

# R&S<sup>®</sup> ZN-Z5x Calibration Units User Manual



1337.5957.02 – 01

This User Manual describes the following models:

- R&S®ZN-Z50, 3.5 mm (f), 2 ports, 9 kHz to 9 GHz (1335.6904.30)
- R&S®ZN-Z50, 3.5 mm (f), 2 ports, 9 kHz to 26.5 GHz (1335.6904.32)
- R&S®ZN-Z51, 3.5 mm (f), 2 ports, 100 kHz to 8.5 GHz (1319.5507.32)
- R&S®ZN-Z51, 3.5 mm (f), 4 ports, 100 kHz to 8.5 GHz (1319.5507.34)
- R&S®ZN-Z51, N (f), 2 ports, 100 kHz to 8.5 GHz (1319.5507.72)
- R&S®ZN-Z51, N (f), 4 ports, 100 kHz to 8.5 GHz (1319.5507.74)
- R&S®ZN-Z52, 3.5 mm (f), 4 ports, 100 kHz to 26.5 GHz (1335.6991.30)
- R&S®ZN-Z53, N (f), 2 ports, 100 kHz to 18 GHz (1335.7046.72)
- R&S®ZN-Z53, 3.5 mm (f), 2 ports, 100 kHz to 26.5 GHz (1335.7046.32)
- R&S®ZN-Z54, 2.92 mm (f), 2 ports, 9 kHz to 40 GHz (1335.7117.92)
- R&S®ZN-Z55, 2.4 mm (f), 2 ports, 9 kHz to 50 GHz (1335.7181.42)

R&S®ZN-Z51 type N models can optionally be equipped with port adapters for connector types N (m), 3.5 mm (m), 7/16 (f), 7/16 (m) or 4.3-10 (f). The adapters are not removable; mixing port types is possible.

For option names and ordering information, see the R&S®ZN-Z5x data sheet.

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## 1 Safety Instructions

This calibration unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards.

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**⚠ CAUTION****General safety considerations**

To maintain this condition and to secure safe operation, you must observe all instructions and warnings given in this manual and in the user manual of the R&S network analyzer.

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## 1.1 USB Connection to the Analyzer

- The calibration unit is intended for direct connection to a network analyzer of the R&S® ZVx or R&S® ZNx family, following the instructions below and in the respective analyzer's help systems.
- The length of the connecting USB cable should not exceed 3 m. It is recommended to use the cable delivered with the calibration unit.
- You can connect several calibration units to the different USB ports of the analyzer. You can also connect calibration units and other devices (mouse, USB memory stick etc.) simultaneously.
- An unused calibration unit may remain connected to the USB port while the network analyzer is performing measurements. It must be disconnected during a firmware update.
- It is safe to connect or disconnect the calibration unit while the network analyzer is operating. Never connect or disconnect the unit while data is being transferred between the analyzer and the unit. Never connect the unit during a firmware update.

## 1.2 ESD Protective Measures

To protect the calibration unit against Electrostatic Discharge (ESD) damage, use the wrist strap and grounding cord supplied with the network analyzer and connect yourself to the GND connector at the front panel. For details, refer to the "Getting Started" guide of your analyzer.

## 1.3 RF Connection

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

## 1.4 Automatic Calibration

A calibration unit is an integrated solution for automatic calibration of several network analyzer ports.

The unit contains calibration standards that are electronically switched when a calibration is performed. The calibration kit data for the internal 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 in general faster and more secure than manual calibration:

- There is no need to connect several standards manually. The number of standards to be connected quickly increases with the number of ports.
- Invalid calibrations due to operator errors (e.g. wrong standards or improper connections) are almost excluded.
- No need to handle calibration kit data.
- The internal standards do not wear out because they are switched electronically.

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### **NOTICE**

#### **Scope of this document**

This User Manual gives a brief introduction to the unit's connection and use. For detailed information, refer to the help system of your network analyzer.

The R&S®ZN-Z5x calibration units differ in the number of calibration ports and the connector types. For an overview, refer to the data sheet.

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## 2 USB Connection to the Network Analyzer

The calibration unit provides the following connectors:

- A 5-pin ruggedized connector at the rear, used to power-supply and control the unit. A USB cable for connection to the network analyzer is provided with the calibration unit.
- Two or four RF connectors numbered 1 to 4, to be connected to the test ports of the analyzer. The connector type is equal for all ports.
- The ports of the R&S®ZN-Z51 type N models (order nos 1319.5507.72 and 1319.5507.74) can be equipped with optional adapters to provide mixed connector calibration. Possible connector types are N(m), 3.5 mm (f), 3.5 mm (m), 7/16 (f), 7/16 (m) or 4.3-10 (f).

### To connect the unit

1. Switch on and start up your network analyzer.
2. Wear a grounded wrist strap; see [Chapter 1.2, "ESD Protective Measures"](#), on page 4.
3. 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.
4. Wait until the operating system has recognized and initialized the new hardware. After completing the initialization, the Status LED will switch to green.
5. The unit is ready to be used as outlined below.

## 3 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 microcontroller is running but there is no USB communication with the network analyzer. With an actual network analyzer firmware, this status should only appear for a short time after connecting the calibration unit.
Blinking red	During the boot sequence of the network analyzer, the LED might show 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 to use.
Blinking orange	Data transfer between the calibration unit and the network analyzer. Do not disconnect the USB cable.
Blinking blue	Calibration in progress .

## 4 Performing an Automatic Calibration

After connection and initialization, you can use the calibration unit as follows:

1. Connect n analyzer ports (n = 1 to 4, depending on your analyzer and calibration unit model and the number of ports to be calibrated) to n arbitrary ports of the calibration unit.
2. Perform the automatic calibration for the selected number of ports using the automatic calibration function of the analyzer. For details, refer to your analyzer's help system.
3. Remove the test cables from the unit, connect your DUT instead, and perform calibrated measurements.

## 5 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 and 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 and more ports, you can choose among several calibration types. The R&S®ZN-Z51 calibration unit with 4.3-10 adaptors includes an additional fork wrench. In order to maintain the accuracy of the 4.3-10 adaptors, use the fork wrench as resistance while tightening the connectors with the torque wrench.

## 6 User Characterization

The calibration unit offers the possibility to store multiple user characterization data files on its internal flash memory. This can be done using the "Characterize Cal Unit" function of your analyzer. For details, refer to the analyzer's help system.

## 7 microSD Card

On the rear of the calibration unit, 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. It is recommended to use only the microSD card that is shipped with the calibration unit. Before removing or inserting the card, disconnect the USB connection of the calibration unit.

## 8 Mounting the Calibration Unit

To mount the calibration unit e.g. on a wafer prober, remove the elastic buffers on the bottom of the housing. There are four threads for use of M2.5 screws.