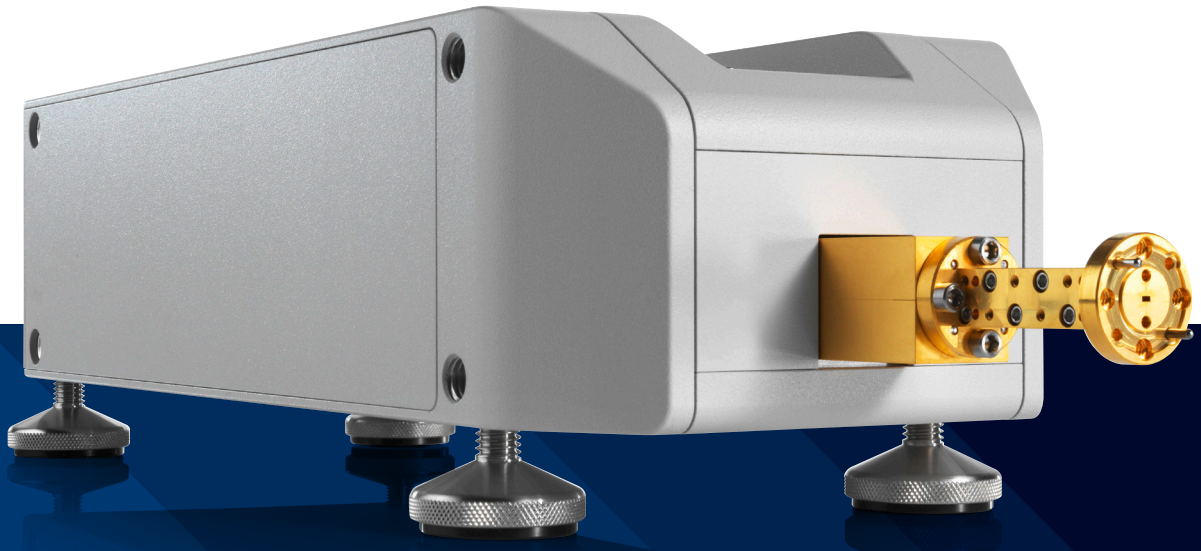
R&S®ZCxxx
mmWAVE CONVERTERS

Network analysis up to 1100 GHz



Product Brochure
Version 04.00

ROHDE&SCHWARZ
Make ideas real

AT A GLANCE

R&S®ZCxxx mmWave converters extend the frequency range of the R&S®ZNA vector network analyzer to 1100 GHz.

R&S®ZCxxx mmWave converters are specifically designed and optimized for use with the R&S®ZNA vector network analyzer. They enable precise mmWave measurements in the frequency range from 50 GHz to 1100 GHz, featuring a wide dynamic range and high output power. Additionally, they offer user-friendly operation and ensure highly stable measurements.

Each port of the R&S®ZNA can operate one R&S®ZCxxx converter, allowing the use of up to four converters without the need for additional equipment.

For active device characterization, the converter's high output power makes it possible to drive the device under test (DUT) into compression. The output power of the converter can be adjusted both manually via a micrometer attenuator and through the input power from the vector network analyzer (VNA).

The converter's wide dynamic range is particularly beneficial for measurements on high-blocking filters, for antenna measurements and for on-wafer amplifier measurements. It also speeds up measurements in general because it enables the use of wider bandwidths while maintaining the same excellent performance.

KEY FACTS

- Diverse models: 12 frequency bands
- Compatibility: operable with any 2-port or 4-port R&S®ZNA vector network analyzer
- High output power
- High dynamic range
- Variable output power
  - Manual adjustment via micrometer attenuator
  - Electronic adjustment (R&S®ZC90E only)
  - Variation of input power for power sweeps and compression point measurements
- Automatic detection by the R&S®ZNA, ensuring easy handling and full firmware integration

BENEFITS

Easy setup and configuration with maximum performance
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Advanced measurement capabilities
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Expanded measurement options
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Useful extras
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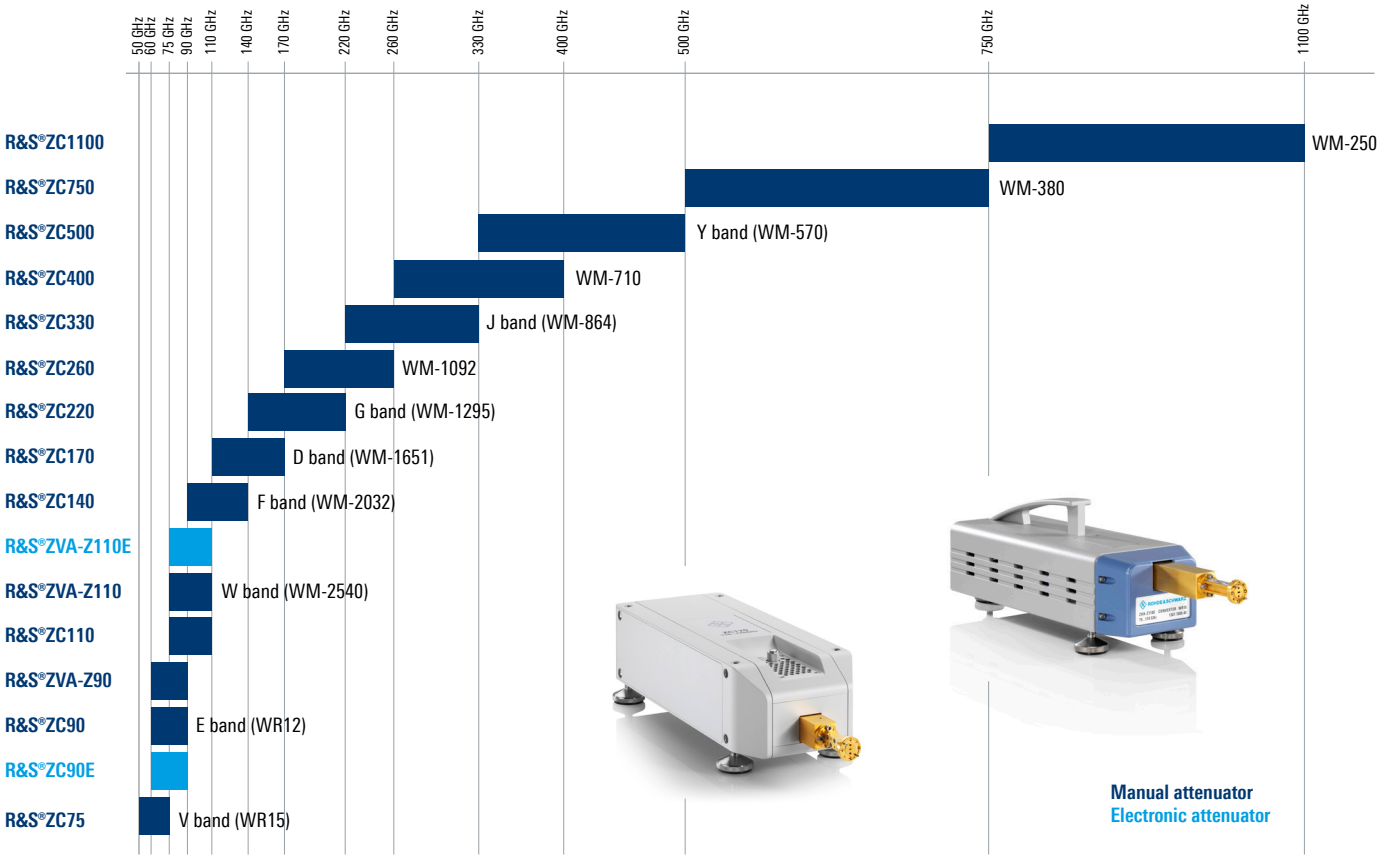
Rohde&Schwarz converter portfolio from 50 GHz to 1100 GHz



EASY SETUP AND CONFIGURATION WITH MAXIMUM PERFORMANCE

A 2-port R&S®ZNA is sufficient to operate two frequency converter modules without the need for additional control boxes. With a 4-port R&S®ZNA, up to four frequency converters can be connected.

The RF signals are supplied by the VNA test ports, while the local oscillator (LO) signal comes from the rear panel LO output port (R&S®ZNA-B8 option), distributed by a power splitter to all frequency converters in the test setup. The reference and measurement signals are captured via the rear panel direct receiver inputs (R&S®ZNA-B26 option).

Variable output power

By default, the R&S®ZCxxx converters always deliver maximum output power. A mechanical attenuator, accessible via the control screw on top of the converters, allows for manual control of the power level within a 40 dB range. This feature helps prevent overloading the DUT, especially during measurements on low-noise amplifiers. Additionally, the output power can be controlled by varying the RF input power.

Automatic parameter setting

The R&S®ZNA firmware enables the operation of the R&S®ZCxxx converters when the R&S®ZNA-K8 converter control option is installed. The network analyzer automatically sets the correct frequency band and configures the required parameters when an R&S®ZCxxx is connected.

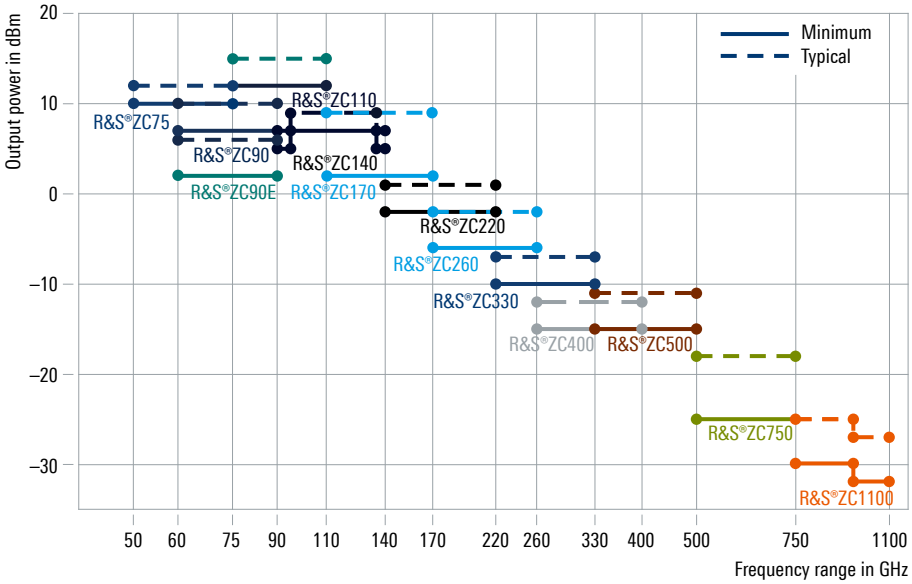
2-port converter setup, front IF/LO connection

For calibration, the analyzer automatically offers the appropriate calibration kit for that frequency band. The network analyzer also protects the converters by limiting the power applied to their coaxial inputs.

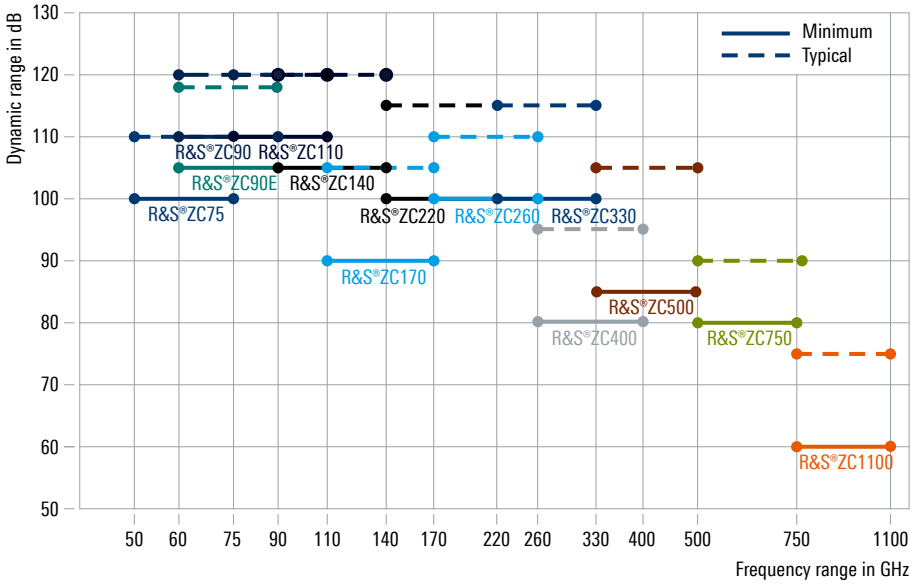
Convenient handling

To enhance user-friendliness and protect the waveguide port, the converters are supplied with a test port adapter for the waveguide connector. The adapter's screwed flange joints are readily accessible, making it easier to connect and calibrate the DUT. The converters can be set up on four height-adjustable feet that can be attached to the bottom, top or either side depending on the DUT's waveguide port orientation.

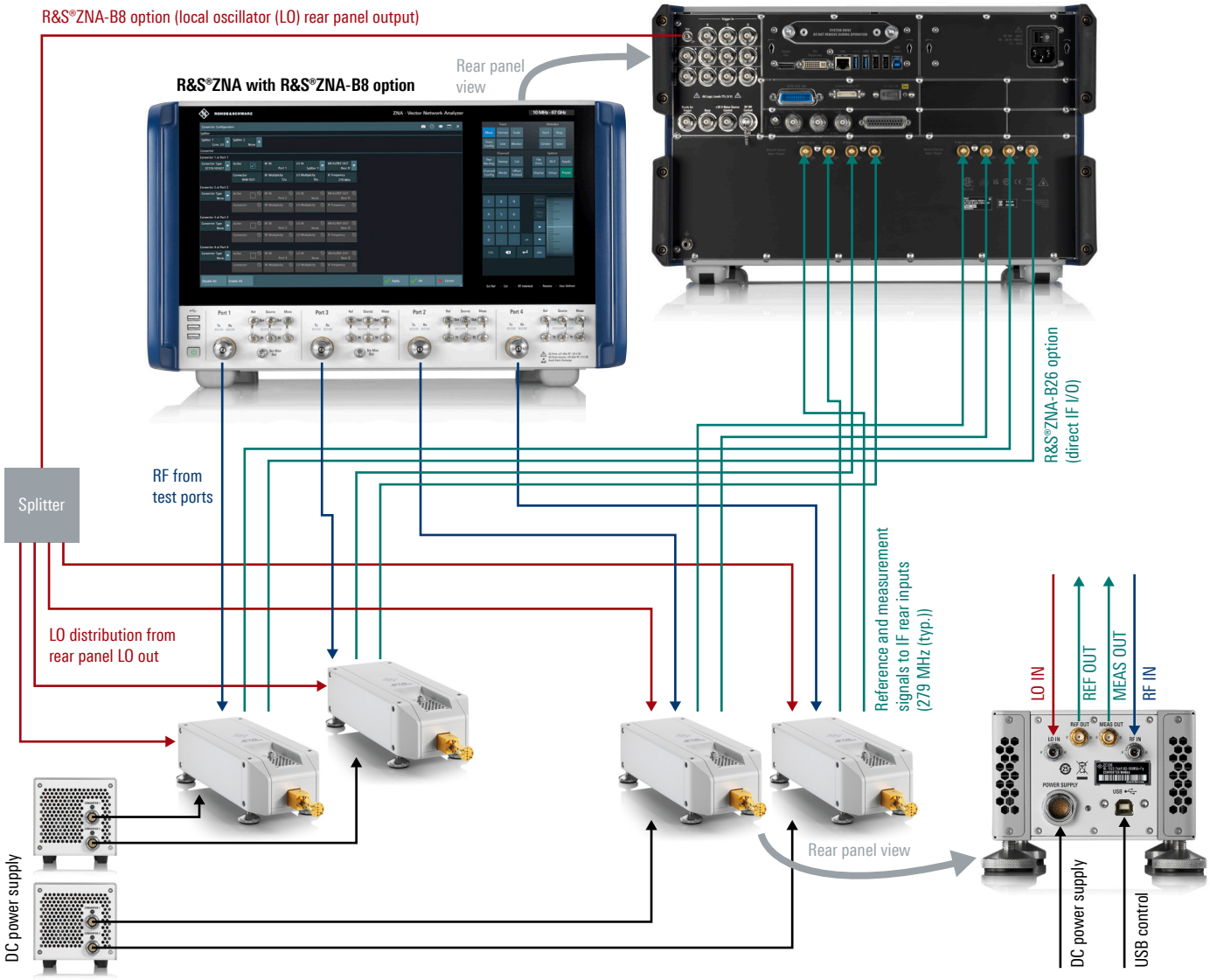
High output power



High dynamic range



Converter configuration with rear panel IF inputs



ADVANCED MEASUREMENT CAPABILITIES

On-wafer device characterization

The R&S®ZNA and R&S®ZCxxx converters are ideal for on-wafer device characterization. The R&S®ZNA can be operated from QAlibria (MPI Corporation) or WinCal software (FormFactor). Full integration makes on-wafer measurements straightforward. Mechanical integration into various prober systems from MPI Corporation and FormFactor makes it possible to mount the R&S®ZCxxx close to the wafer. Especially at high frequencies, direct mounting of the probe to the converter output reduces unnecessary losses and improves overall measurement performance.

Multiport measurements

Multiport devices, such as couplers, can be analyzed using three or four converters. The R&S®ZNA has four internal sources that allow up to four converters to be connected without any external equipment.

Pulsed measurements

The converters are also suitable for pulsed mode operation, which is ideal for characterizing pulsed amplifiers. This applies to both frequency measurements (average pulse and point-in-pulse) and pulse profile measurements.

Up to four converters can be operated with a single R&S®ZNA

Converter with a direct probe connection on an MPI Corporation probe station

Active device characterization: compression point measurement

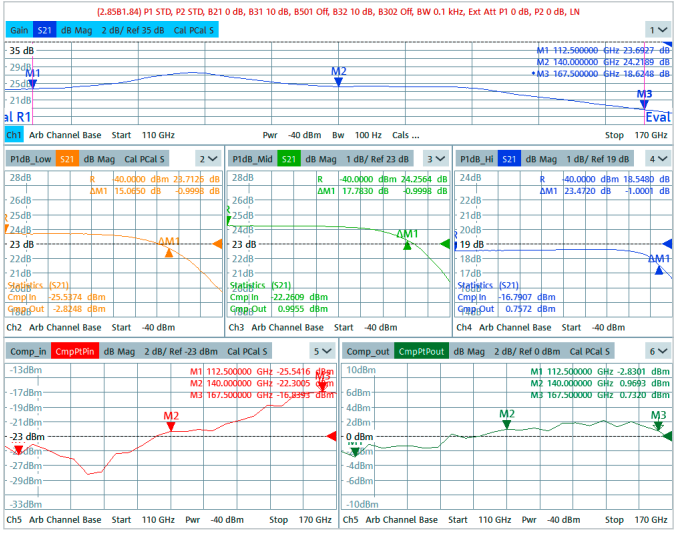
Compression point measurements with frequency converters require output power leveling. The nonlinear relationship between input and output power of the R&S®ZCxxx frequency converters can be characterized across frequency. This data allows for power sweeps by varying RF input power across the waveguide frequency band, enabling active devices to be driven into compression.

Intermodulation measurement with dual source converter

Intermodulation measurements require a 2-tone signal, which can be generated either by two identical R&S®ZCxxx converters and a Magic-Tee for combining the tones or by a dual source converter. The R&S®ZCDSxxx dual source converter features two RF inputs and multiplier chains, plus an internal combiner. At the converter output, the 2-tone signal can be used for intermodulation tests versus frequency or power.

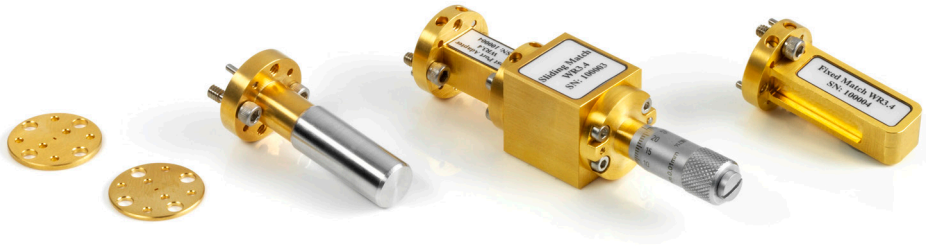
Leveling data set, showing output power versus different input power levels

Gain versus frequency, gain versus power and gain compression point versus frequency at input/output of a D band low-noise amplifier



Intermodulation measurement on D band mixer

EXPANDED MEASUREMENT OPTIONS



R&S®ZV-WR03 waveguide calibration kit for calibration up to 330 GHz

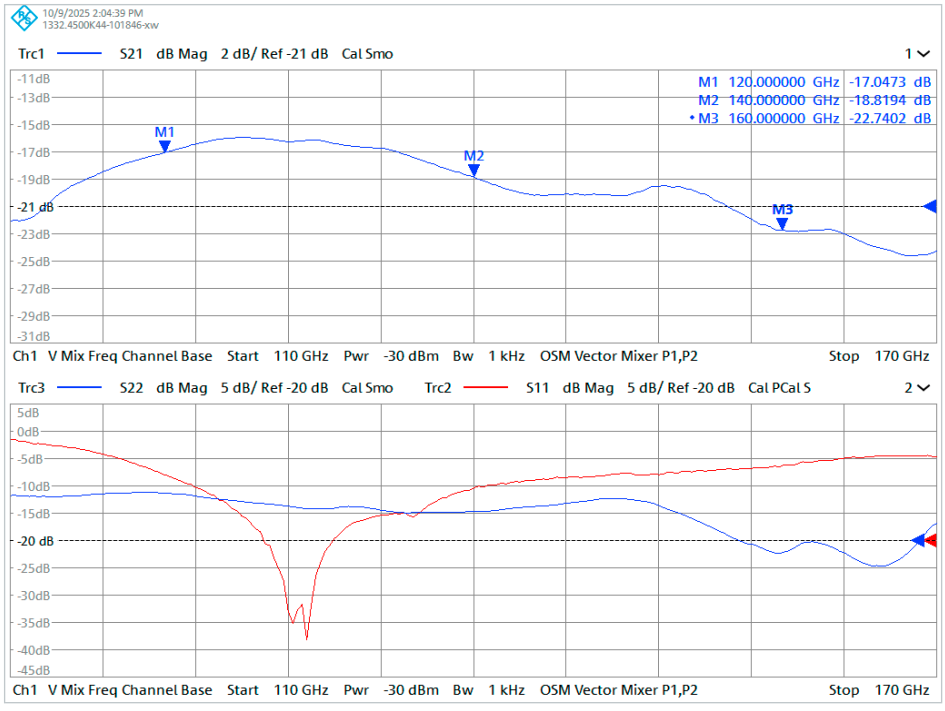
Mixer group delay without LO access

When equipped with the R&S®ZNA-K9 option, the R&S®ZNA can measure group delay on frequency converters without LO access based on a 2-tone signal measurement. This functionality can be extended to the mmWave range with an R&S®ZCDSxxx dual source converter.

Vector error correction

Calibration can be performed using the appropriate R&S®ZV-WRxx or R&S®ZCWMxx waveguide calibration kit. The characteristic data of the calibration kit standards is stored in the analyzer firmware and is automatically loaded when an R&S®ZV-WRxx is selected. The calibration kit includes the following standards: short, shim, shim 2 (in some calibration kits only), fixed match and, optionally, sliding match. When connected together, the shim and short calibration standards form an offset short. The through standard is implemented by connecting the two waveguide outputs of the converters with each other. A sliding match can be used instead of the fixed match. Rohde&Schwarz offers two versions of the calibration kit, with a sliding match and without a sliding match.

D band mixer measured with vector mixer calibration: conversion loss, RF and IF port match

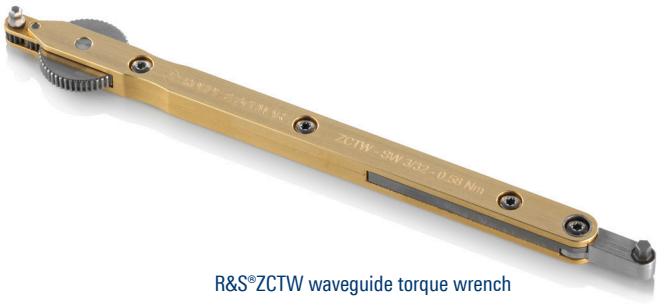


USEFUL EXTRAS

To connect frequency converters to an R&S®ZNA vector network analyzer, Rohde&Schwarz offers useful extras like RF cables, but a power divider and a converter power supply are required.

An angled wrench and a torque wrench for waveguides significantly speed up assembly and ensure proper connections. This leads to repeatable measurement results and reduces possible measurement errors.

For transportation, a transit case ensures safe storage and prevents damage to measurement equipment. Two converters, a calibration kit, a power supply, connection cables and accessories can be stored in the transport case.



R&S®ZCTW waveguide torque wrench

Converters, tools and accessories such as cables can be easily stored and transported in the R&S®ZCSTC transport case

SPECIFICATIONS IN BRIEF

Converter adjustable attenuation	
Converter	**Output power attenuation**
R&S®ZC75	0 dB to 40 dB
R&S®ZC90	no manual adjustment
R&S®ZC90E	0 dB to 25 dB (electronically)
R&S®ZC110	no manual adjustment
R&S®ZC140	0 dB to 40 dB
R&S®ZC170	0 dB to 40 dB
R&S®ZC220	0 dB to 40 dB
R&S®ZC260	0 dB to 40 dB

Converter adjustable attenuation	
Converter	**Output power attenuation**
R&S®ZC330	0 dB to 40 dB
R&S®ZC400	0 dB to 40 dB
R&S®ZC500	0 dB to 40 dB
R&S®ZC750	0 dB to 40 dB
R&S®ZC1100	no manual adjustment
R&S®ZVA-Z90	no manual adjustment
R&S® ZVA-Z110	0 dB to 40 dB
R&S® ZVA-Z110E	0 dB to 25 dB (electronically)

ORDERING INFORMATION

Designation	Type	Order No.
Converter WR15	R&S®ZC75	1323.8259.02
Converter WR12	R&S®ZC90	1323.7600.02
Converter WR12	R&S®ZC90E	1323.7600.04
Converter WM-2540	R&S®ZC110	1323.7617.02
Converter WM-2032	R&S®ZC140	1323.7623.02
Converter WM-1651	R&S®ZC170	1354.5500.02
Converter WM-1295	R&S®ZC220	1323.7646.02
Converter WM-1092	R&S®ZC260	3628.5682.02
Converter WM-864	R&S®ZC330	1323.7669.02
Converter WM-710	R&S®ZC400	3656.9220.02
Converter WM-570	R&S®ZC500	1323.7681.02
Converter WM-570, high-frequency input	R&S®ZC500	1323.7681.03
Converter WM-380	R&S®ZC750	1323.7717.02
Converter WM-250	R&S®ZC1100	1323.7723.02
Converter WM-2540, dual source	R&S®ZCDS110	1354.5322.02
Converter WM-1651, dual source	R&S®ZCDS170	1354.5522.02
Converter WR12	R&S®ZVA-Z90	1322.3024.02
Converter WR10	R&S®ZVA-Z110	1307.7000.02
Converter WR10, electronically adjustable attenuator	R&S®ZVA-Z110E	1307.7000.40
Converter WR10, electronically adjustable high-power attenuator	R&S®ZVA-Z110E	1307.7000.50
Converter set transport case	R&S®ZCSTC	1323.7730.00
Converter power supply (supplies up to two converters)	R&S®ZCPS	1325.6101.02
Power supply cable for R&S®ZCPS, length: 1.2 m	R&S®ZCPSC	1323.8159.12
Power supply cable for R&S®ZCPS, length: 1.6 m	R&S®ZCPSC	1323.8159.16
Power supply cable for R&S®ZCPS, length: 2.0 m	R&S®ZCPSC	1323.8159.20
Test cable, 3.5 mm (f) to 3.5 mm (m), length: 910 mm (two cables per converter required)	R&S®ZV-Z193	1306.4520.36
Test cable, 2.92 mm (f) to 2.92 mm (m), length: 910 mm (two cables per converter required	R&S®ZV-Z195	1306.4536.36
Test cable, 2.92 mm (m) to 2.92 mm (m), length: 910 mm (for LO output)	R&S®ZV-Z195	1306.4536.37
mmWave adaption kit, for R&S®ZNA26/R&S®ZNA43, two converters	R&S®ZCAKN	1332.6178.43
mmWave adaption kit, for R&S®ZNA26/R&S®ZNA43, four converters	R&S®ZCAKN	1332.6178.44
mmWave adaption kit, for R&S®ZNA50/R&S®ZNA67, two converters	R&S®ZCAKN	1332.6178.67
mmWave adaption kit, for R&S®ZNA50/R&S®ZNA67, four converters	R&S®ZCAKN	1332.6178.68

Designation	Type	Order No.
Torque wrench, for waveguide flange screws	R&S®ZV-Z1000	1314.5467.02
Angled wrench, for waveguide flange screws	R&S®ZCAW	1175.1960.00
Angled torque wrench, for waveguide flange screws, 0.58 Nm	R&S®ZCTW	1175.2014.02
Angled torque wrench, for waveguide flange screws, 0.2 Nm	R&S®ZCTW	1175.2014.03
Waveguide calibration kit, WR15 (without sliding match)	R&S®ZV-WR15	1307.7500.30
Waveguide calibration kit, WR15 (with sliding match)	R&S®ZV-WR15	1307.7500.31
Waveguide calibration kit, WR12 (without sliding match)	R&S®ZV-WR12	1307.7700.10
Waveguide calibration kit, WR12 (with sliding match)	R&S®ZV-WR12	1307.7700.11
Waveguide calibration kit, WR10 (without sliding match), compatible with WM-2540 converter	R&S®ZV-WR10	1307.7100.10
Waveguide calibration kit, WR10 (with sliding match), compatible with WM-2540 converter	R&S®ZV-WR10	1307.7100.11
Waveguide calibration kit, WR08 (without sliding match), compatible with WM-2032 converter	R&S®ZV-WR08	1307.7900.10
Waveguide calibration kit, WR08 (with sliding match), compatible with WM-2032 converter	R&S®ZV-WR08	1307.7900.11
Waveguide calibration kit, WR06 (without sliding match), compatible with WM-1651 converter	R&S®ZV-WR06	1311.8807.10
Waveguide calibration kit, WR06 (with sliding match), compatible with WM-1651 converter	R&S®ZV-WR06	1311.8807.11
Waveguide calibration kit, WR05 (without sliding match), compatible with WM-1295 converter	R&S®ZV-WR05	1307.8106.10
Waveguide calibration kit, WR05 (with sliding match), compatible with WM-1295 converter	R&S®ZV-WR05	1307.8106.11
Waveguide calibration kit, WR03 (without sliding match), compatible with WM-864 converter	R&S®ZV-WR03	1307.7300.30
Waveguide calibration kit, WR03 (with sliding match), compatible with WM-864 converter	R&S®ZV-WR03	1307.7300.31
Waveguide calibration kit, WM-1092 (without sliding match)	R&S®ZCWM-1092	3628.5699.02
Waveguide calibration kit, WM-710 (without sliding match)	R&S®ZCWM-710	1339.4070.02
Waveguide calibration kit, WM-570 (without sliding match)	R&S®ZCWM-570	1322.3099.10
Waveguide calibration kit, WM-380 (without sliding match)	R&S®ZCWM-380	1322.3101.02
Waveguide calibration kit, WM-250 (without sliding match)	R&S®ZCWM-250	1322.3118.02
mmWave converter LO	R&S®ZNA-B8	1332.4652.02
Direct IF access	R&S®ZNA-B26	1332.4598.02

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	SERVICE PLANS	ON DEMAND
Calibration	Up to five years [1]	Pay per calibration
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[1] For extended periods, contact your Rohde&Schwarz sales office.

Instrument management made easy

The R&S®InstrumentManager makes it easy to register and manage your instruments. It lets you schedule calibration dates and book services.

Find out more about our service portfolio under:

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- Uncompromising quality
- Long-term dependability

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