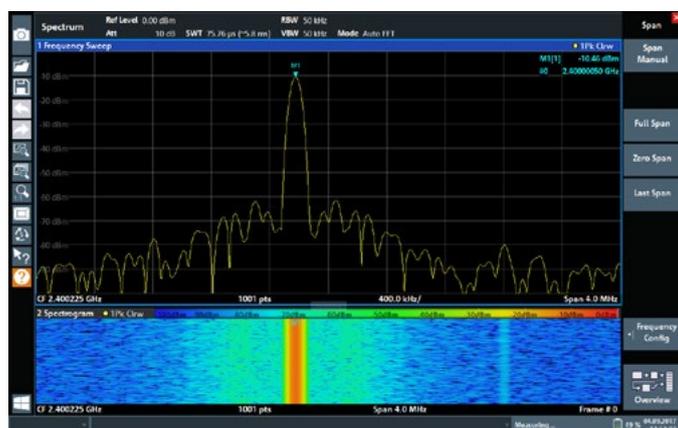
Integrated hardware for solid RF performance

As the R&S®ZNL integrates a dedicated hardware board with the R&S®ZNL3-B1 option, its performance is comparable to pure spectrum analyzers in the economy and midrange class. It features a phase noise of typ. -108 dBc (1 Hz) at 10 kHz offset, a third-order intercept point of typ. $+20$ dBm and typ. -150 dBm displayed average noise level.

Spectrum mode

In the spectrum application the provided functions correspond to those of a conventional spectrum analyzer. The analyzer measures the frequency spectrum of the RF input signal over the selected frequency range with the selected resolution and sweep time. Alternatively, it displays the waveform of the video signal for a fixed frequency. This application requires the R&S®ZNL3-B1 spectrum analysis hardware option.

The spectrum analyzer mode of the R&S®ZNL:
here the full functionality of a standard spectrum analyzer is utilized.



The I/Q analyzer, included in the spectrum analyzer option, is the standard function for digital signal analysis. This application provides measurement and display functions for I/Q Data. It displays the magnitude and phase parameters and the FFT spectrum. The captured IQ data can be transferred to third-party software tools (e.g. Matlab® or Python) for further analysis. This application requires the R&S®ZNL3-B1 spectrum analyzer option. With the R&S®FPL1-B40 option single-carrier signals with up to 40 MHz bandwidth can be analyzed and demodulated.

Analog demodulation

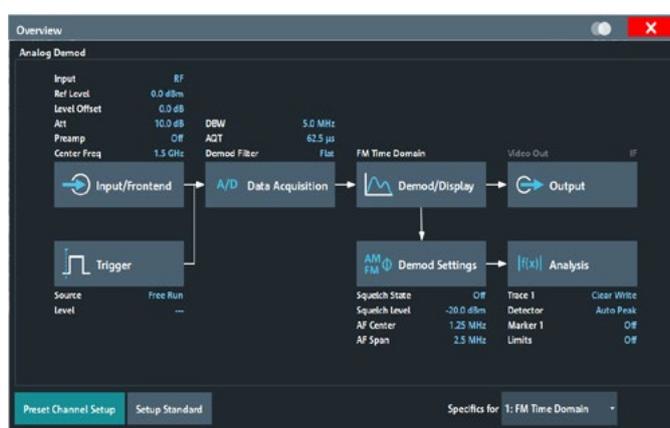
The R&S®FPL1-K7 option converts the R&S®ZNL into an analog modulation analyzer for amplitude, frequency and phase modulated signals. It measures the characteristics of the useful modulation and other items such as residual FM or synchronous modulation. Typical applications of the R&S®FPL1-K7 include:

- ▮ Transient and settling measurements of oscillators like VCOs and PLLs
- ▮ Troubleshooting AM/FM transmitters
- ▮ Simple chirp analysis of pulsed or continuous wave signals

Digital demodulation

The R&S®ZNL with a R&S®ZNL3-B1 option analyzes and demodulates digitally modulated single-carrier signals with up to 40 MHz analysis bandwidth. When analyzing digital modulation signals, R&S®ZNL receives and digitizes the signal, which is then analyzed by the R&S®VSE vector signal explorer software together with the R&S®VSE-K70 or R&S®VSE-K106 option. The software runs directly on the R&S®ZNL or on an external PC.

Overview of the analog demodulation menu:
here all settings can be done.



The 3-in-1 analyzer: RF power meter

Precise power measurements

The R&S®FPL1-K9 option adds the support of R&S®NRP power sensors¹⁾ to the R&S®ZNL for precise power measurements. In order to use a power sensor with the R&S®ZNL the R&S®ZNL3-B1 spectrum analyzer option is needed as well.

The power sensors can be connected via USB or via the ruggedized power sensor connector, included in R&S®FPL1-B5 options.

Up to four power sensors can be connected in parallel. The power sensors can also be used to trigger a measurement at a certain power level.

¹⁾ Please refer to the datasheet, for a list of supported power sensors.

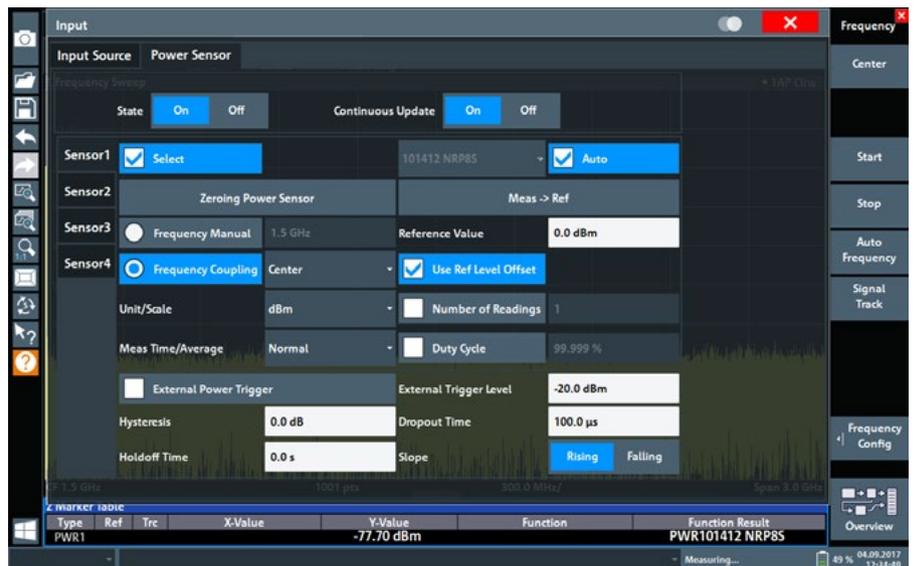


Example for R&S®NRP power sensors: the R&S®NRP8SN and the R&S®NRP85.



The R&S®ZNL can be used for precise power measurements together with a R&S®NRP power sensor.

Overview of the power sensor menu. Each sensor is configured in a separate tap.



Front panel overview

10.1" high-resolution display

- 1280 × 800 pixel resolution

Toolbar

- With standard application functions like print, save/open file, undo, redo, help

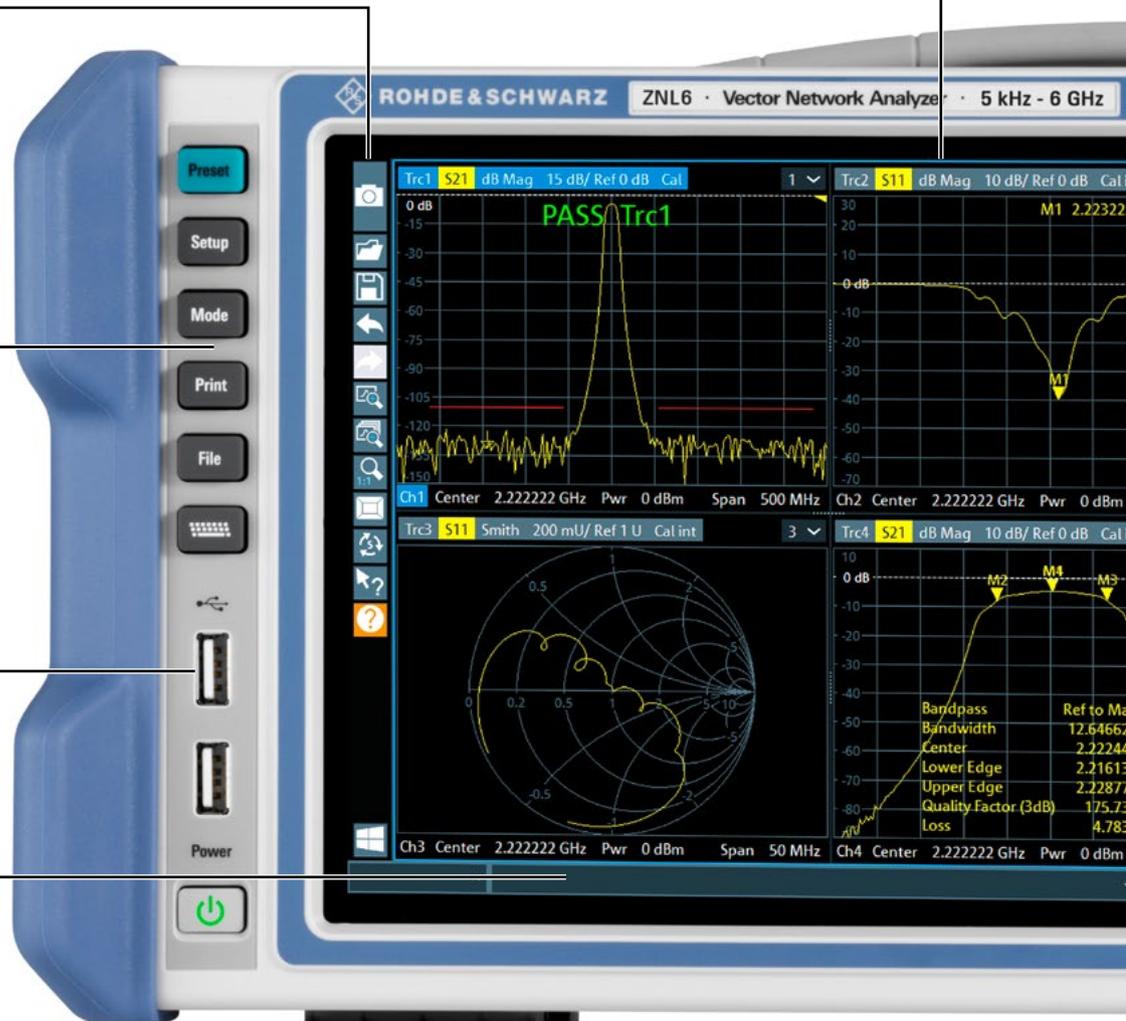
System keys

- For setup, presets, settings etc.

Two USB 2.0 ports

- For storage media
- For connecting accessories

Instrument status bar



Softkey bar

- Quick access to key tools
- Hardware settings at a glance

Numerical keypad

- With unit keys for frequency and level

Function keys

Control knob

Port 1

Port 2/RF input



User interface with multi-touch screen

Clear menu structures for efficient operation

The R&S®ZNL has a user interface, which is well-arranged and clearly structured. Measurements can be configured in just a few steps.

Using the drag-and-drop functionality, traces, channels and diagrams can be arranged to fit the user's needs. Different setups can be saved, reloaded and changing between different setups is possible with minimal effort.

The R&S®ZNL offers a variety of marker functions to evaluate different properties of the measured trace and help the user to operate the instrument efficiently:

- Up to ten markers per trace in different formats such as magnitude, phase, impedance, admittance or VSWR
- The format of the marker can be chosen independently of the displayed format of the trace
- Markers and traces can be named according to applications
- Marker functions as max, min, RMS, peak-to-peak, bandwidth, etc.
- Different read-out functions for marker properties

Moreover, the user can define limit-lines to test compliance of the devices under test.

Wide 10.1" display for convenient operation

The wide 10.1" multi-touch screen is used to display set-ups and arrange measurement tasks suited to the current application. The layout can be adapted to the user's needs simply by drag-and-drop operation.

Integrated PC

With the R&S®ZNL there is no need to supply an external computer controller. With a fully integrated powerful PC platform running the Windows 10® operating system the ZNL is a complete standalone analyzer. With the solid state hard disk the R&S®ZNL delivers fast boot up time and reliability to meet the most demanding applications.

All-in-one display of different measurement modes with MultiView feature

For a full characterization of a device under test, the MultiView display enables the display of an overview of all vector network analysis, spectrum analysis and power meter measurements tabs sequentially. All running measurement modes are combined and automatically displayed and updated in real time in the MultiView tab, which can be accessed directly by tapping on the desired window.

All configured measurements can be performed sequentially by the sequencer in the multiview mode.



In MultiView all tabs can be seen at the same time. In this case one can see a VNA mode measurement in parallel to a SA mode measurement.

Fully portable – go anywhere

Due to its unique hardware concept, the R&S®ZNL unifies different functionalities and still offers a compact form factor. Depending on the included options, the R&S®ZNL only weighs between 6 kg and 8 kg.

Battery and DC supply to power the instrument where needed

Equipped with a carrying handle and the optional battery pack R&S®FPL1-B31, the R&S®ZNL is fully portable allowing it to be conveniently transported to the operational site in the field.

Using the R&S®FPL1-B30 DC power supply option, the R&S®ZNL can be operated with vehicles (12 V/24 V).

Accessories to prepare the instrument for usage in the field

If the instrument needs to be transported or is to be operated in the field for installation purposes, the carrying bag R&S®FPL1-Z2 protects the instrument from damage and dirt. Side vents and the transparent lid allow an operation even if the instrument is safely stored in the bag.

For portable operation, the optional carrying vest holster R&S®FPL1-Z3 is available. The powerful benchtop unit R&S®ZNL becomes a flexible portable instrument and can conveniently be carried. For outside usage in challenging light conditions, the instrument can be equipped with the anti-glare film option R&S®FPL1-Z5. This does not only improve the contrast on the display, but also protects the screen from scratches.

The R&S®ZNL can easily be stored and carried around in a robust transport bag.



The rear view of the R&S®ZNL, where the batteries are seen, which can be easily accessed.



Specifications in brief

Specifications in brief		
Network analysis		
Frequency range	R&S®ZNL3	5 kHz to 3 GHz
	R&S®ZNL6	5 kHz to 6 GHz
Dynamic range		>120 dB (spec.); typ. >130 dB
Output power		0 dBm (spec.); typ. + 3 dBm
Trace noise		<0.0035 dB (spec.); typ. < 0.0005 dB
Measurement speed		
Sweep time	401 points, 2-port TOSM, 200 MHz span, 100 kHz IFBW	16.7 ms
Data transfer		
	IEC/IEEE, 201 points	typ. 3 ms
	HiSLIP over 1 Gbit/s LAN	typ. 2.5 ms
Measurement parameters		Sxy; wave quantities, ratios, impedance parameters (Zxy); admittance parameters (Y); stability factors
Display graphs		dB mag, phase, Smith, polar, SWR, unwr phase, lin. mag, inv. Smith, real, imag, delay
Calibration procedures		reflection normalization open or short, reflection OSM(OSL), enhanced reflection normalization OM or SM; transmission normalization (response calibration), transmission normalization both (response calibration), one path two ports, TOSM (SOLT)
Measurement data points	VNA mode	1 to 100001
	SA mode	101 to 100001
IFBW		1 Hz to 500 kHz, in steps of 1/1.5/2/3/5/7
Spectrum analysis (R&S®ZNL3 with R&S®ZNL3-B1 option)		
Frequency range		5 kHz to 3 GHz (resolution 1 Hz)
Displayed average noise level (DANL)	RF attenuation 0 dB	<-140 dBm (spec.); typ. <-150 dBm
Phase noise	1 GHz, 10 kHz offset	<-103 dBc (1 Hz); <-108 dBc (1 Hz)
Max. signal analysis bandwidth	with R&S®FPL1-B40 option	40 MHz
Intermodulation		
Third-order intercept point (TOI)	300 MHz ≤ fin ≤ 3 GHz	>16 dBm (spec.); typ. >20 dBm
Second harmonic intercept (SHI)	900 MHz ≤ fin ≤ 1.5 GHz	70 dBm (nom.)
General data		
Limit lines	VNA mode	single, segmented, upper limit, lower limit
Channels	within one VNA setup	no limitation
Channel setups		max 14 setups
Traces	VNA mode	no limitation
	SA mode (R&S®ZNL3-B1 option)	6
Markers	VNA mode	10 + ref. marker (per trace)
	SA mode (R&S®ZNL3-B1 option)	16
Operating system		Windows 10®
Display		26.4 cm (10.1"), diagonal WXGA color LCD with touchscreen
Dimensions (W × H × D)		408 mm × 186 mm × 235 mm (16.06 in × 7.32 in × 9.25 in)
Weight	depending on configuration	6 kg to 8 kg (13.23 lb to 17.64 lb)

Ordering information

Designation	Type	Order No.
Base Unit		
Vector Network Analyzer, 5 kHz to 3 GHz, two ports, N (f)	R&S®ZNL3	1323.0012.03
Vector Network Analyzer, 5 kHz to 6 GHz, two ports, N (f)	R&S®ZNL6	1323.0012.06
Hardware options		
Spectrum Analyzer Function for R&S®ZNL3	R&S®ZNL3-B1	1323.1802.02
Extended Level Range for R&S®ZNL3	R&S®ZNL3-B22	1323.1860.02
Extended Level Range for R&S®ZNL6	R&S®ZNL6-B22	1323.2021.02
Receiver Attenuator, R&S®ZNL3 port 1	R&S®ZNL3-B31	1323.1848.02
Receiver Attenuator, R&S®ZNL3 port 2	R&S®ZNL3-B32	1323.1854.02
Receiver Attenuator, R&S®ZNL6 port 1	R&S®ZNL6-B31	1323.2038.02
Receiver Attenuator, R&S®ZNL6 port 2	R&S®ZNL6-B32	1323.2044.02
Additional Removable HDD	R&S®ZNL-B19	1323.2938.02
OCXO Accurate Reference Frequency	R&S®FPL1-B4	1323.1902.02
Additional Interfaces	R&S®FPL1-B5	1323.1883.02
GPIB Interface	R&S®FPL1-B10	1323.1890.02
DC Power Supply for 12 V/24 V supply	R&S®FPL1-B30	1323.1877.02
Li-Ion Battery Pack	R&S®FPL1-B31	1323.1725.02
40 MHz Analysis Bandwidth ¹⁾	R&S®FPL1-B40	1323.1931.02
Software options		
Time Domain Analysis	R&S®ZNL-K2	1323.1819.02
Distance to Fault Measurement	R&S®ZNL-K3	1323.1825.02
AM/FM/φM Analog Modulation Analysis ¹⁾	R&S®FPL1-K7	1323.1731.02
Measurements with R&S®NRP Power Sensors ¹⁾	R&S®FPL1-K9	1323.1754.02
Noise Figure Measurements	R&S®FPL1-K30	1323.1760.02
License Dongle	R&S®FSPC	1310.0002K02
Vector Signal Explorer Base Software	R&S®VSE	1320.7500.02
Vector Signal Analysis	R&S®VSE-K70	1320.7522.02
EUTRA/LTE NB-IOT	R&S®VSE-K106	1320.7900.02
Recommended extras		
Calibration Kit		
Calibration Kit, N, 50 Ω, 0 Hz to 3 GHz	R&S®ZCAN	0800.8515.52
Calibration Kit, N (m), 50 Ω, 0 Hz to 9 GHz	R&S®ZV-Z170	1317.7683.02
Calibration Kit, N (f), 50 Ω, 0 Hz to 9 GHz	R&S®ZV-Z170	1317.7683.03
Calibration Unit		
Calibration Unit, 2 Ports, N(f), 100 kHz to 8.5 GHz	R&S®ZN-Z151	1317.9134.72
Calibration Unit, 2 Ports, SMA(f), 100 kHz to 8.5 GHz	R&S®ZN-Z151	1317.9134.32
Cables		
N (m)/N (m), 50 Ω, length: 0.6 m/0.9 m, 0 Hz to 18 GHz	R&S®ZV-Z191	1306.4507.24/36
N (m)/3.5 mm (m), 50 Ω, length: 0.6 m/0.9 m, 0 Hz to 18 GHz	R&S®ZV-Z192	1306.4513.24/36
3.5 mm (f)/3.5 mm (m), 50 Ω, length: 0.6 m/0.9 m, 0 Hz to 26.5 GHz	R&S®ZV-Z193	1306.4520.24/36
Others		
Protective Hard Cover	R&S®FPL1-Z1	1323.1960.02
Transport Bag, transparent cover	R&S®FPL1-Z2	1323.1977.02
Carrying Vest Holster	R&S®FPL1-Z3	1323.1683.02
Spare Battery Pack	R&S®FPL1-Z4	1323.1677.02
Anti-glare Film	R&S®FPL1-Z5	1323.1690.02
Three-Path Diode Power Sensor, 100 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP8S	1419.0006.02
Three-Path Diode Power Sensor, 100 pW to 200 mW, 10 MHz to 8 GHz, LAN version	R&S®NRP8SN	1419.0012.02

Warranty		
Base unit		3 years
All other items ¹⁾		1 year
Options		
Extended Warranty, one or two years	R&S®WE1/WE2	Please contact your local Rohde & Schwarz sales office.
Extended Warranty with Calibration Coverage, one or two years	R&S®CW1/CW2	
Extended Warranty with Accredited Calibration Coverage, one or two years	R&S®AW1/AW2	

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

Service that adds value

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

Rohde & Schwarz

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

Sustainable product design

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

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

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R&S®ZNL Vector Network Analyzer

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