

# R&S® ZNrun VECTOR NETWORK ANALYZER TEST AUTOMATION SUITE

Platform for automated VNA tests



Product Brochure  
Version 04.00



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# AT A GLANCE

Each stakeholder in the production chain from development to quality control has different requirements when it comes to testing a product. R&S®ZRun consolidates the tools the individual users need in a single software suite featuring easy-to-use GUIs and automation and optimization intelligence.

For a facility manager, the yardstick for optimization could be maximizing the daily production yield, while for a test engineer it might mean being able to easily define a test configuration and have it loaded on each device in the factory in a few seconds. A tester instead might be interested in seeing only the pass/fail results of the measurements, after having started them by scanning a barcode. Quality managers, in turn, might find it convenient to be able to download documentation and real-time yield statistics while on their way to the factory.

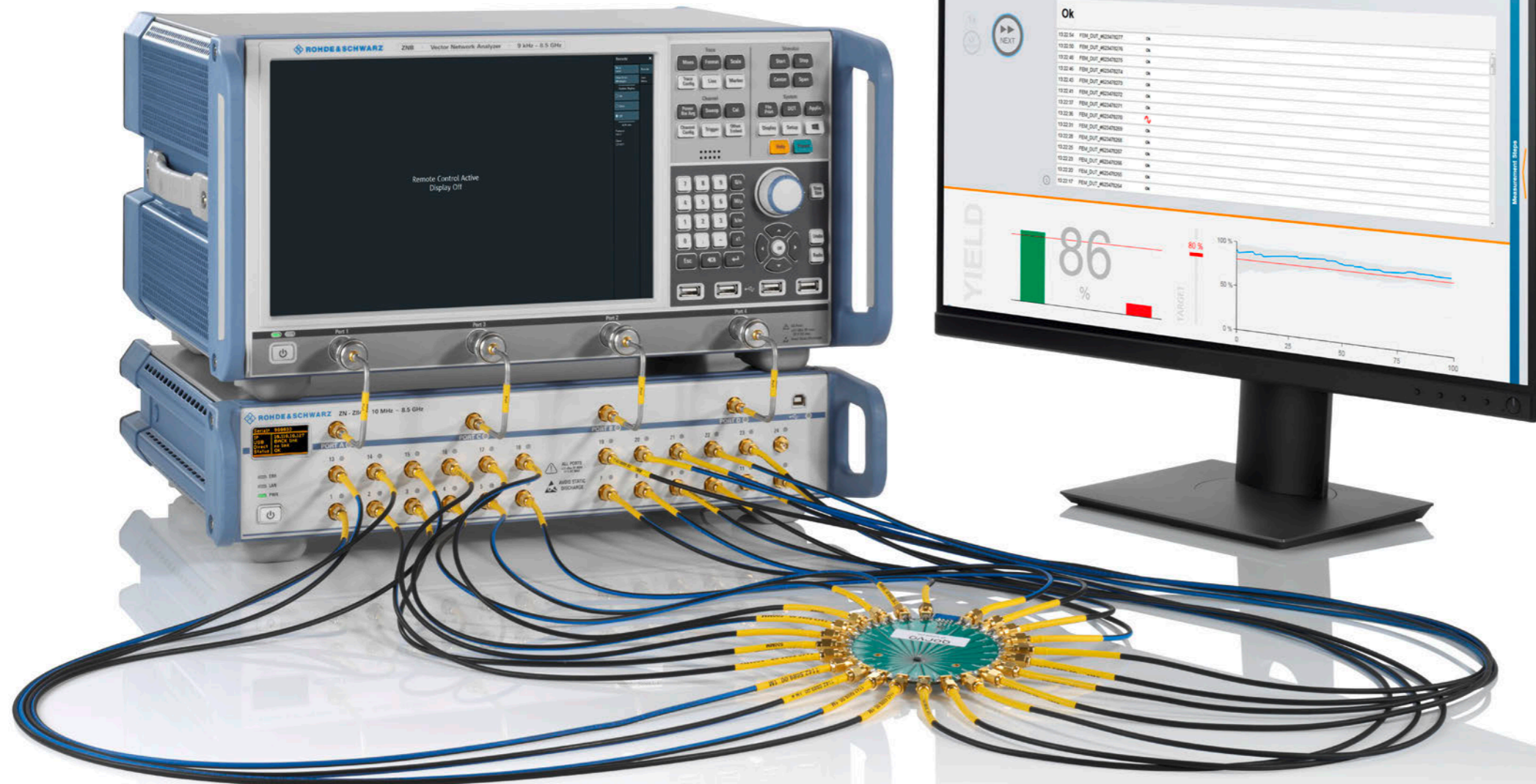
The R&S®ZRun vector network analyzer test automation suite was designed with optimization in mind and acknowledges the associated requirements by offering each party the possibility to expedite their workflows as much as possible by automating processes. The software leverages all of the Rohde&Schwarz RF measurement experience to make the most complicated measurements with vector network analyzers fast, accurate and most of all easy for everyone.

The R&S®ZRun software suite has a client and server structure with several clients. Test developers can configure and control the test setup through a tool called R&S®ZRun workbench. The R&S®ZRun measurement client offers test operators a control panel where they can start measurements and verify results with a workflow as easy as clicking just one button.

For an overview of measured data, the software suite offers the R&S®ZRun visualization client, which not only displays charts and traces in a compact and clear fashion, but also allows exporting them for documentation purposes.

Testing a frontend module with the R&S®ZNB and an R&S®ZN-Z84 switch matrix.

The R&S®ZRun vector network analyzer test automation suite increases measurement throughput.



# BENEFITS

## R&S®ZRun workbench

- ▶ All you need for test development
- ▶ DUT-centric measurement configuration
- ▶ Streamlined workflow
- ▶ Flexible and customizable
- ▶ Automatic detection of connected VNAs
- ▶ Free measurement configuration
- ▶ [page 4](#)

## R&S®ZRun measurement client

- ▶ Easy control of challenging tests
- ▶ Guidance for calibration, automatic generation of connection plan
- ▶ Even more customizable
- ▶ [page 6](#)

## R&S®ZRun visualization client

- ▶ Compact display of all data
- ▶ Intelligent data management and documentation
- ▶ [page 8](#)

## R&S®ZRun advanced capabilities

- ▶ Multiclient control
- ▶ Synchronized measurements on multiple DUTs or with multiple VNAs
- ▶ Measurement tuning
- ▶ [page 9](#)

## Compliance test automation

- ▶ Fully automated compliance test solution
- ▶ Fast multiport measurements without reconnecting cables
- ▶ Time-optimized calibration
- ▶ Straightforward testing in three steps
- ▶ Automated report generation
- ▶ Beyond compliance
- ▶ Required licenses
- ▶ [page 10](#)

# R&S®ZNrun WORKBENCH

Universal tool for test development and result analysis

## All you need for test development

The R&S®ZNrun workbench is designed to accommodate the needs of every user with tasks ranging from test development to result analysis.

Its brand new framework addresses users with two major use cases: defining complex test scenarios in a straightforward manner and modifying or combining configurations to generate new setups and use them as templates. Furthermore, a tuning tool is available to troubleshoot configurations and adjust them to perfectly fit the needs of a given test scenario. Measurements can be started directly from the R&S®ZNrun workbench and results can be presented in the R&S®ZNrun visualization client.

## DUT-centric measurement configuration

Measurement configuration in the R&S®ZNrun workbench is centered around the device under test (DUT). The first thing the user has to do is define the DUT by specifying its ports and input stimuli.

## Streamlined workflow

In the R&S®ZNrun workbench, the user is guided through the measurement configuration in a streamlined process. Every detail (e.g. parameters to be measured, trigger functions) is added step by step. The user can save and reload configurations, and combine different ones, e.g. by importing items such as a particular stimulus when defining a completely new DUT.

Physical Ports			
Name	Type	Logical Port	
PH1	RF	LPO01	X
PH2	RF	LPO01	X
PH3	RF	LPO02	X
PH4	RF	LPO02	X

Logical Ports			
Name	Type	Physical Port 1	Physical Port 2
BLP1	Balanced	PP001	PP002
BLP2	Balanced	PP003	PP004

Port Groups	
Name	Logical Ports
PG001	[LPO01] [LPO02] [LPO03] [LPO04]

VNA Devices							
Name	Type	Port Count	Purpose	Communication Channel	Resource	Waiting Time	
VNA	ZNBT	16					X
Name	Alias	Description	Device Port Type	Connector Type	Gender	Is Node Port	Cable Length
P1	V_01		VNA_PORT	UNKNOWN	male	No	default
P2	V_02		VNA_PORT	UNKNOWN	male	No	default
P3	V_03		VNA_PORT	UNKNOWN	male	No	default
P4	V_04		VNA_PORT	UNKNOWN	male	No	default
P5	V_05		VNA_PORT	UNKNOWN	male	No	default

DUT configuration in the R&S®ZNrun workbench.

Measurement - Add Paths - Port Group			
Port Group	Format	Start Frequency [Hz]	Stop Frequency [Hz]
PG001	DE_MAG	1000000	200000000

Switch & State			
Measurement	Simulation Type	Link Press	Switch & State
PG001	DE_MAG	1001	X

Measurement configuration in the R&S®ZNrun workbench.

## Flexible and customizable

The R&S®ZNRrun architecture provides a .NET remoting API, a C# plug-in interface and a generic plug-in to support Python code snippets. This ensures the coexistence of existing solutions and R&S®ZNRrun. Simply specify the control code to be used in the R&S®ZNRrun workbench plug-in section and integrate custom actions into the measurement cycle. Every custom action will be executed as a single step within the measurement cycle.

## Automatic detection of connected VNAs

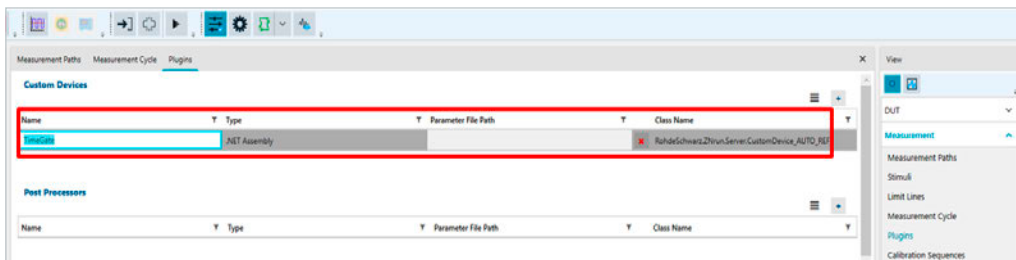
R&S®ZNRrun automatically detects the VNAs connected to it provided that the R&S®ZNRrun workbench and any number of Rohde&Schwarz VNAs are connected to the same LAN segment. The user can choose the appropriate instrument(s) for the measurements to be performed. If selected instruments are not compatible with the defined setup, an error message is output.

## Free measurement configuration

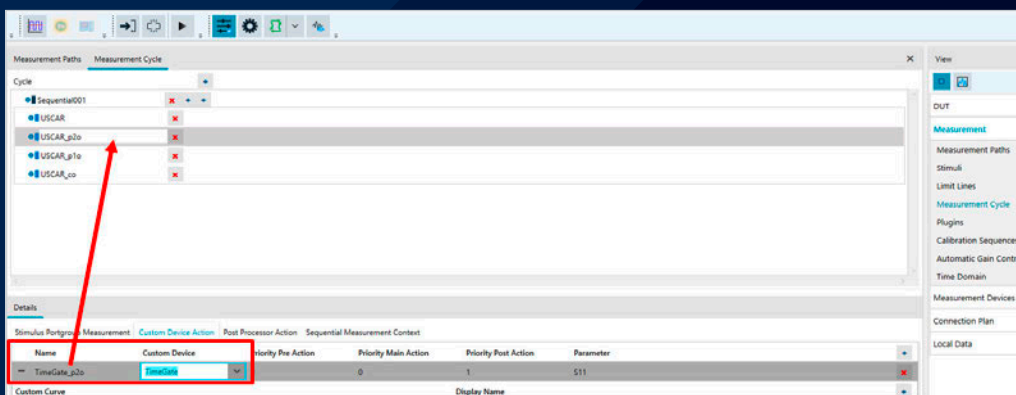
R&S®ZNRrun is a software suite that can be downloaded free of charge from the Rohde&Schwarz website. After starting the R&S®ZNRrun workbench, the user can configure measurements, e.g. by defining the port configuration, the stimuli, and the VNA devices to be used. To execute measurements, an R&S®ZNRrun server with a valid license (R&S®ZNRUN-K1) is required. The license is contained in the R&S®ZNPC license dongle and must be installed on the same machine on which the R&S®ZNRrun server runs. Any additional R&S®ZNRrun option purchased is linked to the R&S®ZNRUN-K1 core license, i.e. to the R&S®ZNPC license dongle.



R&S®ZNPC license dongle.



Importing a plug-in into the R&S®ZNRrun workbench (top) and integrating it into the measurement cycle (bottom).



# R&S®ZNrun MEASUREMENT CLIENT

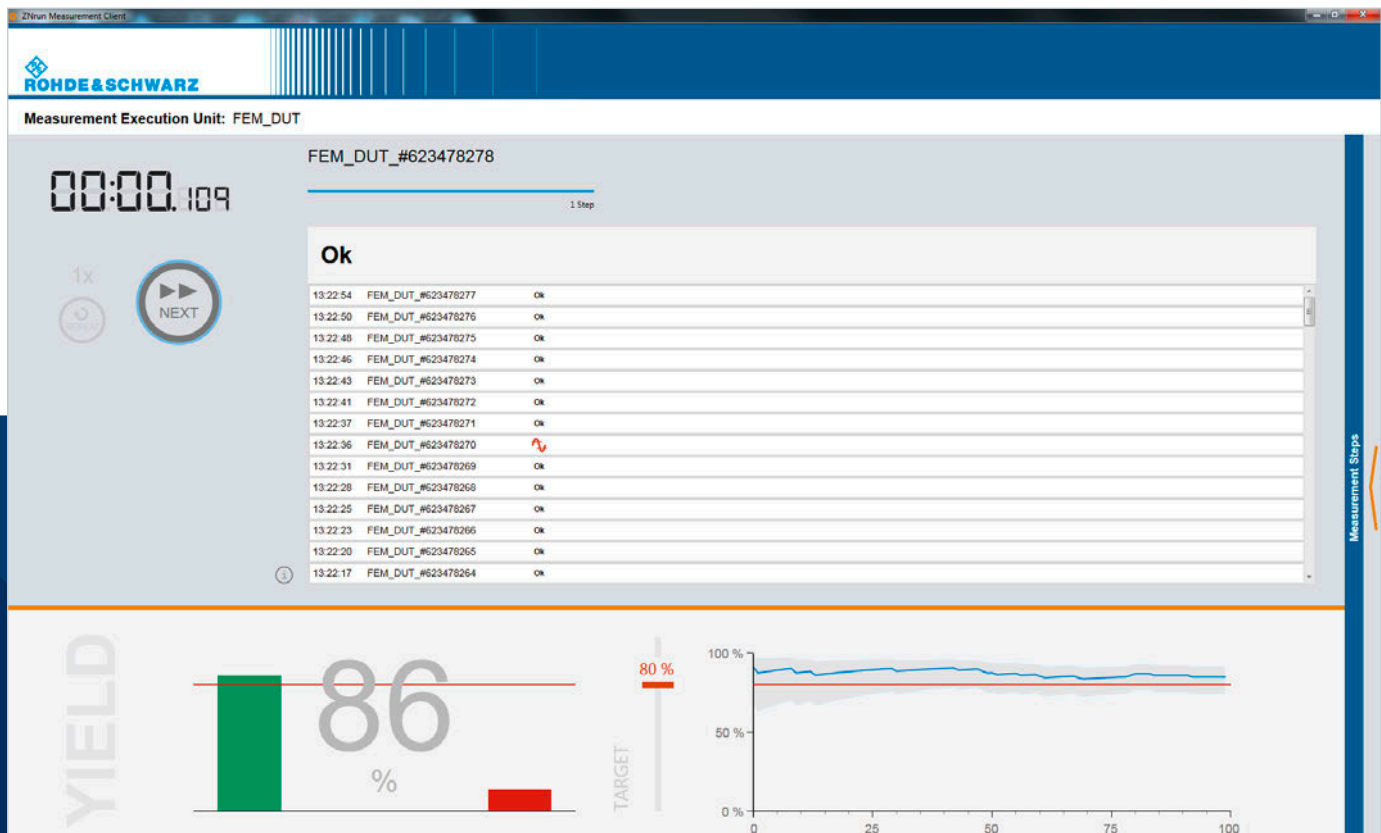
Trouble-free test control

## Easy control of challenging tests

The R&S®ZNrun measurement client provides test operators with a GUI that contains only the functions they really need. If necessary, measurements can simply be started with a click, without any need for additional configurations, and only meaningful results such as pass/fail results or measurement speed can be displayed. The R&S®ZNrun measurement client is a standalone client that can be installed where tests are actually taking place and enables straightforward control of the most challenging measurements.

The R&S®ZNrun measurement client is suitable also for experienced users as it allows defining breakpoints, e.g. for debugging purposes.

R&S®ZNrun measurement client.



## Guidance for calibration, automatic generation of connection plan

Calibrating multiport device setups can be a complex and time-consuming task, especially if T&M equipment is used in a mass production environment. The R&S®ZNRrun calibration client guides the user step by step through calibration, allowing optimal accuracy to be achieved with a minimum number of connection steps between the VNA or switch matrix and the calibration unit or kit.

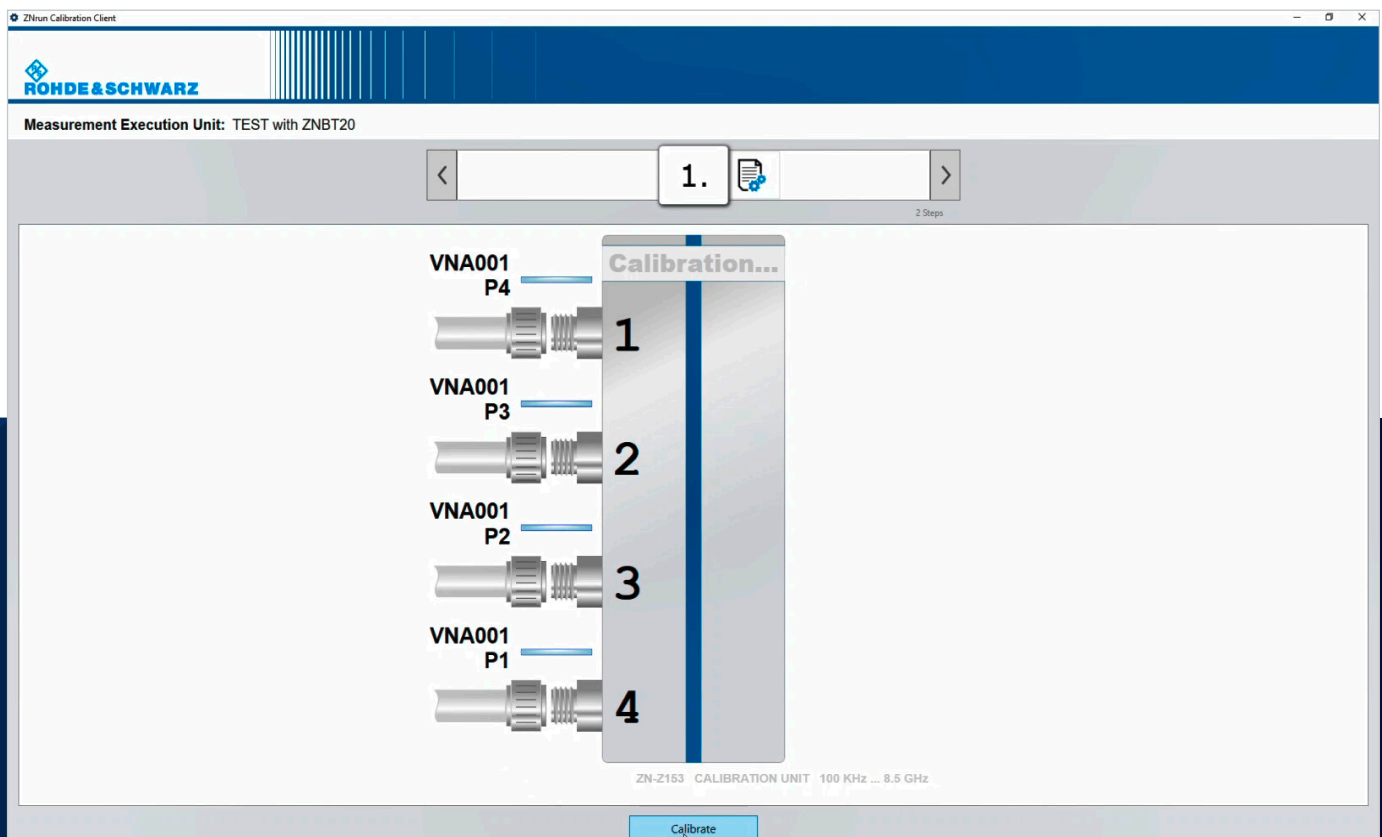
Moreover, R&S®ZNRrun can generate the connection plan for a specific measurement scenario for each measurement unit, minimizing errors in connecting VNAs, switch matrices, fixtures and DUTs.

## Even more customizable

To accommodate individual customer requirements, Rohde & Schwarz engineers can include customized features in the R&S®ZNRrun measurement client, providing test operators with a tool that perfectly fits their measurement needs.

Our engineers can reprogram the GUI and adapt it to customer's application needs and to what test operators need to know. Test operators, on the other hand, can benefit from a tailored interface that allows only the operations they need with the least amount of clicks.

R&S®ZNRrun calibration client.



# R&S®ZNrun VISUALIZATION CLIENT

Everything in view

## Compact display of all data

Most developers would like to view different measured parameters at a time. The R&S®ZNrun visualization client offers a smart way of displaying data, providing an overview of different measurements. It is also possible to display customized charts.

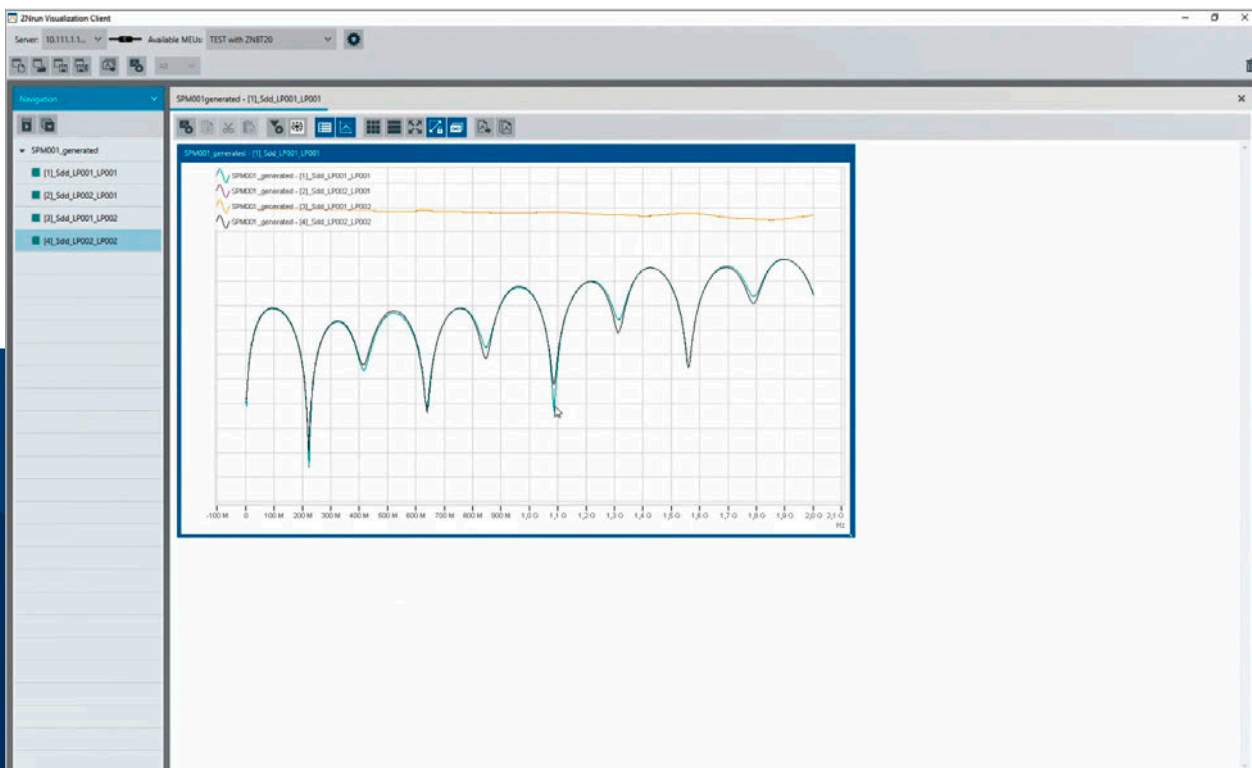
The R&S®ZNrun visualization client also provides a “live” display of every single measurement being executed, enabling a better understanding of results.

## Intelligent data management and documentation

The R&S®ZNrun visualization client has the ability to manage result data from the user’s measurements. It automatically recognizes any changes made, e.g. to data range, or to stimulus signals during the tuning phase, and rescales and updates result charts accordingly.

Results can be documented in numerical and graphical form in the R&S®ZNrun visualization client via a plug-in. They can also be easily exported using the most common portable data format.

R&S®ZNrun visualization client within the R&S®ZNrun workbench.



# R&S®ZRun ADVANCED CAPABILITIES

## Optional features

### Multiclient control

In a mass production environment, it is important that multiple measurements can be run at the same time. The R&S®ZNRUN-K2 multiclient capability option allows more than one measurement execution unit to run on the R&S®ZRun server, requiring only a single license for the R&S®ZNRUN-K2 option.

### Synchronized measurements on multiple DUTs or with multiple VNAs

There is a growing need for parallel characterization of multiple RF paths in different RF bands, especially in the production of frontend modules for mobile communications, for characterizing MIMO antennas, or even for cavity filters. The R&S®ZNRUN-K5 DUT/VNA multiplicity option allows parallel measurements. This unique feature makes it possible to connect one vector network analyzer from Rohde&Schwarz to multiple DUTs or controllers of the same type (e.g. two handlers) and measure in parallel. The R&S®ZNRUN-K5 option also enables measuring a complex DUT using multiple vector network analyzers from Rohde&Schwarz (provided no crossbar measurements are needed between VNAs) and collecting results as if for a single measurement.

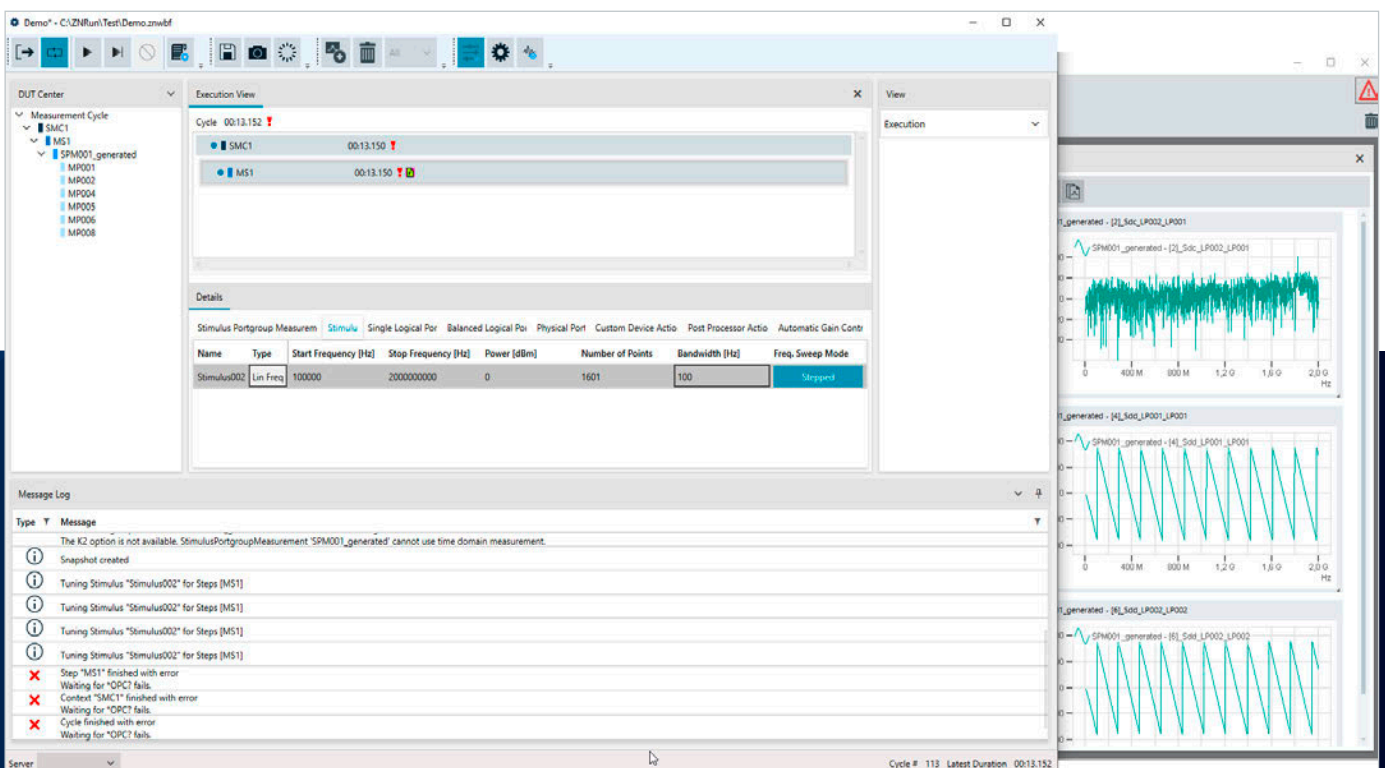
### Measurement tuning

When a new product is introduced, test engineers usually do not know exactly how to measure that product with the perfect balance between speed and accuracy with the equipment they have.

By performing a full calibration across the whole frequency range supported by the DUT and configuring the measurement with the smallest IF bandwidth and maximum number of points, the user has a basic configuration to start with. Together with the R&S®ZNRUN-K6 measurement tuning capability option the R&S®ZRun workbench is the perfect tool for a test engineer to troubleshoot and optimize a specific configuration and immediately observe the effect of each modification.

The measurement can be further optimized e.g. by using a segmented sweep perfectly matching the DUT characteristics or by introducing a delay at a particular frequency or a loss for a particular DC value. The tuned measurement can be finally saved, and also temporarily stored as a snapshot with the possibility of rolling back to the previous one.

Measurement tuning with the R&S®ZRun visualization client and the R&S®ZNRUN-K6 option.





# COMPLIANCE TEST AUTOMATION

Fully automated compliance testing of high speed cables

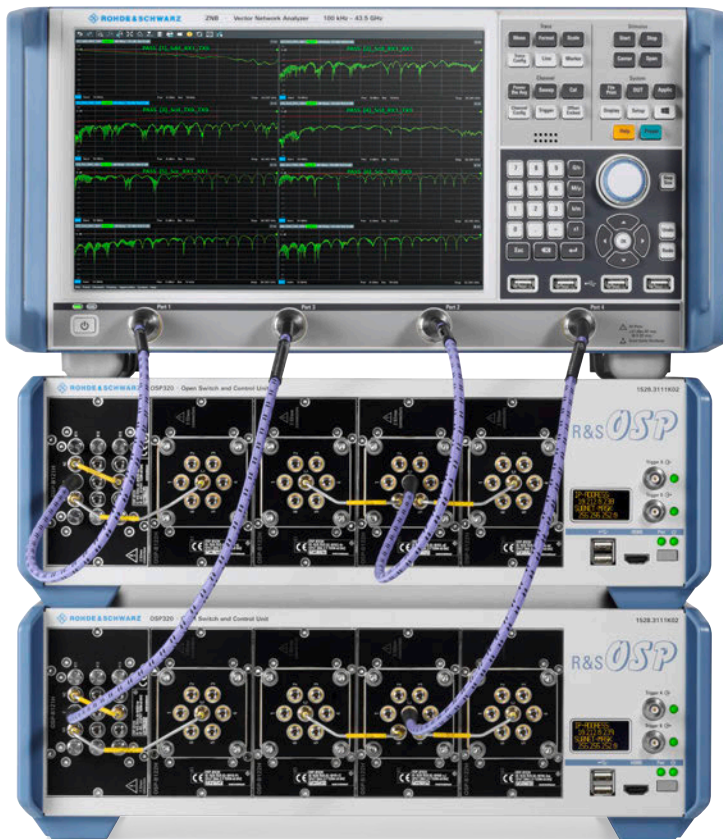
## Fully automated compliance test solution

Testing high speed cable assemblies for data centers or consumer electronics is a highly complex task that requires support of higher frequencies and a multiport setup. Conventional manual testing with a 4-port vector network analyzer is time-consuming and error-prone, requiring the cables to be reconnected many times and different tests to be executed repetitively for every lane in a cable assembly.

Rohde&Schwarz introduces its first fully automated compliance test solution, based on the R&S®ZNRUN vector network analyzer test automation suite. It allows easy, precise and time-saving compliance testing of high speed cable assemblies as required for the relevant standards.

## Fast multiport measurements without reconnecting cables

The R&S®ZNRUN-K4xx compliance test automation options include three simple steps for the test procedure: setup, calibrate and measure. Each automated step is optimized for minimum measurement time and delivers reproducible results – two key benefits of this fully automated solution from Rohde&Schwarz. For example, a 48-port setup with an R&S®ZNB vector network analyzer and an R&S®OSP open switch and control unit makes it possible to switch up to 256 ports without reconnecting any port. This drastically reduces the typical test time. For example, the test time for an IEEE802.3cd high speed Ethernet cable with 8 lanes takes just one hour compared to one day with manual testing.



Rohde & Schwarz solution for fully automated compliance testing of high speed cables using the R&S®ZNB vector network analyzer and two R&S®OSP320 open switch and control units controlled by the R&S®ZNRUN software suite.



### Time-optimized calibration

The calibration algorithms in R&S®ZNRUN are optimized for maximum speed and a minimum number of cable recon-nections, saving effort and time. For example, calibrating a 48-port setup for testing IEEE 802.3cd 8-lane cables requires no more than 45 minutes instead of several hours.

### Straightforward testing in three steps

With the R&S®ZNRUN compliance test automation options, testing is organized in three steps: setup, calibrate and measure. The steps are part of a dedicated, easy-to-use application, the R&S®ZNRUN cable test client (included with the R&S®ZNRUN-K1 core software). The R&S®ZNRUN compliance test automation options guide the user through port connection for calibration, minimizing the risk of erroneous connections and increasing confidence in measurement results.

### Automated report generation

Test results are automatically stored and can be postpro-cessed in line with the recommendations defined in the relevant standards. Result tables, S-parameter diagrams and overall pass/fail results are consolidated into a test report, allowing the user to save time and focus on result analysis.

### Beyond compliance

The R&S®ZNRUN compliance test automation options allow result postprocessing as required for the relevant standards to reach compliance faster and easier. In addition, they offer an easy way to debug and verify the cable assemblies under test in the R&S®ZNRUN workbench included with the R&S®ZNRUN-K1 core software.

Via the R&S®ZNRUN plug-in interface, the measurement workflow can be extended with other applications or inte-grated into existing automated testing environments.

### Required licenses

The Rohde&Schwarz solutions for fully automated compli-ance testing of high speed cable assemblies include sup-port for hardware, software and accessories.

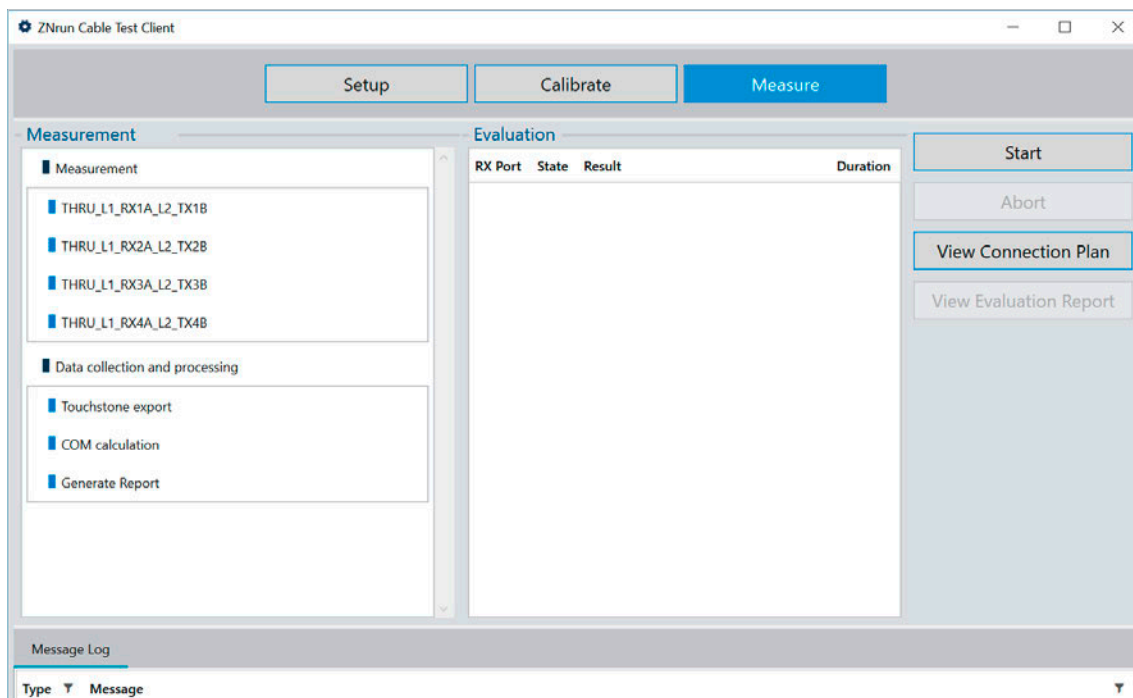
Licenses for the following items are required to run the R&S®ZNRUN compliance test automation options:

- ▶ R&S®ZNRUN-K1 VNA test automation software
- ▶ R&S®ZNRUN-K4xx compliance test automation option for the respective standard(s) (see ordering information)

A dedicated maintenance option is available for each R&S®ZNRUN-K4xx option.

Compliance measurements on high speed cables made easy with R&S®ZNRUN in only three steps: setup – calibrate – measure.

R&S®ZNRUN also controls execution of the test steps and lists the actions to be taken for each step.



# SYSTEM REQUIREMENTS

Requirements	
<b>System</b>	
PC processor	32 bit (x86) or 64 bit (x64), 1 GHz or faster
Memory	
RAM	1 Gbyte (x86) 1.5 Gbyte (x64)
Disk space	600 Mbyte (x86) 1.5 Gbyte (x64)
USB port	for R&S®ZNPC license dongle
Operating system	Windows 10
Microsoft .NET Framework 4.7.2 or higher	can be installed during installation of R&S®ZNRUN
Virtual instrument software architecture (VISA) library	can be installed during installation of R&S®ZNRUN, possible from version 1.5
<b>Plug-in development</b>	
Microsoft Visual Studio 2017 or higher	installed, in line with system requirements

# ORDERING INFORMATION

Designation	Type	Order No.
<b>R&amp;S®ZNRUN core software and license dongle</b>		
VNA test automation software (core software)	R&S®ZNRUN-K1	1326.7124.02
License dongle	R&S®ZNPC	1325.6601.02
<b>Enhanced capability options</b>		
Multiclient capability	R&S®ZNRUN-K2	1326.7130.02
DUT/VNA multiplicity	R&S®ZNRUN-K5	1334.4237.02
Measurement tuning capability	R&S®ZNRUN-K6	1334.4250.02
<b>Compliance test automation options</b>		
Compliance test automation for high speed Ethernet IEEE802.3bj/by/cd	R&S®ZNRUN-K410	1332.6010.02
Compliance test automation for high speed Ethernet IEEE802.3ck	R&S®ZNRUN-K411	1332.6026.02
<b>Maintenance options <sup>1)</sup></b>		
Software maintenance for R&S®ZNRUN-K1	R&S®ZNRUNSWMK1	1334.4214.81
Software maintenance for R&S®ZNRUN-K5	R&S®ZNRUNSWMK5	1334.4243.81
Software maintenance for R&S®ZNRUN-K6	R&S®ZNRUNSWMK6	1334.4220.81
Software maintenance for R&S®ZNRUN-K410	R&S®ZNRUNMK410	1332.6061.81
Software maintenance for R&S®ZNRUN-K411	R&S®ZNRUNMK411	1332.6078.81

<sup>1)</sup> Dedicated maintenance options are included for the first year after purchase. This period can be optionally prolonged.

## More information

- ▶ Rohde & Schwarz VNAs: [www.rohde-schwarz.com/products/test-and-measurement/network-analyzers\\_64043.html](http://www.rohde-schwarz.com/products/test-and-measurement/network-analyzers_64043.html)
- ▶ R&S®OSP open switch and control platform: [www.rohde-schwarz.com/product/osp-n](http://www.rohde-schwarz.com/product/osp-n)

Your local Rohde & Schwarz expert will help you find the best solution for your requirements.  
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- ▶ 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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