RPG ZCxxx Millimeter-Wave Converters 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 $\langle , \leq , \rangle, \geq , \pm$, 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.



Non-traceable specifications with limits (n. trc.)

Represent product performance that is specified and tested as described under "Specifications with limits" above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Radiometer Physics laboratories.

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 indicated as follows: "parameter: value".

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Radiometer Physics.

General information

The RPG ZCxxx millimeter-wave converters are optional for the following four-port vector network analyzers: R&S[®]ZVA24, R&S[®]ZVA40, R&S[®]ZVA50 or R&S[®]ZVA67, and R&S[®]ZVT20 (not suitable for RPG ZC750 and RPG ZC1100) with at least four ports. The converters facilitate measurements in the millimeter-wave frequency range. The RPG ZCxxx millimeter-wave converters are available for the frequency bands from:

- 53 GHz to 78 GHz (RPG ZC78)
- 78 GHz to 118 GHz (RPG ZC118)
- 170 GHz to 260 GHz (RPG ZC260)
- 260 GHz to 400 GHz (RPG ZC400)
- 500 GHz to 750 GHz (RPG ZC750)
- 750 GHz to 1100 GHz (RPG ZC1100)

Other frequency bands are covered by other models from the R&S®ZVA-Zxxx or R&S®ZCxxx converter series.

The millimeter-wave converters consist of a dedicated reflectometer module containing a directional coupler, a frequency multiplier for generating the source signal, two harmonic mixers as downconverters and a manually adjustable attenuator for output power adjustment. In addition, the RPG ZCxxx converters allow output power leveling and power sweeps by adjusting the RF input power.

The four-port network analyzer must be equipped with the R&S[®]ZVAxx-B16 and R&S[®]ZVA-K8 options.

The RPGZCxxx millimeter-wave converters come with the following accessories:

- Hex ball driver
- · Two coaxial cables with SMA connectors for the reference and measurement output signals
- Waveguide-to-waveguide adapter (test port adapter, factory mounted)
- DC cable and USB cable
- · Waveguide flange screws and dowel pins
- Documentation

The RPG ZCxxx millimeter-wave converters must be operated with the R&S[®]ZCPS power supply module (available as an option; one module supplies two converters).

Specifications

Test port

Frequency range	RPG ZC78	53 GHz to 78 GHz	
	RPG ZC118	78 GHz to 118 GHz	
	RPG ZC260	170 GHz to 260 GHz	
	RPG ZC400	260 GHz to 400 GHz	
	RPG ZC750	500 GHz to 750 GHz	
	RPG ZC1100	750 GHz to 1100 GHz	
Waveguide designator	RPG ZC78	WG-3.6 x 1.8	
5 5	RPG ZC118	WG-2.4 x 1.2	
	RPG ZC260	WM-1092	
	RPG ZC400	WM-710	
	RPG ZC750	WM-380	
	RPG ZC1100	WM-250	
Connector type	RPG ZC78	precision waveguide flange	
(anti cocking flange)	RPG ZC118	compatible with GOST 13317	
(RPG 7C260		
	RPG ZC400	precision waveguide flange	
	RPG 7C750	compatible with flange types UG-387/U-M	
	RPG 7C1100	and IEEE 1785.2a	
Output power	at ± 7 dBm input power from the R&S [®] 7VA	⟨v/₽&\$®7\/T20	
	53 GHz to 78 GHz	$> \pm 6 dBm (n trc) typ \pm 12 dBm$	
	PPG 70118	> +0 dbm (n. nc.), typ. +12 dbm	
		> 16 dPm (n tro) tun 10 dPm	
		> +0 dbm (n. nc.), typ. +9 dbm	
	170 CHz to 240 CHz	$\sim 9 dPm (n tro) tun 4 dPm$	
	240 CHz to 260 CHz	> -6 dBin (n. tro.), typ4 dBin	
	240 GHZ 10 200 GHZ > -12 ubili (ii. iic.), iyp7 ubili		
	RPG 20400		
		> - 15 dBm (n. trc.), typ 10 dBm	
	RPG 20750		
	500 GHZ to 750 GHZ	> -30 dBm (n. trc.), typ. $-25 dBm$	
	525 GHZ to 700 GHZ	> -25 dBm (n. trc.), typ18 dBm	
	RPG 201100		
	750 GHz to 1100 GHz	> -40 dBm (n. trc.), typ25 dBm	
Output power attenuation	RPG 2C78 manually adjustable	0 dB to 40 dB	
	RPG 2C118 manually adjustable	n.A.	
	RPG ZC260 manually adjustable	0 dB to 40 dB	
	RPG ZC400 manually adjustable	0 dB to 40 dB	
	RPG ZC750 manually adjustable	0 dB to 40 dB	
	RPG ZC1100 manually adjustable	n.A.	
Output power flatness across the	at 0 dB attenuator setting		
waveguide band at minimum attenuation	RPG ZC78	< 9 dB (n. trc.)	
(peak-to-peak)	RPG ZC118	< 7 dB (n. trc.)	
	RPG ZC260	< 11 dB (n. trc.)	
	RPG ZC400	< 14 dB (n. trc.)	
	RPG ZC750	< 17 dB (n. trc.)	
	RPG ZC1100	< 20 dB (n. trc.)	
Damage level	RPG ZC78	+20 dBm	
	RPG ZC118	+20 dBm	
	RPG ZC260	+10 dBm	
	RPG ZC400	+10 dBm	
	RPG ZC750	+0 dBm	
	RPG ZC1100	+0 dBm	

Source input (RF IN)

Connector type	RPG ZC78	2.92 mm, female	
	RPG ZC118	2.92 mm, female	
	RPG ZC260	2.92 mm, female	
	RPG ZC400	2.92 mm, female	
	RPG ZC750	2.92 mm, female	
	RPG ZC1100	2.92 mm, female	
Frequency range and multiplication factor	RPG ZC78	13.250 GHz to 19.500 GHz × 4	
	RPG ZC118	13.000 GHz to 19.666 GHz × 6	
	RPG ZC260	14.166 GHz to 21.666 GHz × 12	
	RPG ZC400	14.444 GHz to 22.222 GHz × 18	
	RPG ZC750	13.888 GHz to 20.833 GHz × 36	
	RPG ZC1100	13.888 GHz to 20.370 GHz × 54	
Input power range	RPG ZC78	-15 dBm to +10 dBm	
	RPG ZC118	-15 dBm to +10 dBm	
	RPG ZC260	+5 dBm to +10 dBm	
	RPG ZC400	+5 dBm to +10 dBm	
	RPG ZC750	+5 dBm to +10 dBm	
	RPG ZC1100	+5 dBm to +10 dBm	

Local oscillator input (LO IN)

Connector type	RPG ZC78	2.92 mm, female	
	RPG ZC118	2.92 mm, female	
	RPG ZC260	2.92 mm, female	
	RPG ZC400	2.92 mm, female	
	RPG ZC750	2.92 mm, female	
	RPG ZC1100	2.92 mm, female	
Frequency range and multiplication factor	RPG ZC78	8.833 GHz to 13.000 GHz × 6	
	RPG ZC118	13.000 GHz to 19.666 GHz × 6	
	RPG ZC260	14.166 GHz to 21.666 GHz × 12	
	RPG ZC400	13.000 GHz to 20.000 GHz × 20	
	RPG ZC750	13.888 GHz to 20.833 GHz × 36	
	RPG ZC1100	15.625 GHz to 22.916 GHz × 48	
Input power range	RPG ZC78	+5 dBm to +10 dBm	
	RPG ZC118	+5 dBm to +10 dBm	
	RPG ZC260	+5 dBm to +10 dBm	
	RPG ZC400	+5 dBm to +10 dBm	
	RPG ZC750	+5 dBm to +10 dBm	
	RPG ZC1100	+5 dBm to +10 dBm	

Measurement output (MEAS OUT)

Connector type	RPG ZC78	SMA, female	
	RPG ZC118	SMA, female	
	RPG ZC260	SMA, female	
	RPG ZC400	SMA, female	
	RPG ZC750	SMA, female	
	RPG ZC1100	SMA, female	
Frequency range	RPG ZC78	5 MHz to 2000 MHz	
	RPG ZC118	5 MHz to 2000 MHz	
	RPG ZC260	5 MHz to 2000 MHz	
	RPG ZC400	5 MHz to 2000 MHz	
	RPG ZC750	5 MHz to 2000 MHz	
	RPG ZC1100	5 MHz to 2000 MHz	

Reference output (REF OUT)

Connector type	RPG ZC78	SMA, female	
	RPG ZC118	SMA, female	
	RPG ZC260	SMA, female	
	RPG ZC400	SMA, female	
	RPG ZC750	SMA, female	
	RPG ZC1100	SMA, female	
Frequency range	RPG ZC78	5 MHz to 2000 MHz	
	RPG ZC118	5 MHz to 2000 MHz	
	RPG ZC260	5 MHz to 2000 MHz	
	RPG ZC400	5 MHz to 2000 MHz	
	RPG ZC750	5 MHz to 2000 MHz	
	RPG ZC1100	5 MHz to 2000 MHz	

USB connector (USB •<----)

Connector type	RPG ZC78	universal serial bus (USB), type B
	RPG ZC118	universal serial bus (USB), type B
	RPG ZC260	universal serial bus (USB), type B
	RPG ZC400	universal serial bus (USB), type B
	RPG ZC750	universal serial bus (USB), type B
	RPG ZC1100	universal serial bus (USB), type B

Power supply input (POWER SUPPLY)

Connector type	RPG ZC78	ODU MINI-SNAP [®] 19-pin miniature	
		circular connector with push-pull locking	
	RPG ZC118	ODU MINI-SNAP [®] 19-pin miniature	
		circular connector with push-pull locking	
	RPG ZC260	ODU MINI-SNAP [®] 19-pin miniature	
		circular connector with push-pull locking	
	RPG ZC400	ODU MINI-SNAP [®] 19-pin miniature	
		circular connector with push-pull locking	
	RPG ZC750	ODU MINI-SNAP [®] 19-pin miniature	
		circular connector with push-pull locking	
	RPG ZC1100	ODU MINI-SNAP [®] 19-pin miniature	
		circular connector with push-pull locking	
Power consumption	RPG ZC78	5 W	
	RPG ZC118	8 W	
	RPG ZC260	12 W	
	RPG ZC400	10 W	
	RPG ZC750	30 W	
	RPG ZC1100	28 W	

System characteristics

Traco stability	PDC 7C79	$t_{\rm VD} = 0.2 dR$ and $t_{\rm VD} = 2^{\circ}$	
Tace stability	RFG2070	typ. < 0.2 dB and typ. < 2 typ. < 0.2 dB and typ. < 2°	
	RFG 20110	yp. < 0.2 uB and $yp. < 2$	
	RPG 20200	yp. < 0.4 dB and $yp. < 4$	
	RPG 2C400	typ. < 0.5 dB and typ. $< 6^{\circ}$	
	RPG ZC750	typ. < 0.4 dB and typ. $< 4^{\circ}$	
	RPG ZC1100	typ. < 0.5 dB and typ. $< 6^{\circ}$	
I race stability is defined as the maximum de	eviation of the max. or min. hold trace of the r	eflection factor from its initial (reference)	
trace when measuring a converter whose wa	aveguide port is terminated with a short. The	data is valid if the ambient temperature of	
the R&S [®] ZVA/R&S [®] ZV120 and the converte	er has not changed by more than 1 K over 1 h	nour, the output power of the converter is	
unattenuated and the measurement bandwin	dth is set to 100 Hz.		
Source match	RPG ZC78	> 19 dB, > 30 dB (typ.)	
(without system error correction)	RPG ZC118	> 19 dB, > 30 dB (typ.)	
	RPG ZC260	> 20 dB (n. trc.) ¹	
	RPG ZC400	> 20 dB (n. trc.) ¹	
	RPG ZC750	> 15 dB (n. trc.) ¹	
	RPG ZC1100	> 15 dB (n. trc.) ¹	
Directivity	RPG ZC78	> 23 dB, > 37 dB (typ.)	
(without system error correction)	RPG ZC118	> 23 dB, > 30 dB (typ.)	
	RPG ZC260	> 20 dB (n. trc.) ¹	
	RPG ZC400	> 20 dB (n. trc.) ¹	
	RPG ZC750	> 15 dB (n. trc.) ¹	
	RPG ZC1100	> 5 dB (n. trc.) ¹	
Effective source match	RPG ZC78	> 35 dB (meas.)	
(with system error correction)	RPG ZC118	> 35 dB (meas.)	
(, ,	RPG ZC260	> 30 dB (meas.)	
	RPG ZC400	> 30 dB (meas.)	
	RPG ZC750	> 28 dB (meas.)	
	RPG ZC1100	> 25 dB (meas.)	
Effective directivity	RPG 7C78	> 35 dB (meas)	
(with system error correction)	RPG ZC118	> 35 dB (meas)	
	RPG 7C260	> 30 dB (meas)	
	RPG 7C400	> 30 dB (meas)	
	RPC 7C750	> 25 dB (meas.)	
	RPC 7C1100	> 15 dB (meas.)	
Dynamic range	PPG 7C79	> 100 dP two 115 dP	
	RPC 7C118	> 100 dB, typ. 110 dB	
	PDC 7C260	> 100 dB, typ. 110 dB	
	KPG 20/00	> 80 aB, typ. 90 aB	
	RPG 201100	> 40 aB, typ. 65 dB	

Dynamic range is defined as the difference between the data trace of the transmission magnitude with maximum test port output power and both test ports through-connected on the one hand and the RMS value of the data trace of the transmission magnitude produced by noise and crosstalk with the test ports short-circuited on the other hand. The specification is valid without system error correction and at 10 Hz measurement bandwidth. The dynamic range can be increased by using a measurement bandwidth of 1 Hz.

¹ Without consideration of measurement uncertainty



Figure 1: Test port output power versus frequency of the RPG ZC78.



Figure 2: Dynamic range versus frequency of the RPG ZC78.



Figure 3: Test port output power versus frequency of the RPG ZC118.



Figure 4: Dynamic range versus frequency of the RPGZC118.



Figure 5: Test port output power versus frequency of the RPG ZC260.



Figure 6: Dynamic range versus frequency of the RPG ZC260.



Figure 7: Test port output power versus frequency of the RPG ZC400.



Figure 8: Dynamic range versus frequency of the RPG ZC400.



Figure 9: Test port output power versus frequency of the RPG ZC750.



Figure 10: Dynamic range versus frequency of the RPG ZC750.



Figure 11: Test port output power versus frequency of the RPG ZC1100.



Figure 12: Dynamic range versus frequency of the RPG ZC1100.

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 IEC 60068-2-1 and
		IEC 60068-2-2
Damp heat		+40 °C at 80 % rel. humidity,
		in line with IEC 60068-2-30
Mechanical resistance	vibration, sinusoidal	5 Hz to 150 Hz,
		in line with IEC 60068-2-6
	vibration, random	10 Hz to 300 Hz,
		in line with IEC 60068-2-64
	shock	40 g shock spectrum,
		in line with MIL-STD-810, method 516,
		procedure I
Operation	permissible altitude	3000 m above sea level
Dimensions ($W \times H \times D$)	with feet height adjusted to	123 mm × 88.38 mm × 322.5 mm
	12.1 mm (0.5 in)	(4.84 in × 3.48 in × 12.70 in)
Dimensions ($W \times H \times D$)	with feet height adjusted to	123 mm × 88.38 mm × 262.5 mm
	12.1 mm (0.5 in)	(4.84 in × 3.48 in × 10.33 in)
Number of feet	alternatively	3 or 4
Feet height	user-adjustable	12.1 mm to 29.1 mm
_		(0.5 in to 1.1 in)
Weight		3 kg (7 lb)
Shipping weight		5 kg (11 lb)



Туре	Waveguide	Dimension X (Distance between converter front panel and center of attenuator screw)	Dimension Y (Distance between converter front panel and waveguide flange surface)
RPG ZC78	WG-3.6 x 1.8	68.0 mm	72.5 mm
RPG ZC260	WM-1092	52.0 mm	65.5 mm
RPG ZC400	WM-710	52.0 mm	50.5 mm
RPG ZC260	WM-380	28.5 mm	43.5 mm
RPG ZC400	WM-250	n.A.	25.5 mm

Dimensions (in mm) of the RPGZCxxx millimeter-wave converters.



Dimensions (in mm) of the RPGZCxxx millimeter-wave converters.

Ordering information

Designation	Туре	Order No.
Converter WG-3.6 x 1.8	RPG ZC78	3626.5356.02
Converter WG-2.4 x 1.2	RPG ZC118	3626.5362.02
Converter WM-1092	RPG ZC260	3628.5682.02
Converter WM-710	RPG ZC400	21000070
Converter WM-380	RPG ZC750	1323.7717.02
Converter WM-250	RPG ZC1100	1323.7723.02
Converter Set Transport Case	R&S [®] ZCSTC	1323.7730.00
Converter Power Supply (supplies two converters)	R&S [®] ZCPS	1325.6101.02
DC Connection Cable (40 cm longer than the standard	R&S [®] ZCPSC	1323.7952.00
DC connection cable delivered with each converter)		
Test Cable, 3.5 mm (f) to 3.5 mm (m), length: 910 mm	R&S [®] ZV-Z193	1306.4520.36
(two cables per converter required)		
Test Cable, 2.92 mm (f) to 2.92 mm (m), length: 910 mm	R&S [®] ZV-Z195	1306.4536.36
(two cables per converter required)		
Waveguide Calibration Kit WG 3.6x1.8 (without sliding match)	RPG ZC-RU78	3626.5379.02
compatible with converter ZC78		
Waveguide Calibration Kit WG 2.4x1.2 (without sliding match)	RPG ZC-RU118	3626.5385.02
compatible with converter ZC118		
Waveguide Calibration Kit WM-1092 (without sliding match)	RPG ZC-WM1092	3628.5699.02
compatible with converter ZC260		
Waveguide Calibration Kit WM-710 (without sliding match)	RPG ZC-WM710	1339.4070.02
compatible with converter ZC400		
Waveguide Calibration Kit WM-380 (without sliding match)	RPG ZC-WM380	1322.3101.02
compatible with converter ZC750		
Waveguide Calibration Kit WM-250 (without sliding match)	RPG ZC-WM250	1322.3118.02
compatible with converter ZC1100		
Converter Control Software	R&S [®] ZVA-K8	1307.7022.02
Adapter Kit, including a power divider and two right angle	R&S [®] ZCAK	1323.7746.24
SMA (m/m) adapters (required if R&S [®] ZVA24 var. 28 or		
R&S [®] ZVA40 var. 48 (VNAs with four sources) is used)		
Adapter Kit, including four 1.85 mm (f) to 2.92 mm (m) adapters	R&S®ZCAK	1323.7746.50
and four 1.85 mm (m) to 2.92 mm (f) adapters (required if		
R&S [®] ZVA50 is used)	5.0.0	
Adapter Kit, including a power divider, two right angle	R&S®ZCAK	1323.7746.67
SMA (m/m) adapters, three 1.85 mm (f) to 2.92 mm (m) adapters		
and four 1.85 mm (m) to 2.92 mm (f) adapters (required if		
K&S°ZVAb/ IS USED)		4044540700
I orque vyrench, for waveguide flange screws	R&5°ZV-21000	1314.5467.02
Angled wrench, for waveguide flange screws	K&S [®] ZCAW	1175.1960.00
Angled Torque Wrench, for waveguide flange screws	R&S [®] ZCTW	11/5.2014.02

Service options		
Extended Warranty, one year	R&S [®] WE1	Please contact your local
Extended Warranty, two years	R&S [®] WE2	Rohde & Schwarz sales office.
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 ². Necessary calibration and adjustments carried out during repairs are also covered.

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 ² and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For product brochure, see PD 3607.1471.12 and www.rohde-schwarz.com

² Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.