R&S®ZN-ZE1xx Calibration Units User Manual

1179522402
Version 02

ROHDE&SCHWARZ
Make ideas real

This User Manual describes the following R&S®ZN-ZE1xx models:

- R&S®ZN-ZE104, 2 ports, 5 kHz to 4.5 GHz (1350.8040.04)
- R&S®ZN-ZE109, 2 ports, 5 kHz to 9 GHz (1350.8040.09)
- R&S®ZN-ZE118, 2 ports, 5 kHz to 18 GHz (1350.8040.18)
- R&S®ZN-ZE126, 2 ports, 5 kHz to 26.5 GHz (1350.8040.26)

The R&S®ZN-ZE1xx models are equipped with two of the following port options:

- R&S®ZN-ZE1-B170, N (f), port 1
  R&S®ZN-ZE1-B171, N (m), port 1
  R&S®ZN-ZE1-B270, N (f), port 2
  R&S®ZN-ZE1-B271, N (m), port 2
  R&S®ZN-ZE1-B130, 3.5 mm (f), port 1
  R&S®ZN-ZE1-B131, 3.5 mm (m), port 1
  R&S®ZN-ZE1-B230, 3.5 mm (f), port 2
  R&S®ZN-ZE1-B231, 3.5 mm (m), port 2

The adapters are not removable. Mixing of port types are not possible but mixing of port gender is possible. N type connectors are not available for frequencies > 18 GHz.
For option names and ordering information, see the R&S®ZN-ZE1xx data sheet.

Muehldorfstr. 15, 81671 Muenchen, Germany
Phone: +49 89 41 29 - 0
Email: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com

1179.5224.02 | Version 02 | R&S®ZN-ZE1xx

R&S®ZN-Z1xx is abbreviated as R&S ZN-Z1xx

Contents

1 Safety information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the following chapters.

Intended use

Calibration units R&S®ZN-ZE1xx enable the automatic calibration of Rohde & Schwarz network analyzers in a simple, firmware-guided procedure. They are intended for the development, production and verification of electronic components and devices in industrial, administrative and laboratory environments. Observe the operating conditions and performance limits stated in the data sheet.

Where do I find safety information?

Safety information is part of the product documentation. It warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- The multilingual printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

Target audience

The target audience is developers and technicians.

2 Preparing for use

Here, you can find basic information about setting up the product for the first time.

2.1 Unpacking and checking

1. Unpack the product carefully.
2. Retain the original packing material. Use it when transporting or shipping the product later.
3. Using the delivery notes, check the equipment for completeness.
4. Check the equipment for damage.

   If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

2.2 ESD protective measures

To protect calibration unit and vector network analyzer (VNA) against electrostatic discharge (ESD) damage, use the wrist strap and grounding cord supplied with the VNA. Connect yourself to the GND connector of the VNA. For details, refer to the "Getting Started" guide of your VNA.

2.3 USB connection

The calibration unit is equipped with a USB Type-C connector at the rear. The USB connection is used to power-supply and control the unit from a VNA of the R&S® ZVx or R&S® ZNx family.

A direct USB connection is recommended. You can connect several calibration units to different USB ports of the analyzer and you can connect other USB devices (mouse, keyboard, memory stick etc.) simultaneously.

In general, an unused calibration unit can remain connected to the USB port of the analyzer and you can connect or disconnect it while the VNA is operating. However, note the following restrictions.

- The length of the connecting cable must not exceed 3 m. Use the USB cable delivered with the calibration unit, if possible.
- The calibration unit relies on a USB voltage supply of 5V. If you connect it via a USB hub, you have to use an active one.
- During a firmware update of the VNA, the calibration unit must be disconnected.
- Do not disconnect the unit while data is being transferred between the analyzer and the unit.

2.4 RF connections

The calibration unit provides two RF connectors (numbered 1 to 2), to be connected to the test ports of the analyzer. The connector type is the same for all RF ports of a calibration unit, either type N or PC 3.5 mm equivalent.

The maximum RF input power of the calibration unit is beyond the RF output power range of the analyzer. If the device is directly connected to the test ports of the analyzer, there is no risk of damaging the calibration unit.

If you use an external power amplifier, make sure that the maximum RF input power of the calibration unit quoted in the data sheet is never exceeded.

3 Working with R&S®ZN-ZE1xx

A calibration unit enables the automatic calibration of several VNA ports in one simple procedure. It contains calibration standards that are electronically switched by the analyzer firmware, when a calibration is performed. The characteristic data of these standards is stored in the calibration unit, so that the analyzer can calculate the error terms and apply the calibration without any further input.

Automatic calibration is faster and less error-prone than manual calibration:

- There is no need to connect calibration standards manually, which is particularly time-saving if you want to calibrate multiple ports.
- Invalid calibrations due to operator errors (e.g. wrong standards or improper connections) are almost excluded.
- There is no need to handle calibration kit data.
- The internal standards do not wear out because they are switched electronically.

3.1 Establishing the USB connection

To establish the USB connection between calibration unit and VNA, proceed as follows:

1. Switch on and start up your VNA.
2. **NOTICE!** ESD protective measures. Wear a grounded wrist strap whenever you connect the calibration unit to the VNA via USB (see Chapter 2.2, "ESD protective measures", on page 4).

   Connect the USB Type-A connector of the USB cable to any of the USB Type-A connectors on the front or rear panel of the analyzer. You can also connect the unit before switching on the analyzer.
3. Wait until the operating system has recognized and initialized the new hardware. After completing the initialization, the status LED will switch to green (see Chapter 3.2, "Function of the status LED", on page 6).

   The unit is ready to use, as outlined below.

3.2 Function of the status LED

The LED on top of the Calibration Unit informs about the actual status of the device. The different states have the following meaning:

OFF	The calibration unit is not connected or defective.
Red	The micro controller is running but there is no USB communication with the VNA. With a current VNA firmware and error-free operation, this status only appears for a short time after connecting the calibration unit.
Blinking red	During the boot sequence of the VNA, the LED possibly shows a fast blinking red until the operating system is started. The LED switches between red and green, until the firmware comes up.
Green	The calibration unit is ready use.
Blinking orange	Data transfer between the calibration unit and the VNA. Do not disconnect the USB cable.
Blinking blue	Calibration in progress. Do not disconnect the USB cable.

3.3 Performing an automatic calibration

Once the USB connection between calibration unit and VNA has been established, an automatic calibration can be performed as follows:

1. Start the automatic calibration function of your VNA.
2. Configure the automatic calibration. In particular:
   a) Select the test ports that you want to calibrate and the desired calibration type.
   b) Select the appropriate R&S®ZN-ZE1xx model and characterization.
   c) Configure the required RF port assignments between analyzer and calibration unit.
3. **NOTICE!** ESD protective measures. Wear a grounded wrist strap whenever you establish an RF connection between calibration unit and VNA (see Chapter 2.2, "ESD protective measures", on page 4).

   For each RF port assignment:
   a) Establish the RF connections between VNA and calibration unit, as depicted in the analyzer GUI.
   b) Acquire calibration data.
   c) Proceed with the next port assignment or dissolve the RF connections, as depicted in the analyzer GUI.

Accuracy considerations

To ensure an accurate calibration, please observe the following items:

- Do not use adaptors between the calibration unit and the test ports.
- After connecting the unit to the USB port, allow for a sufficient warm-up time (see data sheet) before starting the calibration.
- To ensure best accuracy, the analyzer automatically reduces the source power to –10 dBm. If the test setup contains a large attenuation, deactivate Automatic Power Reduction for Calibration Unit in the Calibration tab of the System Configuration dialog. Also, ensure an input power of –10 dBm at the ports of the calibration unit (please also refer to the data sheet).

The calibration type depends on the number of ports and of the analyzer type. If a single port is calibrated, the analyzer uses a reflection calibration type (e.g. Full One Port / Refl OSM). For 2 ports, you can choose among several calibration types.

3.4 User characterization

The calibration unit offers the possibility to store multiple user characterization data files either on its internal flash memory or on the microSD card. Use the "Characterize Cal Unit" function of your VNA for this purpose. For details, refer to the analyzer's help system.

3.5 microSD card

On the rear of the calibration units, there is a microSD card slot. The microSD card can be used to store user characterization data. The factory data is always stored on the internal memory.

- Use the microSD card shipped with the calibration unit, if possible.
- Before removing or inserting the microSD card, disconnect the USB connection between calibration unit and VNA.

4 Contacting customer support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:

Figure 4-1: QR code to the Rohde & Schwarz support page