

R&S®ZNB Vector Network Analyzer

Leading in speed,
dynamic range and
ease of operation



R&S®ZNB

Vector Network Analyzer

At a glance

More than 60 years of experience in the field of vector network analysis pay off: Rohde & Schwarz once again sets new benchmarks – with the R&S®ZNB vector network analyzers. The new family of network analyzers features high measurement speed, outstanding precision and exceptional ease of operation.

With frequency ranges of 9 kHz to 4.5 GHz and 9 kHz to 8.5 GHz, the new network analyzers are primarily targeted at applications in the mobile radio and electronic goods industries. The R&S®ZNB is the right choice when it comes to developing, producing and servicing RF components such as amplifiers, mixers, filters and cables.

The R&S®ZNB vector network analyzers feature a wide dynamic range of up to 140 dB (at 10 Hz IF bandwidth), low trace noise of less than 0.004 dB RMS (at 10 kHz IF bandwidth) and high output power of up to +13 dBm, which can be adjusted electronically in a range of more than 95 dB.

The new analyzers combine high measurement accuracy with exceptional speed – better than 10 μ s per point. They feature excellent temperature and long-term stability, which ensures reliable measurements over several days without having to recalibrate the units.

These short-depth, compact two-port and four-port analyzers leave plenty of space on the workbench for the measurement application. They feature low operating noise thanks to low power consumption and a sophisticated cooling concept. The low power consumption also reduces operating costs and protects the environment.

Key facts

- Wide dynamic range of up to 140 dB
- Short sweep times of 4 ms for 401 points
- High temperature stability of typ. 0.01 dB/°C
- Wide power sweep range of 98 dB
- Wide range of IF bandwidths from 1 Hz to 10 MHz
- Manual and automatic calibration
- Large, high-resolution 12.1" screen
- Touchscreen user interface
- Two or four test ports



R&S®ZNB

Vector Network Analyzer

Benefits and key features

Designed to meet the highest standards

- ▮ Wide dynamic range from 9 kHz for fast measurements on high-blocking DUTs
- ▮ Excellent raw data for high basic accuracy
- ▮ High temperature stability for long calibration intervals
- ▮ Fast synthesizers for high measurement speed

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Convenient characterization of active and passive RF components

- ▮ Fast embedding/de-embedding for impedance matching using virtual networks
- ▮ Mixed-mode S-parameters for balanced DUT characterization
- ▮ Extensive analysis functions for convenient trace analysis
- ▮ Amplifier measurements with wide power sweep range and receiver step attenuators
- ▮ Time-domain analysis for distance-to-fault (DTF) measurements and filter adjustment

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Network analysis made easy

- ▮ Flat and clear menu structures for efficient operation
- ▮ Optimal display configuration for each measurement task

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Simple calibration – manual or automatic

- ▮ The right calibration method for every test application
- ▮ TSM (Through, Short, Match) – full calibration in only five steps
- ▮ Simple and error-free – automatic calibration in 30 seconds

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High throughput in production

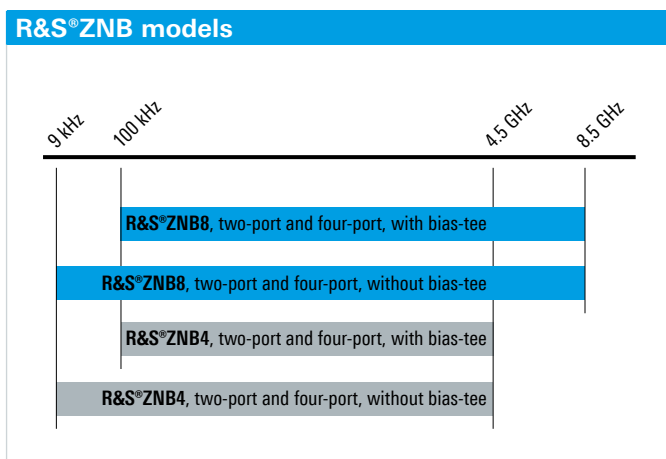
- ▮ Short measurement times
- ▮ High measurement speed due to wide dynamic range and optimized IF bandwidths
- ▮ Segmented sweep for high speed and accuracy
- ▮ Fast switching between instrument setups

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A worthwhile investment

- ▮ Ready for the future
- ▮ Upgrading test systems without rewriting system software
- ▮ An analyzer that speaks the user's language

▷ [page 13](#)



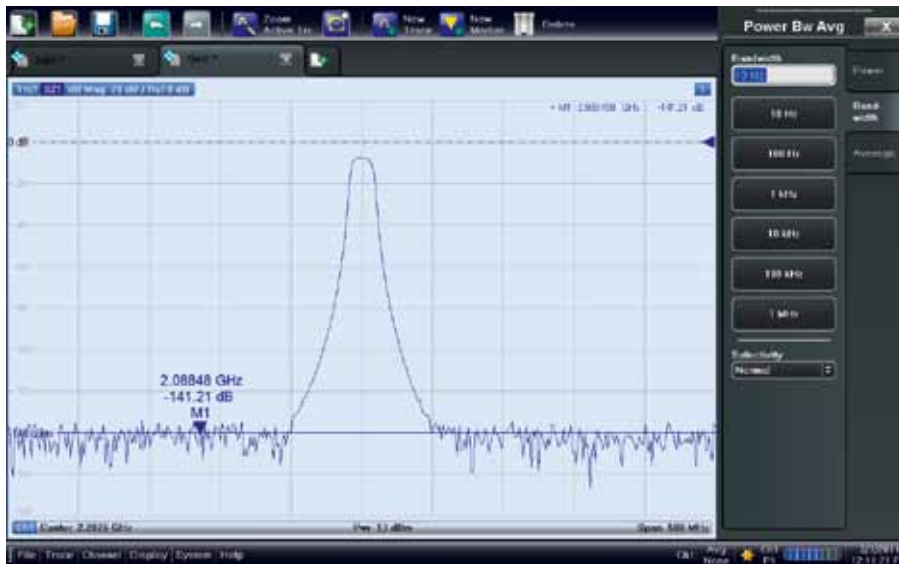
Designed to meet the highest standards

The analyzers of the R&S®ZNB family combine wide dynamic range, excellent raw data, high temperature stability and fast synthesizers to yield performance previously found only in high-end network analyzers. This makes the instruments ideally suited for applications in the development and large-scale production of sophisticated RF components.

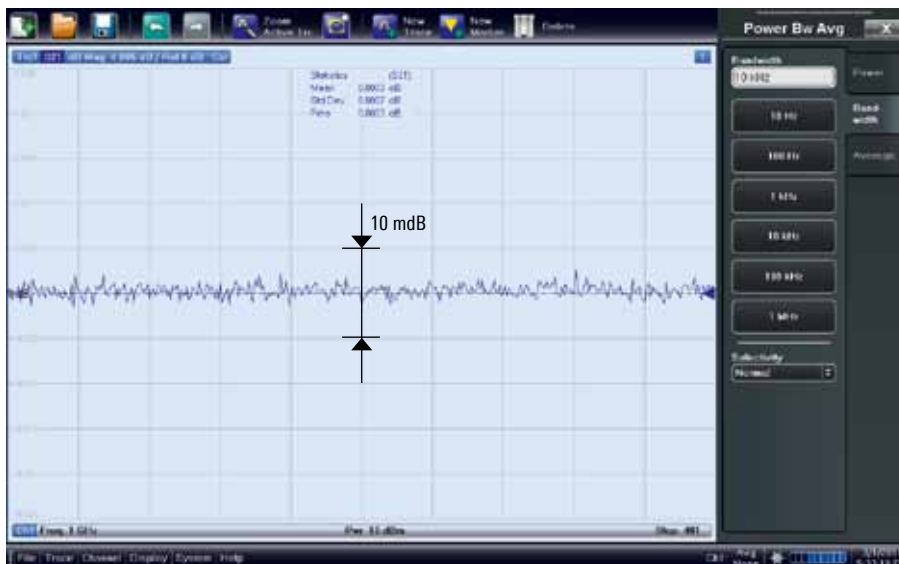
Wide dynamic range from 9 kHz for fast measurements on high-blocking DUTs

The R&S®ZNB receivers combine high power-handling capacity with high sensitivity and low trace noise. The R&S®ZNB provides typically 140 dB dynamic range (at 10 Hz IF bandwidth), 10 dB better than that of other, comparable products on the market, which will mainly speed up manual adjustments of high-blocking filters.

Users will benefit from the R&S®ZNB's wide dynamic range not only in the mobile radio frequency bands, but right from the 9 kHz start frequency.

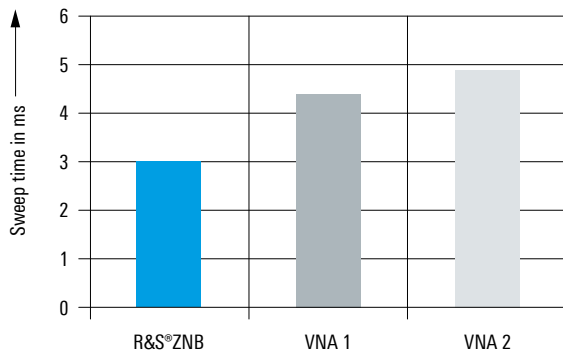


R&S®ZNB dynamic range
(at 10 Hz IF bandwidth).

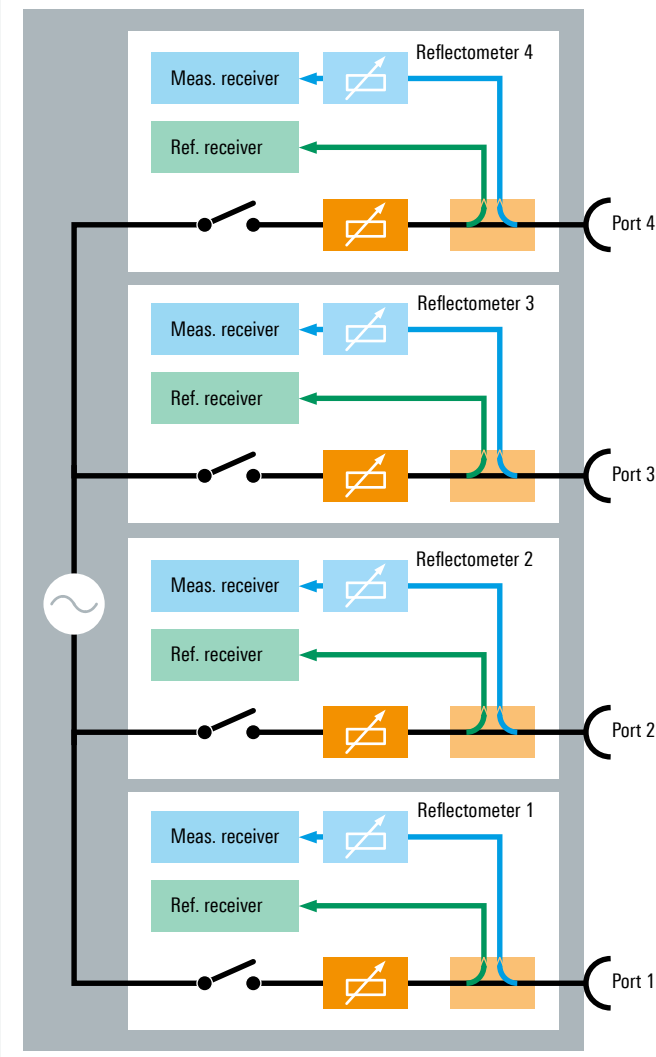


R&S®ZNB trace noise
(at 10 kHz IF bandwidth).

Measurement speed, R&S®ZNB versus competitor products



Block diagram of the R&S®ZNB four-port model



Excellent raw data for high basic accuracy

The R&S®ZNB offers directivity of more than 30 dB and a test port match of up to 25 dB even without calibration. Long-term and temperature stability are improved, and accuracy is increased even further after calibration. Even with partial calibration, for example transmission normalization with a through standard, the R&S®ZNB provides accuracy previously achieved only with complex two-port calibration – at a speed twice as high as with full two-port calibration.

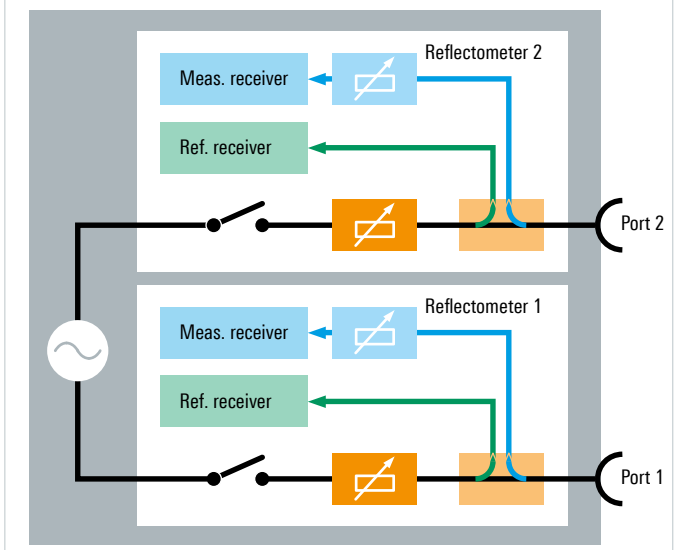
High temperature stability for long calibration intervals

The R&S®ZNB's test set and receivers feature excellent temperature and long-term stability. The analyzer measures S-parameters with very low magnitude and phase drift of typically less than 0.01 dB/°C and 0.15°/°C. A calibrated R&S®ZNB allows precise measurements over several days without recalibration.

Fast synthesizers for high measurement speed

The R&S®ZNB has fast synthesizers with switching times of below 10 µs. This yields high sweep rates and allows the analyzer to perform measurements faster than competitor products.

Block diagram of the R&S®ZNB two-port model



Convenient characterization of active and passive RF components

Fast embedding/de-embedding for impedance matching using virtual networks

Coaxial and balanced components, such as SAW filters used in mobile phone frontends, are specified together with the networks that match them to the impedance of the surrounding circuit. The R&S®ZNB can embed the DUT into virtual matching networks to provide realistic conditions by simulating the DUT installed in its operational environment. The R&S®ZNB offers a choice of predefined matching network topologies. The values of the individual network elements can be edited. If such values are edited, the R&S®ZNB immediately recalculates the network and embeds the DUT in the new network in realtime. In addition to predefined topologies, *.s2p and *.s4p files can be read into the R&S®ZNB and used for embedding/de-embedding.

Mixed-mode S-parameters for balanced DUT characterization

To characterize a DUT with two balanced ports, the R&S®ZNB treats the DUT as an unbalanced four-port device. It calculates the 16 single-ended S-parameters and converts them to mixed-mode S-parameters. This additional computational effort does not compromise measurement speed. A wizard guides the user through the individual steps of the measurement – fast and straightforward.

Extensive analysis functions for convenient trace analysis

A wide variety of analysis functions help the user evaluate important parameters at a glance:

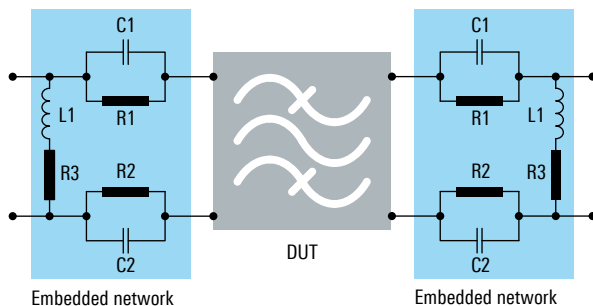
- Ten markers per trace
- Automatic bandwidth measurements
- Limit line and ripple check with pass/fail indication
- Statistical trace analysis including maximum, minimum, RMS and peak-to-peak detection as well as compression point measurement
- Equation editor for complex, realtime trace mathematics

Amplifier measurements with wide power sweep range and receiver step attenuators

The R&S®ZNB's wide, electronically adjustable power sweep range from -85 dBm to +13 dBm enables fast analysis of the linear and nonlinear characteristics of small and large-signal amplifiers.

Electronic step attenuators in the receive paths increase the 0.1 dB compression point to +27 dBm. The wear-free attenuators feature delay-free switching, further enhances measurement speed and extends the R&S®ZNB's useful life in production.

Impedance matching using virtual networks



Equation editor for trace mathematics.

Additional features:

- Four DC inputs for measuring amplifier DC power consumption and efficiency
- Measurement of stability factors of balanced and unbalanced amplifiers
- Support of R&S®NRP-Zxx power sensors, providing high-precision power versus power and power versus frequency measurements

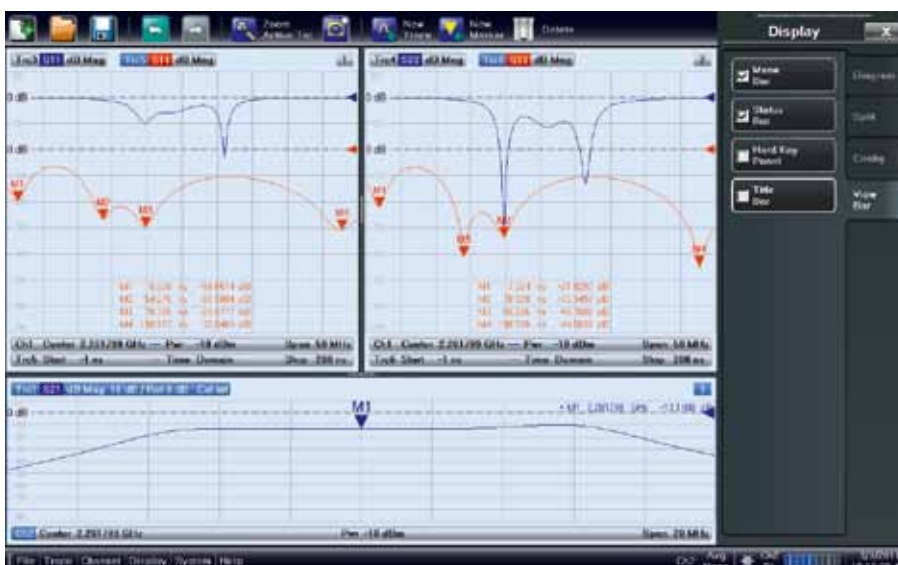
Using prediction, the R&S®ZNB's frequency range can be virtually extended by a factor of up to 10. This yields resolution substantially higher than would be expected from the upper frequency limit of 4.5 GHz or 8.5 GHz. For many applications, this eliminates the need for a higher-frequency – and more expensive – network analyzer.

Time-domain analysis for distance-to-fault (DTF) measurements and filter adjustment

The R&S®ZNB offers powerful time-domain analysis to measure components such as cables or filters. With 100 000 points per trace, the R&S®ZNB measures even electrically long DUTs such as long cables without any problems. The R&S®ZNB's gating function makes it easy to locate cable faults and analyze them in detail.



Compression measurement on an amplifier.



Filter adjustment using time-domain analysis.

Network analysis made easy

The R&S®ZNB vector network analyzers turn into reality what many users desire: configuration, measurement and analysis that are truly intuitive.

Flat and clear menu structures for efficient operation

The R&S®ZNB groups together logically related analyzer control functions at a single operational level, doing away with submenus and multilevel, nested menu structures.

- The R&S®ZNB features a soft panel that immediately shows all control elements that may be needed for a measurement and effectively helps users perform measurement tasks
- Via the soft panel, users can access all instrument functions in a maximum of three operating steps
- Pop-up menus allow many test parameters to be edited right where they are displayed
- Wizards guide the user through the steps of an operating sequence, for example when calibrating the network analyzer, thereby reducing operator errors to a minimum

Clearly structured user interface



Optimal display configuration for each measurement task

The R&S®ZNB features a brilliant 12.1" WXGA color touch-screen. The user can set up the display as required by arranging diagrams, traces and channels in any desired combination. Traces can simply be dragged and dropped between diagrams, either with a finger or the mouse. The names of traces, channels and markers can be edited and replaced by user-specific names to make them easier to identify and to provide consistent result documentation.

With the R&S®ZNB, several instrument setups are available simultaneously. The user simply touches or clicks a tab to put the desired setup and diagrams in the foreground and start the associated measurements.

This convenient approach makes it possible to handle different measurement tasks simultaneously without overloading the display with diagrams that are not currently needed. The user can add further measurements for a given component without modifying the original measurement. This function allows the user to very quickly switch between setups, an essential prerequisite for high throughput in production.



Simple calibration – manual or automatic

The right calibration method for every test application

The R&S®ZNB supports all common calibration methods for coaxial DUTs as well as calibration methods for measurements on DUTs in test fixtures and on printed boards. Graphical wizards guide the user step by step through the calibration.

- **TOSM** calibration (**T**hrough, **O**pen, **S**hort, **M**atch)
- **TRL/LRL** calibration (**T**hrough, **R**eflect, **L**ine/**L**ine, **R**eflect, **L**ine) for printed-board-based test structures and on-wafer applications
- **TRM** calibration (**T**hrough, **R**eflect, **M**atch) for applications using test fixtures
- **UOSM** calibration (**U**nknown Through, **O**pen, **S**hort, **M**atch) for DUTs equipped with different types of input and output connectors and for calibration with an unknown through standard. Compared with the conventional adapter removal calibration method, this method reduces the number of calibration steps from 14 to 7. This saves time and reduces the risk of calibration errors

TSM (Through, Short, Match) – full calibration in only five steps

A network analyzer's accuracy after calibration essentially depends on the quality of the calibration standards used. The quality of the standards, in turn, depends mainly on how accurately the standards can be described by models. Describing the open standard using a model may be problematic; Rohde&Schwarz therefore created the new TSM calibration method for the R&S®ZNB. The new method requires only a through, a short and a match standard; an open standard is not needed. TSM provides accuracy equivalent to that of TOSM, and reduces the number of calibration steps from seven to five.



R&S®ZNB calibration wizard.

Typical effective system data of the R&S®ZNB			
	9 kHz to 100 kHz	100 kHz to 4.5 GHz	4.5 GHz to 8.5 GHz
Directivity	46	45	40
Source match	41	40	36
Load match	44	45	40
Reflection tracking	0.02	0.02	0.05
Transmission tracking	0.028	0.018	0.09

Simple and error-free – automatic calibration in 30 seconds

Rohde & Schwarz offers automatic calibration units with two and four ports. The units are immediately ready for operation and calibrate an R&S®ZNB in less than 30 seconds, covering 201 points. Users can connect adapters to the calibration unit to match different connector types used on the DUT. They can re-characterize the calibration unit, together with the adapters, and store the resulting data to the unit's internal memory.



R&S®ZV-Z132 calibration kit.



R&S®ZV-Z51 calibration unit (automatic).

High throughput in production

Short measurement times

The R&S®ZNB features short measurement times, a result of fast synthesizer settling times, short sampling times due to large IF bandwidths, high-speed data processing up to the display, and fast LAN or IEC/IEEE bus data transfer to the controller.

The analyzer's large IF bandwidths enable fast sampling times of less than 1 μ s per point. The large IF bandwidths, combined with the short synthesizer settling times, yield a total measurement time of no more than 4 ms for a frequency sweep covering 401 points.

High measurement speed due to wide dynamic range and optimized IF bandwidths

Measurement speed for tests on high-blocking DUTs, such as on base station duplex filters, is determined by the required dynamic range and the corresponding IF bandwidth. The R&S®ZNB features a dynamic range more than 10 dB higher than that of comparable products on the market. This means that, at an IF bandwidth higher by a factor of 10, the R&S®ZNB measures ten times faster than comparable products at the same dynamic range. The R&S®ZNB offers IF bandwidths from 1 Hz to 10 MHz, settable in steps of 1, 1.5, 2, 3, 5, 7 and 10, for optimized speed and dynamic range.

The R&S®ZNB offers up to 140 dB dynamic range for a 10 Hz IF bandwidth. For a sweep with 110 dB dynamic range covering 201 points, the R&S®ZNB requires less than 30 ms, a value that is attractive for base station filter manufacturers.

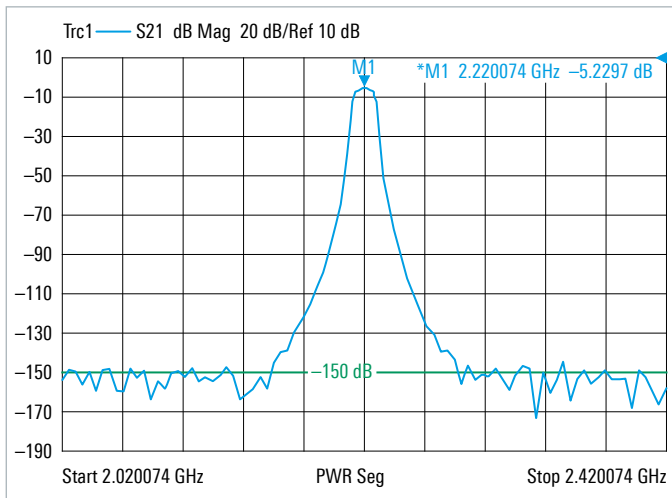
Segmented sweep for high speed and accuracy

When testing high-blocking DUTs such as repeater duplex filters, high IF bandwidths are required in the passband to provide short measurement times. In the stopband, on the other hand, such tests require high output powers and narrow IF bandwidths to provide the required dynamic range.

The R&S®ZNB's segmented sweep function divides the frequency axis 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.

Fast switching between instrument setups

To carry out complex measurements with different instrument setups, R&S®ZNB users do not need to load the setups from the hard disk each time. Once called, the setups for the required measurements, including calculated data such as calibration values, remain available in RAM. This reduces switching time, especially for measurements involving a large number of points. Switching between setups in remote operation is virtually instantaneous. Manually, all the user has to do is touch the screen to activate the setup needed for a desired DUT or measurement.



Filter measurement with segmented sweep.



Dialog for configuring a segmented sweep.

A worthwhile investment

Ready for the future

Industrial network analyzers have a useful life of ten years or more, depending on the application. Measurement tasks often change during this time, and there is an obvious need to increase measurement speed.

The R&S®ZNB has a modular design, i.e. subassemblies such as DC inputs, GPIB interface, power supply, controller and hard disk are inserted into slots on the rear. All test applications can be activated with a key code.

The R&S®ZNB can be quickly upgraded for new measurement tasks. Keeping the R&S®ZNB up to date, such as by adding a more powerful, next-generation controller or new functionality, involves only minimum downtime and service cost.

Upgrading test systems without rewriting system software

Network analyzers are the core of many test systems, for example in RF component production. Using latest generation Rohde&Schwarz network analyzers, system performance can be significantly enhanced.

The R&S®ZNB supports the remote control command sets of practically all other Rohde&Schwarz network analyzers as well as those of other manufacturers' instruments. Replacing an obsolete analyzer with an R&S®ZNB therefore poses no problems. In most cases it is sufficient to verify the R&S®ZNB's response during a measurement sequence; there is no need for costly modifications in the system software.

An analyzer that speaks the user's language

Many tasks are easiest solved in one's native language; the R&S®ZNB therefore comes with a multilingual user interface. Currently available languages include English, French, Russian, Chinese and Japanese.



Soft panel menus for selecting language (left) and remote control command set (right).

Ordering information

Designation	Type	Frequency range	Order No.
Base units			
Vector Network Analyzer, Two Ports, 4.5 GHz, N	R&S®ZNB4	9 kHz to 4.5 GHz	1311.6010.22
Vector Network Analyzer, Four Ports, 4.5 GHz, N	R&S®ZNB4	9 kHz to 4.5 GHz	1311.6010.24
Vector Network Analyzer, Two Ports, 8.5 GHz, N	R&S®ZNB8	9 kHz to 8.5 GHz	1311.6010.42
Vector Network Analyzer, Four Ports, 8.5 GHz, N	R&S®ZNB8	9 kHz to 8.5 GHz	1311.6010.44
Options			
Bias-Tees for Two-Port R&S®ZNB	R&S®ZNB-B1	100 kHz to 4.5/8.5 GHz	1316.1700.02
Bias-Tees for Four-Port R&S®ZNB	R&S®ZNB-B1	100 kHz to 4.5/8.5 GHz	1316.1700.04
Receiver Step Attenuator, Port 1, for R&S®ZNB4	R&S®ZNB4-B31	9 kHz to 4.5 GHz	1316.0185.02
Receiver Step Attenuator, Port 2, for R&S®ZNB4	R&S®ZNB4-B32	9 kHz to 4.5 GHz	1316.0179.02
Receiver Step Attenuator, Port 3, for R&S®ZNB4	R&S®ZNB4-B33	9 kHz to 4.5 GHz	1316.0262.02
Receiver Step Attenuator, Port 4, for R&S®ZNB4	R&S®ZNB4-B34	9 kHz to 4.5 GHz	1316.0433.02
Extended Power Range for Two-Port R&S®ZNB4	R&S®ZNB4-B22	9 kHz to 4.5 GHz	1316.0210.02
Extended Power Range for Four-Port R&S®ZNB4	R&S®ZNB4-B24	9 kHz to 4.5 GHz	1316.0233.02
Receiver Step Attenuator, Port 1, for R&S®ZNB8	R&S®ZNB8-B31	9 kHz to 8.5 GHz	1316.0191.02
Receiver Step Attenuator, Port 2, for R&S®ZNB8	R&S®ZNB8-B32	9 kHz to 8.5 GHz	1316.0204.02
Receiver Step Attenuator, Port 3, for R&S®ZNB8	R&S®ZNB8-B33	9 kHz to 8.5 GHz	1316.0162.02
Receiver Step Attenuator, Port 4, for R&S®ZNB8	R&S®ZNB8-B34	9 kHz to 8.5 GHz	1316.0440.02
Extended Power Range for Two-Port R&S®ZNB8	R&S®ZNB8-B22	9 kHz to 8.5 GHz	1316.0227.02
Extended Power Range for Four-Port R&S®ZNB8	R&S®ZNB8-B24	9 kHz to 8.5 GHz	1316.0240.02
Precision Frequency Reference	R&S®ZNB-B4		1316.1769.02
GPIO Interface	R&S®ZNB-B10		1311.5995.02
DC Inputs	R&S®ZNB-B81		1316.0004.02
Time Domain (TDR)	R&S®ZNB-K2		1316.0156.02
10 MHz Receiver Bandwidth	R&S®ZNB-K17		1316.1881.02
Accessories			
Calibration kits (manual calibration)			
Calibration Kit, N, 50 Ω	R&S®ZCAN	0 Hz to 3 GHz	0800.8515.52
Calibration Kit, N, 50 Ω	R&S®ZV-Z270	0 Hz to 18 GHz	5011.6536.02
Calibration Kit, 3.5 mm	R&S®ZV-Z235	0 Hz to 26.5 GHz	5011.6542.02
Calibration Kit, N (m), 50 Ω	R&S®ZV-Z121	0 Hz to 8 GHz	1164.0496.02
Calibration Kit, N (f), 50 Ω	R&S®ZV-Z121	0 Hz to 8 GHz	1164.0496.03
Calibration Kit, 3.5 mm (m), 50 Ω	R&S®ZV-Z132	0 Hz to 15 GHz	1164.1092.02
Calibration Kit, 3.5 mm (f), 50 Ω	R&S®ZV-Z132	0 Hz to 15 GHz	1164.1092.03
Calibration units (automatic calibration)			
Calibration Unit, Four Ports, 3.5 mm (f)	R&S®ZV-Z51	300 kHz to 8 GHz	1164.0515.30
Calibration Unit, Four Ports, N (f)	R&S®ZV-Z51	300 kHz to 8 GHz	1164.0515.70
Calibration Unit, Four Ports, 3.5 mm (f)	R&S®ZV-Z52	10 MHz to 24 GHz	1164.0521.30
Calibration Unit, Two Ports, N (f)	R&S®ZV-Z53	300 kHz to 18 GHz	1164.0473.72
Calibration Unit, Two Ports, 3.5 mm (f)	R&S®ZV-Z53	300 kHz to 24 GHz	1164.0473.32
Test cables			
N (m)/N (m), 50 Ω, 0.6 m/1 m length	R&S®ZV-Z91	0 Hz to 18 GHz	1301.7572.25/.38
N (m)/N (m), 50 Ω, 0.6 m/0.9 m length	R&S®ZV-Z191	0 Hz to 18 GHz	1306.4507.24/.36
N (m)/3.5 mm (m), 50 Ω, 0.6 m/1 m length	R&S®ZV-Z92	0 Hz to 18 GHz	1301.7589.25/.38
N (m)/3.5 mm (m), 50 Ω, 0.6 m/0.9 m length	R&S®ZV-Z192	0 Hz to 18 GHz	1306.4513.24/.36
3.5 mm (f)/3.5 mm (m), 0.6 m/1 m length	R&S®ZV-Z93	0 Hz to 26.5 GHz	1301.7595.25/.38
3.5 mm (f)/3.5 mm (m), 0.6 m/0.9 m/1.5 m length	R&S®ZV-Z193	0 Hz to 26.5 GHz	1306.4520.24/.36
Hardware add-ons			
USB Keyboard	R&S®PSL-Z2		1157.6870.04
USB Mouse	R&S®PSL-Z10		1157.7060.03
19" Rack Adapter	R&S®ZZA-KN5		1175.3040.00

Service options		
Two-Year Calibration Service	R&S®CO2ZNB	Please contact your local Rohde & Schwarz sales office.
Three-Year Calibration Service	R&S®CO3ZNB	
Five-Year Calibration Service	R&S®CO5ZNB	
One-Year Repair Service following the warranty period	R&S®RO2ZNB	
Two-Year Repair Service following the warranty period	R&S®RO3ZNB	
Four-Year Repair Service following the warranty period	R&S®RO5ZNB	

For data sheet, see PD 5214.5384.22 and www.rohde-schwarz.com

Your local Rohde & Schwarz expert will help you determine the optimum solution for your requirements. To find your nearest Rohde & Schwarz representative, visit www.sales.rohde-schwarz.com



Service you can rely on

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

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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