

# R&S® ZV-Z135 Calibration Kit Specifications



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# Definitions

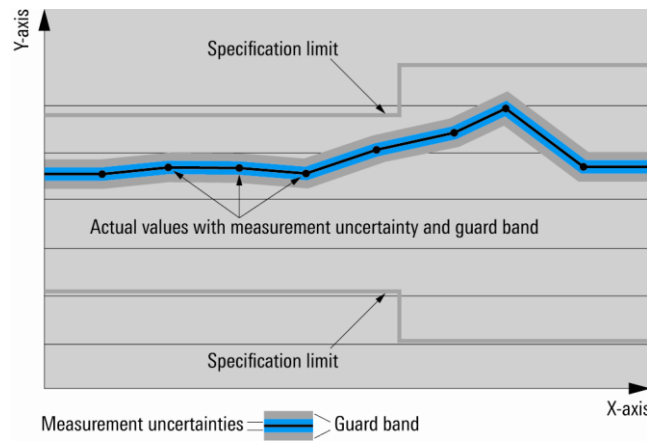
## General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

## Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



## Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

## Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with  $<$ ,  $>$  or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

## Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

## Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

## Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

# Specifications

## Mechanical data

|                                 |                      |                                   |
|---------------------------------|----------------------|-----------------------------------|
| <b>Connector type</b>           | R&S®ZV-Z135 model.02 | 3.5 mm, male                      |
|                                 | R&S®ZV-Z135 model.03 | 3.5 mm, female                    |
| <b>Gauge</b>                    | R&S®ZV-Z135 model.02 | 0 mm to 0.076 mm                  |
|                                 | R&S®ZV-Z135 model.03 | 0 mm to 0.076 mm                  |
| <b>Inner conductor material</b> |                      | Au-plated age-hardened CuBe alloy |
| <b>Outer conductor material</b> |                      | CuSnZn-plated Cu alloy            |
| <b>Body</b>                     |                      | blue anodized Al                  |

## Electrical data of R&S®ZV-Z135 (3.5 mm, female)

|                              |                  |                                                  |
|------------------------------|------------------|--------------------------------------------------|
| <b>Frequency range</b>       |                  | 0 Hz to 15 GHz                                   |
| <b>Through standard</b>      |                  |                                                  |
| Return loss                  | 0 Hz to 4 GHz    | typ. 36 dB                                       |
|                              | 4 GHz to 8 GHz   | typ. 30 dB                                       |
|                              | 8 GHz to 13 GHz  | typ. 27 dB                                       |
|                              | 13 GHz to 15 GHz | typ. 25 dB                                       |
| Insertion loss               |                  | typ. $0.02 \text{ dB} \cdot \sqrt{f/\text{GHz}}$ |
| Electrical length            |                  | typ. 38.25 mm                                    |
| <b>Open standard</b>         |                  |                                                  |
| Fringing capacitance         | $C_0$            | -7.425 fF                                        |
|                              | $C_1$            | 2.47 fF/GHz                                      |
|                              | $C_2$            | -0.226 fF/GHz <sup>2</sup>                       |
|                              | $C_3$            | 0.00618 fF/GHz <sup>3</sup>                      |
| Offset length                |                  | 9.24 mm                                          |
| Loss                         |                  | typ. $0.01 \text{ dB} \cdot \sqrt{f/\text{GHz}}$ |
| <b>Short standard</b>        |                  |                                                  |
| Inductance                   | $L_0$            | 27.98 pH                                         |
|                              | $L_1$            | -5.01 pH/GHz                                     |
|                              | $L_2$            | 0.3038 pH/GHz <sup>2</sup>                       |
|                              | $L_3$            | -0.00613 pH/GHz <sup>3</sup>                     |
| Offset length                |                  | 9.2 mm                                           |
| Loss                         |                  | typ. $0.01 \text{ dB} \cdot \sqrt{f/\text{GHz}}$ |
| <b>Match standard</b>        |                  |                                                  |
| DC resistance                |                  | 50.0 $\Omega \pm 0.5 \Omega$                     |
| Return loss                  | 0 Hz to 4 GHz    | typ. 42 dB                                       |
|                              | 4 GHz to 8 GHz   | typ. 37 dB                                       |
|                              | 8 GHz to 13 GHz  | typ. 30 dB                                       |
|                              | 13 GHz to 15 GHz | typ. 24 dB                                       |
| Maximum input power          |                  | 0.5 W                                            |
| <b>Effective system data</b> |                  |                                                  |
| Directivity                  | 0 Hz to 4 GHz    | > 41 dB                                          |
|                              | 4 GHz to 8 GHz   | > 38 dB                                          |
|                              | 8 GHz to 13 GHz  | > 29 dB                                          |
|                              | 13 GHz to 15 GHz | > 23 dB                                          |
| Source match                 | 0 Hz to 4 GHz    | > 36 dB                                          |
|                              | 4 GHz to 8 GHz   | > 31 dB                                          |
|                              | 8 GHz to 13 GHz  | > 26 dB                                          |
|                              | 13 GHz to 15 GHz | > 20 dB                                          |
| Reflection tracking          | 0 Hz to 4 GHz    | < 0.025 dB                                       |
|                              | 4 GHz to 8 GHz   | < 0.03 dB                                        |
|                              | 8 GHz to 13 GHz  | < 0.04 dB                                        |
|                              | 13 GHz to 15 GHz | < 0.05 dB                                        |
| Load match                   | 0 Hz to 4 GHz    | > 39 dB                                          |
|                              | 4 GHz to 8 GHz   | > 35 dB                                          |
|                              | 8 GHz to 13 GHz  | > 27 dB                                          |
|                              | 13 GHz to 15 GHz | > 21 dB                                          |
| Transmission tracking        | 0 Hz to 4 GHz    | < 0.05 dB                                        |
|                              | 4 GHz to 8 GHz   | < 0.10 dB                                        |
|                              | 8 GHz to 13 GHz  | < 0.20 dB                                        |
|                              | 13 GHz to 15 GHz | < 0.40 dB                                        |

## Electrical data of R&S®ZV-Z135 (3.5 mm, male)

|                              |                  |                                                  |
|------------------------------|------------------|--------------------------------------------------|
| <b>Frequency range</b>       |                  | 0 Hz to 15 GHz                                   |
| <b>Through standard</b>      |                  |                                                  |
| Return loss                  | 0 Hz to 4 GHz    | typ. 36 dB                                       |
|                              | 4 GHz to 8 GHz   | typ. 30 dB                                       |
|                              | 8 GHz to 13 GHz  | typ. 27 dB                                       |
|                              | 13 GHz to 15 GHz | typ. 25 dB                                       |
| Insertion loss               |                  | typ. $0.02 \text{ dB} \cdot \sqrt{f/\text{GHz}}$ |
| Electrical length            |                  | typ. 38.25 mm                                    |
| <b>Open standard</b>         |                  |                                                  |
| Fringing capacitance         | $C_0$            | 3.434 fF                                         |
|                              | $C_1$            | -0.3752 fF/GHz                                   |
|                              | $C_2$            | -0.000676 fF/GHz <sup>2</sup>                    |
|                              | $C_3$            | 0.000725 fF/GHz <sup>3</sup>                     |
| Offset length                |                  | 9.24 mm                                          |
| Loss                         |                  | 0.01 dB $\cdot \sqrt{f/\text{GHz}}$              |
| <b>Short standard</b>        |                  |                                                  |
| Inductance                   | $L_0$            | 22.44 pH                                         |
|                              | $L_1$            | -4.568 pH/GHz                                    |
|                              | $L_2$            | 0.2909 pH/GHz <sup>2</sup>                       |
|                              | $L_3$            | -0.00516 pH/GHz <sup>3</sup>                     |
| Offset length                |                  | 9.217 mm                                         |
| Loss                         |                  | 0.015 dB $\cdot \sqrt{f/\text{GHz}}$             |
| <b>Match standard</b>        |                  |                                                  |
| DC resistance                |                  | 50.0 $\Omega \pm 0.5 \Omega$                     |
| Return loss                  | 0 Hz to 4 GHz    | typ. 42 dB                                       |
|                              | 4 GHz to 8 GHz   | typ. 37 dB                                       |
|                              | 8 GHz to 13 GHz  | typ. 30 dB                                       |
|                              | 13 GHz to 15 GHz | typ. 24 dB                                       |
| Maximum input power          |                  | 0.5 W                                            |
| <b>Effective system data</b> |                  |                                                  |
| Directivity                  | 0 Hz to 4 GHz    | > 41 dB                                          |
|                              | 4 GHz to 8 GHz   | > 38 dB                                          |
|                              | 8 GHz to 13 GHz  | > 29 dB                                          |
|                              | 13 GHz to 15 GHz | > 23 dB                                          |
| Source match                 | 0 Hz to 4 GHz    | > 36 dB                                          |
|                              | 4 GHz to 8 GHz   | > 31 dB                                          |
|                              | 8 GHz to 13 GHz  | > 26 dB                                          |
|                              | 13 GHz to 15 GHz | > 20 dB                                          |
| Reflection tracking          | 0 Hz to 4 GHz    | < 0.025 dB                                       |
|                              | 4 GHz to 8 GHz   | < 0.03 dB                                        |
|                              | 8 GHz to 13 GHz  | < 0.04 dB                                        |
|                              | 13 GHz to 15 GHz | < 0.05 dB                                        |
| Load match                   | 0 Hz to 4 GHz    | > 39 dB                                          |
|                              | 4 GHz to 8 GHz   | > 35 dB                                          |
|                              | 8 GHz to 13 GHz  | > 27 dB                                          |
|                              | 13 GHz to 15 GHz | > 21 dB                                          |
| Transmission tracking        | 0 Hz to 4 GHz    | < 0.05 dB                                        |
|                              | 4 GHz to 8 GHz   | < 0.10 dB                                        |
|                              | 8 GHz to 13 GHz  | < 0.20 dB                                        |
|                              | 13 GHz to 15 GHz | < 0.40 dB                                        |

## General data

|                                  |                               |                                                              |
|----------------------------------|-------------------------------|--------------------------------------------------------------|
| Temperature loading              | operating temperature range   | +18 °C to +28 °C                                             |
|                                  | permissible temperature range | +5 °C to +40 °C                                              |
|                                  | storage temperature range     | –40 °C to +70 °C, in line with EN 60068-2-1 and EN 60068-2-2 |
| Standards                        | R&S® ZV-Z135                  | IEC 60169-23                                                 |
| Recommended calibration interval |                               | 1 year                                                       |
| Dimensions (W × H × D)           | R&S® ZV-Z135 model.02         | 65 mm × 22 mm × 90 mm,<br>(2.6 in × 0.9 in × 3.6 in)         |
| Dimensions (W × H × D)           | R&S® ZV-Z135 model.03         | 74 mm × 22 mm × 95 mm,<br>(2.9 in × 0.9 in × 3.7 in)         |
| Weight                           | R&S® ZV-Z135                  | 225 g (0.5 lb)                                               |
| Shipping weight                  |                               | 1 kg (2.2 lb)                                                |

## Ordering information

| Designation                      | Type         | Order No.    |
|----------------------------------|--------------|--------------|
| Calibration Kit (3.5 mm, male)   | R&S® ZV-Z135 | 1317.7677.02 |
| Calibration Kit (3.5 mm, female) | R&S® ZV-Z135 | 1317.7677.03 |

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## Rohde & Schwarz

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R&S®ZV-Z135 Calibration Kit

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