

# R&S® ZV-ZCAN Calibration Kit

## Precision standards from DC to 3 GHz



# R&S®ZV-ZCAN Calibration Kit At a glance

The R&S®ZCAN calibration kit is used to calibrate test setups with network analyzers. The calibration kit contains short (S), open (O), match (M), and through (T) standards, with type N connectors (male and female). The short and the open standard are combined in one component. The R&S®ZCAN supports full one-port (OSM) as well as two-port and multiport calibrations (e.g. TOSM, TRM, TOM) for reflection and transmission measurements. The calibration kit is available in 50  $\Omega$  and 75  $\Omega$  versions.

## Uses

Calibration standards are mainly used to perform system error calibration in vector network analyzers. The measurement accuracy of such instruments is determined to a great extent by the quality of the calibration standards used, which must therefore be manufactured with the utmost precision. Typical applications include OSM (Open, Short, Match) and TOSM (Through, Open, Short, Match) system error calibration for reflection and transmission measurements.

Another application is the normalization of a network analyzer by means of an open and/or a short standard, or a match. In addition, the match can be used to check the directivity of a network analyzer or the directivity when using an external SWR bridge such as the R&S®ZRB2 or R&S®ZRC.

The calibration standards can also be used as universal components in a wide range of T&M applications, helping to simplify measurements.

## Description

The R&S®ZCAN calibration standards are manufactured with the greatest care and with extremely small mechanical tolerances. In the case of the shorts, for instance, the vital part for electrical contact is a precision-machined, gold-plated solid metal piece with a very smooth surface. This results in low losses and low contact resistance and, consequently, in a virtually ideal reflection coefficient with a magnitude of 1 and a phase of 180° over the entire frequency range. The open standards suppress any potential radiation at an open end of a line, and ensure a precisely defined fringing capacitance. For the female connector of the open standard, this is achieved by means of a cap on the inner conductor, where the cap is fixed to a spring-loaded dielectric rod. The matches are outstanding for their low reflection; the typical return loss is 50 dB, i.e. reflection coefficient = 0.3% or VSWR = 1.006. The through standards, which are well matched and precisely dimensioned, have a low insertion loss of typ. 0.03 dB at 3 GHz.

# Specifications

Specifications		
Frequency range		0 Hz to 3 GHz
Characteristic impedance		50 $\Omega$ , 75 $\Omega$
Connectors		type N, male and female
Return loss of matches		$\geq 46$ dB (50 $\Omega$ , typ.), $\geq 40$ dB (75 $\Omega$ , typ.)
Insertion loss of throughs		$\leq 0.1$ dB
Return loss of throughs		$\geq 34$ dB
Power-handling capacity		1 W
General data		
Operating temperature range		0 °C to +55 °C
Storage temperature range		-40 °C to +75 °C
Dimensions of carrying case	W x H x D	266 mm x 179 mm x 49 mm (10.47 in x 7.05 in x 1.93 in)
Weight (including carrying case)		820 g (1.81 lb)

For data sheet, see PD 5214.1950.22 and [www.rohde-schwarz.com](http://www.rohde-schwarz.com)

# Ordering information

Designation	Type	Order No.
Calibration Kit, type N, 50 $\Omega$ , 0 Hz to 3 GHz	R&S®ZV-ZCAN model.52	0800.8515.52
Calibration Kit, type N, 75 $\Omega$ , 0 Hz to 3 GHz	R&S®ZV-ZCAN model.72	0800.8515.72

Service options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales partner.
Extended Warranty, two years	R&S®WE2	
Extended Warranty, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Calibration Coverage, three years	R&S®CW3	
Extended Warranty with Calibration Coverage, four years	R&S®CW4	

Your local Rohde & Schwarz representative will help you determine the optimum solution for your requirements. To find your nearest Rohde & Schwarz representative, visit [www.sales.rohde-schwarz.com](http://www.sales.rohde-schwarz.com)

# R&S® ZV-ZCAN Calibration Kits Specifications



Version 05.01, April 2015

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## Definitions

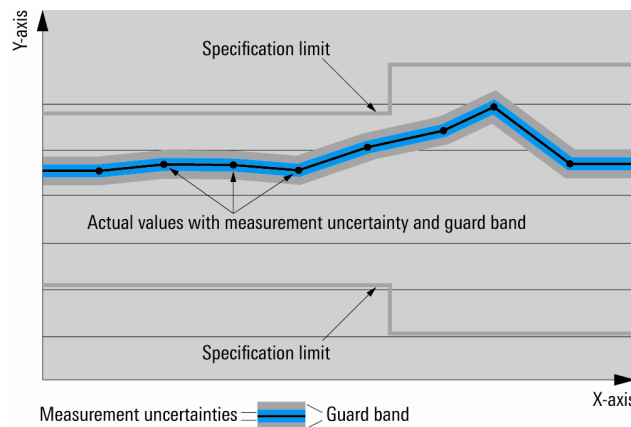
### General

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.

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# Specifications

## Mechanical data

Connector type	R&S®ZV-ZCAN model.52	type N, 50 Ω, female and male
	R&S®ZV-ZCAN model.72	type N, 75 Ω, female and male
Inner conductor material		Au-plated age-hardened CuBe alloy
Outer conductor material		stainless steel

## Electrical data of R&S®ZV-ZCAN (Type N, 50 Ω, female and male)

The specified effective system data is established after performing a TOSM system error calibration on an R&S®ZVL3 vector network analyzer using the calibration kit's characteristic data. This data is valid between +18 °C and +28 °C at a measurement bandwidth of 10 Hz and a nominal power of –10 dBm at the calibration ports.

<b>Frequency range</b>		0 Hz to 3 GHz
Through standard (male – male)		
Return loss		typ. 34 dB
Insertion loss		nom. 0.012 dB $\sqrt{f/\text{GHz}}$
Electrical length		nom. 48.97 mm
<b>Through standard (female – female)</b>		
Return loss		typ. 34 dB
Insertion loss		nom. 0.008 dB $\sqrt{f/\text{GHz}}$
Electrical length		nom. 29.04 mm
<b>Open standard (male)</b>		
Fringing capacitance	C <sub>0</sub>	24 fF
	C <sub>1</sub>	1.8 fF/GHz
	C <sub>2</sub>	0.1 fF/GHz <sup>2</sup>
	C <sub>3</sub>	0 fF/GHz <sup>3</sup>
Offset length		5.26 mm
Loss		nom. 0.002 dB $\sqrt{f/\text{GHz}}$
<b>Short standard (male)</b>		
Inductance	L <sub>0</sub>	0 pH
	L <sub>1</sub>	0 pH/GHz
	L <sub>2</sub>	0 pH/GHz <sup>2</sup>
	L <sub>3</sub>	0 pH/GHz <sup>3</sup>
Offset length		5.27 mm
Loss		nom. 0.002 dB $\sqrt{f/\text{GHz}}$
<b>Match standard (male)</b>		
DC resistance		50.0 Ω ± 0.5 Ω
Return loss		typ. 46 dB
Maximum average input power		1 W
<b>Open standard (female)</b>		
Fringing capacitance	C <sub>0</sub>	99 fF
	C <sub>1</sub>	–2.3 fF/GHz
	C <sub>2</sub>	0.22 fF/GHz <sup>2</sup>
	C <sub>3</sub>	0 fF/GHz <sup>3</sup>
Offset length		0 mm
Loss		nom. 0.0 dB $\sqrt{f/\text{GHz}}$
<b>Short standard (female)</b>		
Inductance	L <sub>0</sub>	0 pH
	L <sub>1</sub>	0 pH/GHz
	L <sub>2</sub>	0 pH/GHz <sup>2</sup>
	L <sub>3</sub>	0 pH/GHz <sup>3</sup>
Offset length		0 mm
Loss		nom. 0.0 dB $\sqrt{f/\text{GHz}}$
<b>Match standard (female)</b>		
DC Resistance		50.0 Ω ± 0.5 Ω
Return loss		typ. 46 dB
Maximum average input power		1 W
<b>Effective system data</b>		
Directivity		> 42 dB
Source match		> 25 dB
Reflection tracking		< 0.05 dB
Load match		> 41 dB
Transmission tracking		< 0.2 dB

## Electrical data of R&S®ZV-ZCAN (Type N, 75 Ω, female and male)

The specified effective system data is established after performing a TOSM system error calibration on an R&S®ZVL3-75 vector network analyzer using the calibration kit's characteristic data. This data is valid between +18 °C and +28 °C at a measurement bandwidth of 10 Hz and a nominal power of –10 dBm at the calibration ports.

<b>Frequency range</b>		0 Hz to 3 GHz
Through standard (male – male)		
Return loss		typ. 34 dB
Insertion loss		nom. 0.012 dB $\sqrt{f/\text{GHz}}$
Electrical length		nom. 49.07 mm
<b>Through standard (female – female)</b>		
Return loss		typ. 34 dB
Insertion loss		nom. 0.008 dB $\sqrt{f/\text{GHz}}$
Electrical length		nom. 29.47 mm
<b>Open standard (male)</b>		
Fringing capacitance	C <sub>0</sub>	58 fF
	C <sub>1</sub>	–2.7 fF/GHz
	C <sub>2</sub>	–1.0 fF/GHz <sup>2</sup>
	C <sub>3</sub>	0 fF/GHz <sup>3</sup>
Offset length		5.26 mm
Loss		nom. 0.002 dB $\sqrt{f/\text{GHz}}$
<b>Short standard (male)</b>		
Inductance	L <sub>0</sub>	0 pH
	L <sub>1</sub>	0 pH/GHz
	L <sub>2</sub>	0 pH/GHz <sup>2</sup>
	L <sub>3</sub>	0 pH/GHz <sup>3</sup>
Offset length		5.27 mm
Loss		nom. 0.002 dB $\sqrt{f/\text{GHz}}$
<b>Match standard (male)</b>		
DC resistance		75.0 Ω ± 1.0 Ω
Return loss		typ. 40 dB
Maximum average input power		1 W
<b>Open standard (female)</b>		
Fringing capacitance	C <sub>0</sub>	75 fF
	C <sub>1</sub>	–9.0 fF/GHz
	C <sub>2</sub>	1.9 fF/GHz <sup>2</sup>
	C <sub>3</sub>	0 fF/GHz <sup>3</sup>
Offset length		0 mm
Loss		nom. 0.0 dB $\sqrt{f/\text{GHz}}$
<b>Short standard (female)</b>		
Inductance	L <sub>0</sub>	0 pH
	L <sub>1</sub>	0 pH/GHz
	L <sub>2</sub>	0 pH/GHz <sup>2</sup>
	L <sub>3</sub>	0 pH/GHz <sup>3</sup>
Offset length		0 mm
Loss		nom. 0.0 dB $\sqrt{f/\text{GHz}}$
<b>Match standard (female)</b>		
DC resistance		75.0 Ω ± 1.0 Ω
Return loss		typ. 40 dB
Maximum average input power		1 W
<b>Effective system data</b>		
Directivity		> 40 dB
Source match		> 25 dB
Reflection tracking		< 0.05 dB
Load match		> 40 dB
Transmission tracking		< 0.2 dB



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## 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
Recommended calibration interval		1 year
Dimensions (W × H × D)	R&S®ZV-ZCAN model.52 and/or model.72	266 mm × 179 mm × 49 mm, (10.5 in × 7.1 in × 1.93 in)
Weight	R&S®ZV-ZCAN	820 g (1.8 lb)
Shipping weight		1.5 kg (3.3 lb)

## Ordering information

Designation	Type	Order No.
Calibration Kit, Type N, 50 $\Omega$ , 0 Hz to 3 GHz	R&S®ZV-ZCAN model.52	0800.8515.52
Calibration Kit, Type N, 75 $\Omega$ , 0 Hz to 3 GHz	R&S®ZV-ZCAN model.72	0800.8515.72

Service options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Calibration Coverage, three years	R&S®CW3	
Extended Warranty with Calibration Coverage, four years	R&S®CW4	

### Extended warranty with a term of one to four years (WE1 to WE4)

Repairs carried out during the contract term are free of charge <sup>1</sup>. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

### Extended warranty with calibration (CW1 to CW4)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs <sup>1</sup> and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

<sup>1</sup> Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

**Service that adds value**

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

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The Rohde & Schwarz electronics group is a leading supplier of solutions in the fields of test and measurement, broadcast and media, secure communications, cyber-security, and radiomonitoring and radiolocation. Founded more than 80 years ago, this independent global company has an extensive sales network and is present in more than 70 countries. The company is headquartered in Munich, Germany.

**Sustainable product design**

- ▮ 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****Rohde & Schwarz GmbH & Co. KG**

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R&amp;S®ZV-ZCAN Calibration Kits

Data without tolerance limits is not binding | Subject to change

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