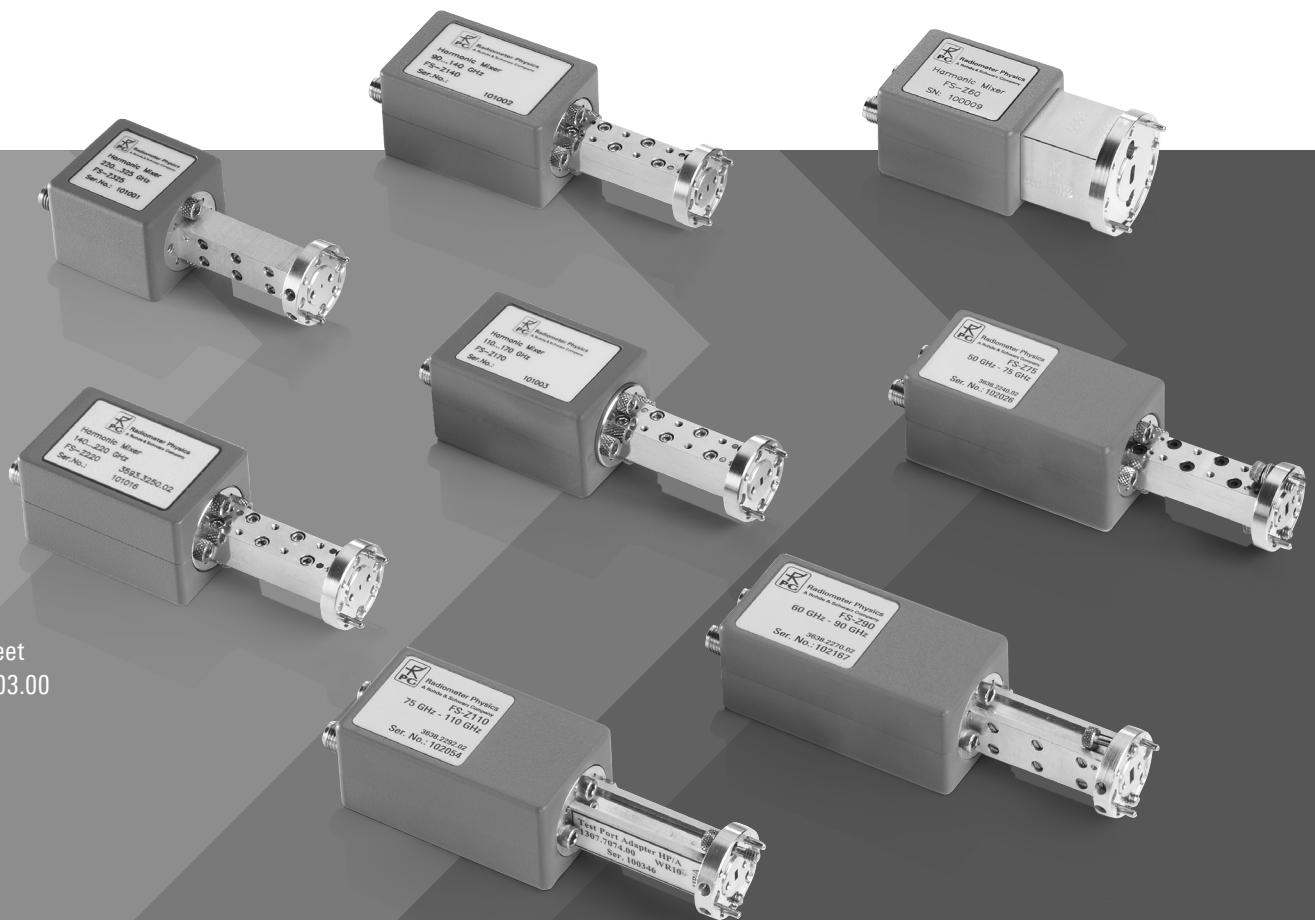# RPG FS-Zxxx
HARMONIC MIXERS

Specifications

Data Sheet
Version 03.00

# ROHDE&SCHWARZ

Make ideas real

CONTENTS

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 <, ≤, >, ≥, ±, 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.
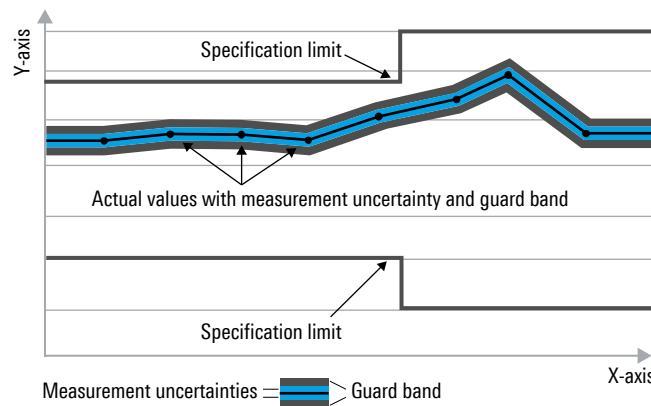
Non-traceable specifications with limits (n. trc.)

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 Rohde & Schwarz 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 designated with the format "parameter: value".

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

General information

The RPG FS-Zxxx harmonic mixers are available for the following frequency bands:

- 40 GHz to 60 GHz   (RPG FS-Z60)
- 50 GHz to 75 GHz   (RPG FS-Z75)
- 60 GHz to 90 GHz   (RPG FS-Z90)
- 75 GHz to 110 GHz   (RPG FS-Z110)
- 90 GHz to 140 GHz   (RPG FS-Z140)
- 110 GHz to 170 GHz   (RPG FS-Z170)
- 140 GHz to 220 GHz   (RPG FS-Z220)
- 220 GHz to 325 GHz   (RPG FS-Z325)

Specifications

Test port

Frequency range	RPG FS-Z60	40 GHz to 60 GHz
	RPG FS-Z75	50 GHz to 75 GHz
	RPG FS-Z90	60 GHz to 90 GHz
	RPG FS-Z110	75 GHz to 110 GHz
	RPG FS-Z140	90 GHz to 140 GHz
	RPG FS-Z170	110 GHz to 170 GHz
	RPG FS-Z220	140 GHz to 220 GHz
	RPG FS-Z325	220 GHz to 325 GHz
Harmonic number	RPG FS-Z60	#4
	RPG FS-Z75	#6
	RPG FS-Z90	#6
	RPG FS-Z110	#8
	RPG FS-Z140	#10
	RPG FS-Z170	#12
	RPG FS-Z220	#16
	RPG FS-Z325	#22
P1dB	RPG FS-Z60	+0 dBm (typ.)
	RPG FS-Z75	−5 dBm (typ.)
	RPG FS-Z90	−6 dBm (typ.)
	RPG FS-Z110	−6 dBm (typ.)
	RPG FS-Z140	−3 dBm (typ.)
	RPG FS-Z170	−3 dBm (typ.)
	RPG FS-Z220	−3 dBm (typ.)
	RPG FS-Z325	−5 dBm (typ.)
Temperatur drift (0 °C to +55 °C)	RPG FS-Z60	< 1 dB (typ.)
	RPG FS-Z75	
	RPG FS-Z90	
	RPG FS-Z110	
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	
Conversion loss	RPG FS-Z60	+13 dB (typ.)
	RPG FS-Z75	+18 dB (typ.)
	RPG FS-Z90	+18 dB (typ.)
	RPG FS-Z110	+22 dB (typ.)
	RPG FS-Z140	+26 dB (typ.)
	RPG FS-Z170	+26 dB (typ.)
	RPG FS-Z220	+32 dB (typ.)
	RPG FS-Z325	+38 dB (typ.)

RF input

Waveguide designator	RPG FS-Z60	WR-19
	RPG FS-Z75	WR-15
	RPG FS-Z90	WR-12
	RPG FS-Z110	WM-2540 (WR-10)
	RPG FS-Z140	WM-2032 (WR-8)
	RPG FS-Z170	WM-1651 (WR-6.5)
	RPG FS-Z220	WM-1295 (WR-5.1)
	RPG FS-Z325	WM-864 (WR-3.4)
Connector type (anti cocking flange)	RPG FS-Z60	Rohde & Schwarz precision waveguide flange (compatible with UG-383)
	RPG FS-Z75	Rohde & Schwarz precision waveguide flange (compatible with UG-387/U-M and IEEE 1785.2)
	RPG FS-Z90	
	RPG FS-Z110	
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	
VSWR	RPG FS-Z60	1.3 : 1 (typ.)
	RPG FS-Z75	1.4 : 1 (typ.)
	RPG FS-Z90	1.4 : 1 (typ.)
	RPG FS-Z110	1.4 : 1 (typ.)
	RPG FS-Z140	1.5 : 1 (typ.)
	RPG FS-Z170	1.6 : 1 (typ.)
	RPG FS-Z220	1.7 : 1 (typ.)
	RPG FS-Z325	3 : 1 (typ.)

Local oscillator input (LO IN)

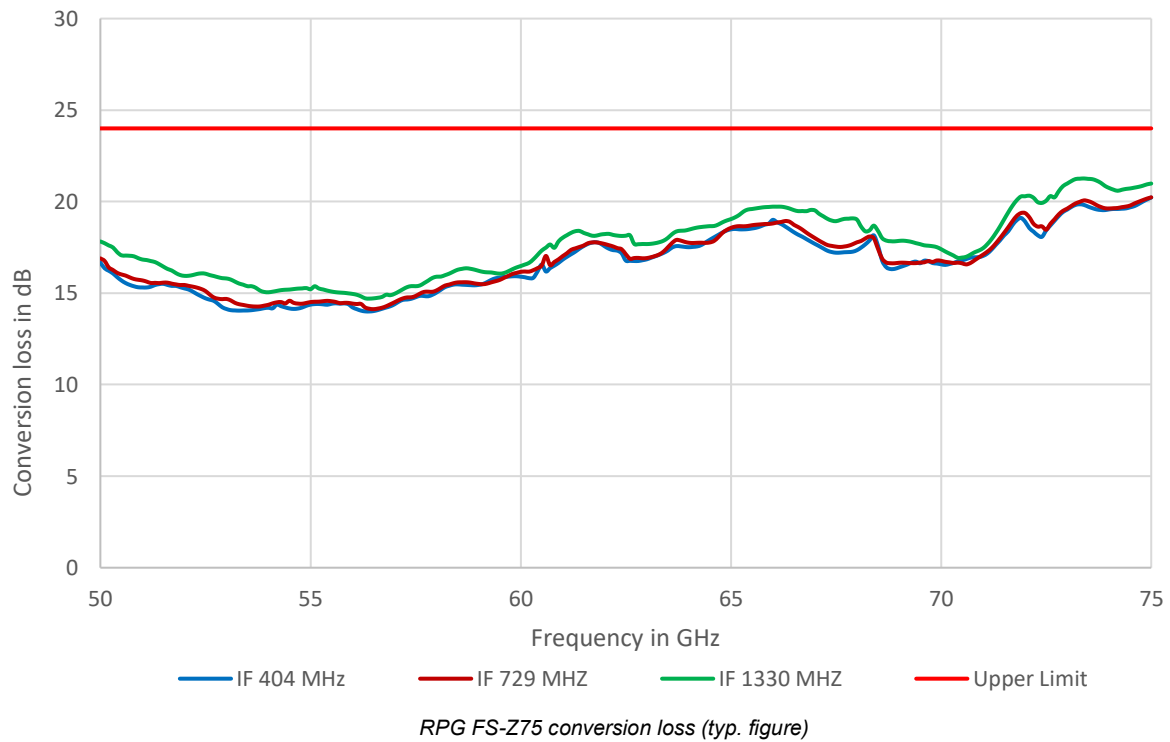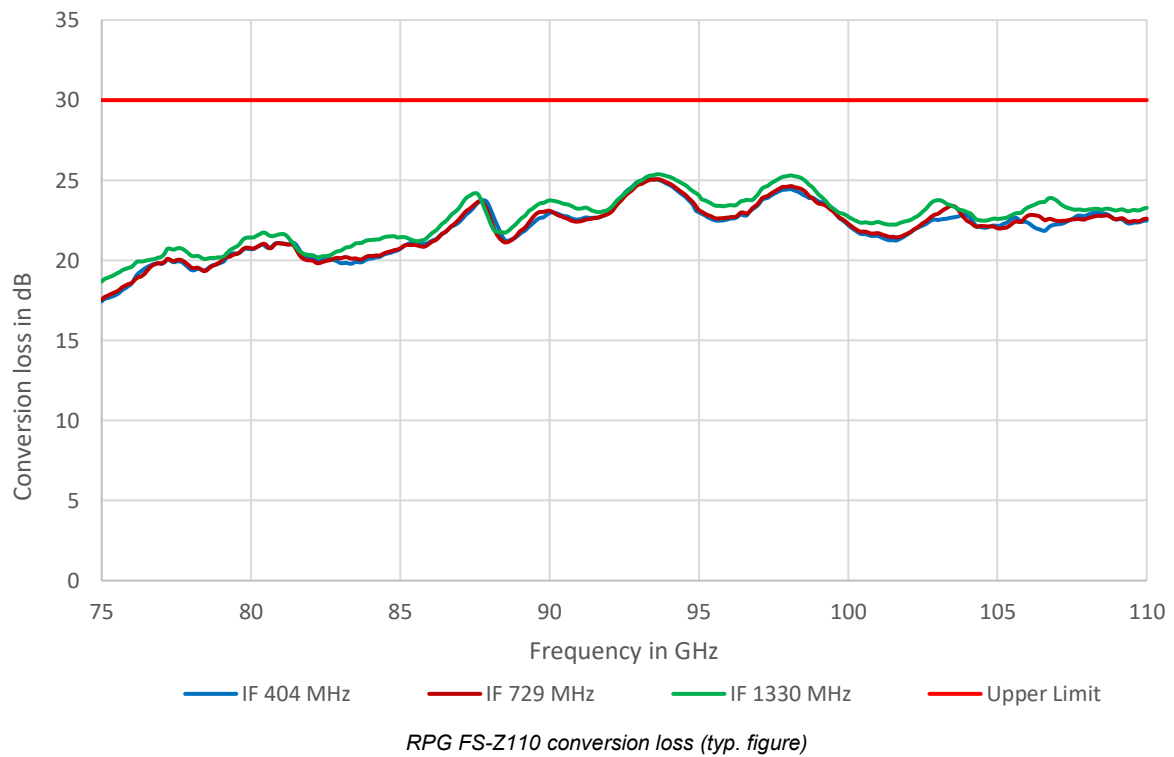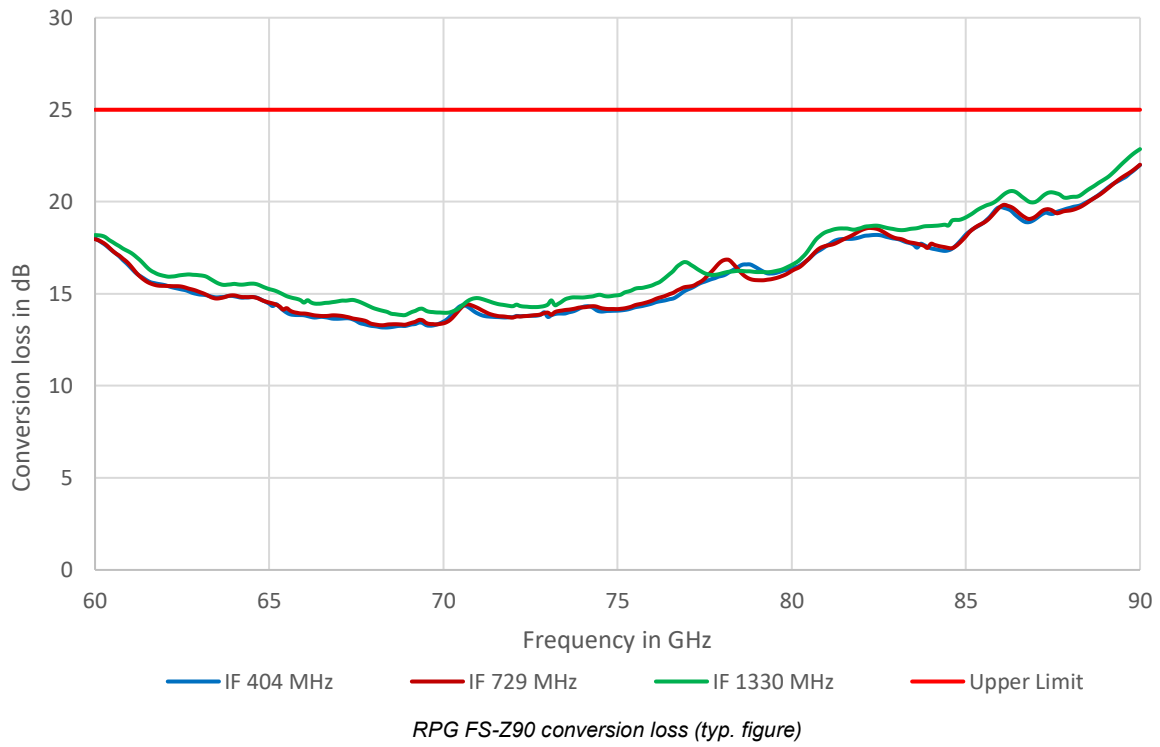| LO frequency range [GHz]	RPG FS-Z60	8.60 GHz to 15.40 GHz
	RPG FS-Z75	8.00 GHz to 12.84 GHz
	RPG FS-Z90	7.44 GHz to 15.34 GHz
	RPG FS-Z110	7.75 GHz to 13.99 GHz
	RPG FS-Z140	9.00 GHz to 14.00 GHz
	RPG FS-Z170	9.13 GHz to 14.13 GHz
	RPG FS-Z220	8.72 GHz to 13.72 GHz
	RPG FS-Z325	10.00 GHz to 14.77 GHz
Connector type	RPG FS-Z60	SMA connector (female)
	RPG FS-Z75	
	RPG FS-Z90	
	RPG FS-Z110	
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	
LO input power	RPG FS-Z60	+13.0 dBm (typ.)
	RPG FS-Z75	+14.0 dBm (typ.)
	RPG FS-Z90	+14.0 dBm (typ.)
	RPG FS-Z110	+15.5 dBm (typ.)
	RPG FS-Z140	+14.0 dBm (typ.)
	RPG FS-Z170	+15.5 dBm (typ.)
	RPG FS-Z220	+13.0 dBm (typ.)
	RPG FS-Z325	+16.0 dBm (typ.)

Intermediate frequency output (IF OUT)

Connector type	RPG FS-Z60	SMA connector (female)
	RPG FS-Z75	
	RPG FS-Z90	
	RPG FS-Z110	
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	
Frequency range	RPG FS-Z60	5 MHz to 2000 MHz
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	
	RPG FS-Z75	5 MHz to 6000 MHz
	RPG FS-Z90	
	RPG FS-Z110	

Absolute maximum ratings

RF input power	RPG FS-Z60	+23 dBm
	RPG FS-Z75	+10 dBm
	RPG FS-Z90	
	RPG FS-Z110	
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	
LO input power	RPG FS-Z60	+17 dBm
	RPG FS-Z75	
	RPG FS-Z90	
	RPG FS-Z110	
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	
Case temperature	RPG FS-Z60	+45 °C
	RPG FS-Z75	
	RPG FS-Z90	
	RPG FS-Z110	
	RPG FS-Z140	
	RPG FS-Z170	
	RPG FS-Z220	
	RPG FS-Z325	

Conversion loss figures

RPG FS-Z60 conversion loss (typ. figure)

RPG FS-Z75 conversion loss (typ. figure)

RPG FS-Z90 conversion loss (typ. figure)

RPG FS-Z110 conversion loss (typ. figure)

RPG FS-Z140 conversion loss (typ. figure)

RPG FS-Z170 conversion loss (typ. figure)

RPG FS-Z220 conversion loss (typ. figure)

RPG FS-Z325 conversion loss (typ. figure)
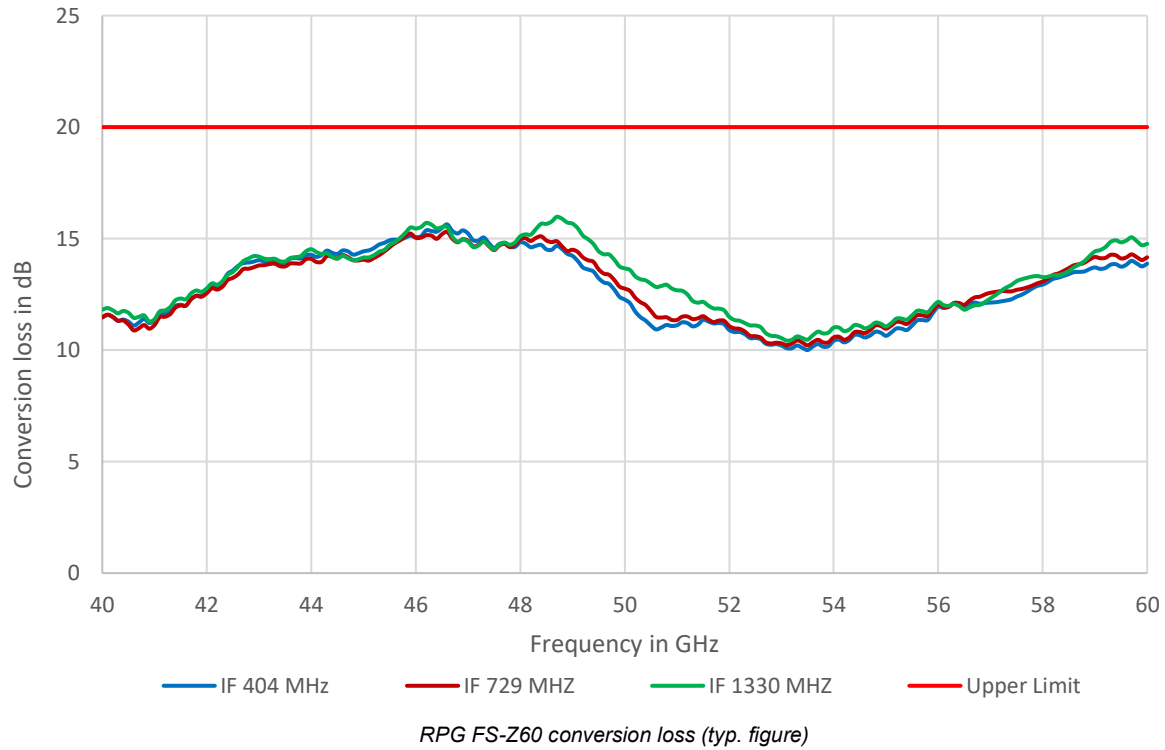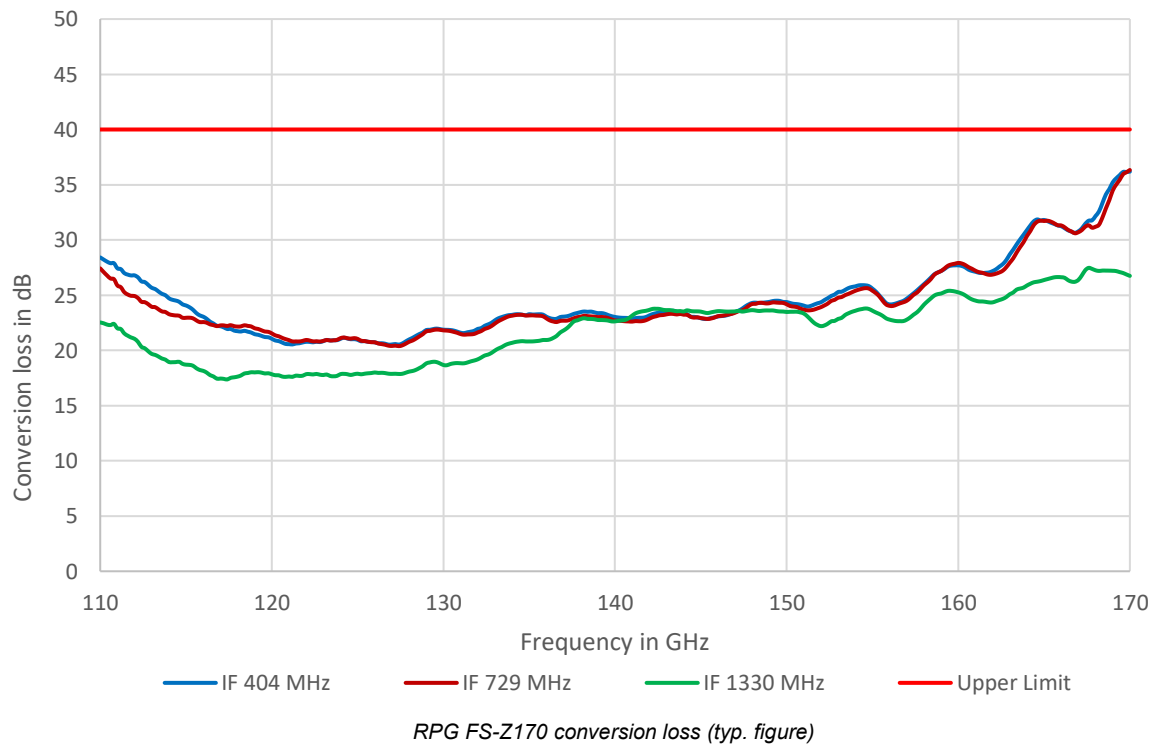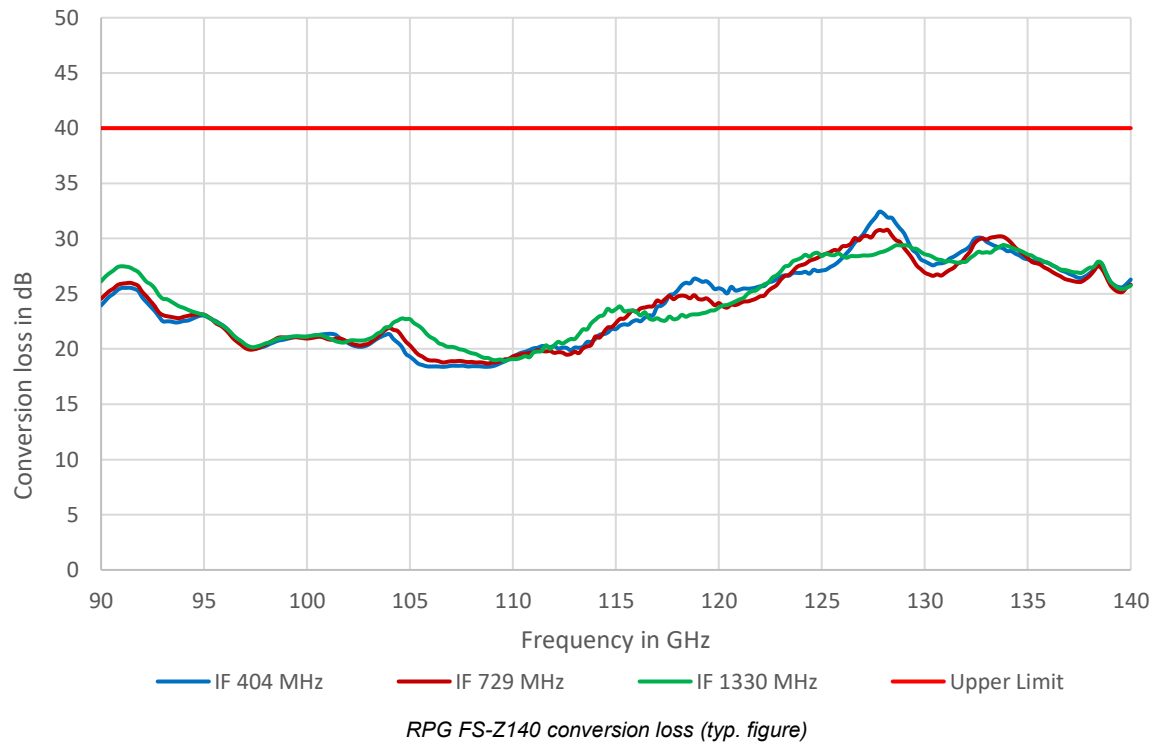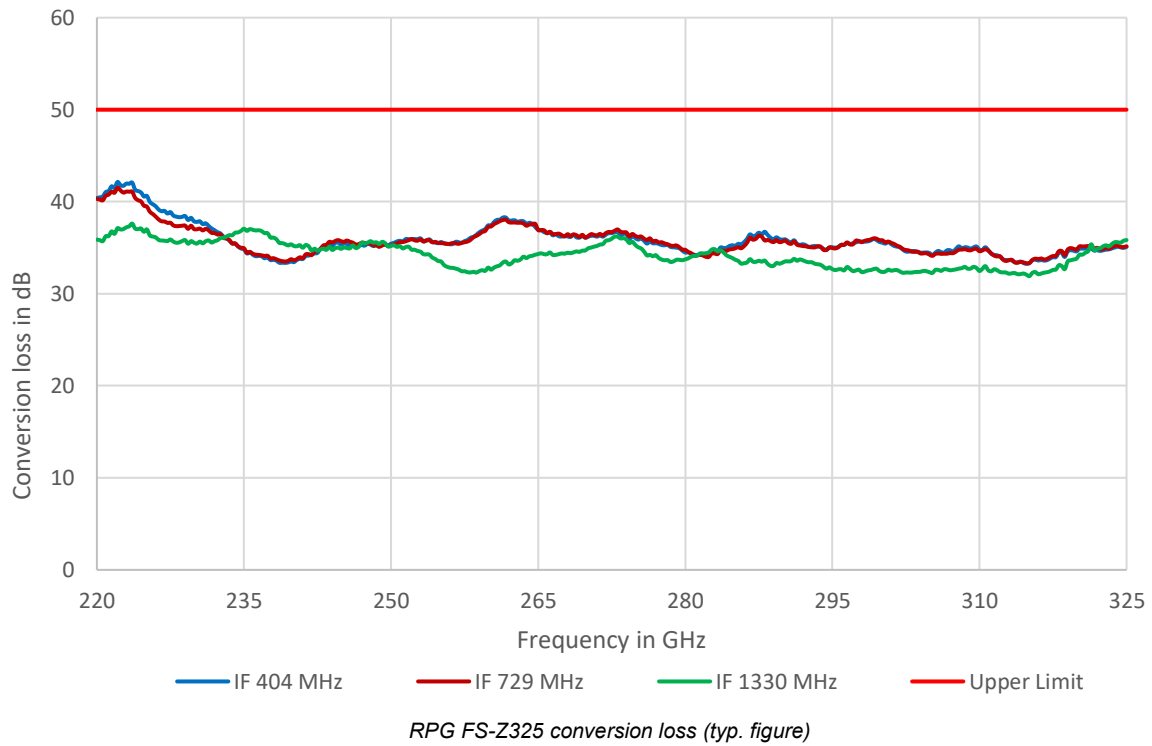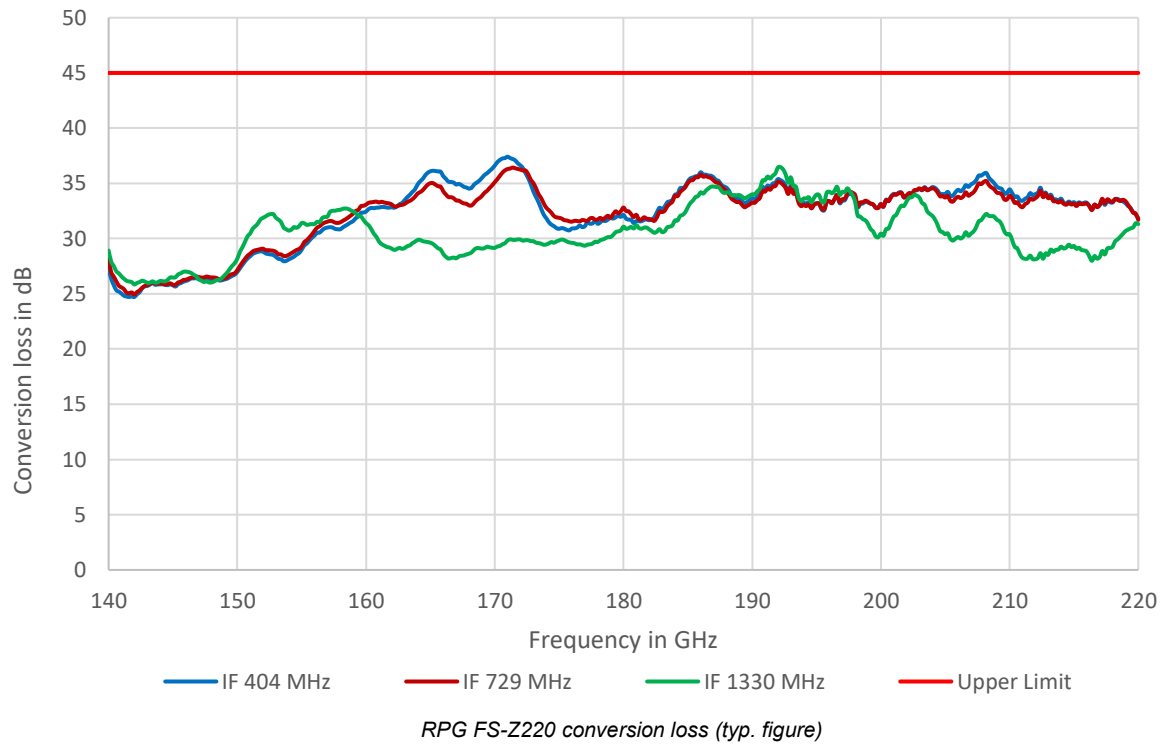
General data

Temperature loading	operating temperature range	0 °C to +55 °C
	permissible temperature range	0 °C to +55 °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 95 % rel. humidity, in line with IEC 60068-2-30
Dimensions (W × H × D)	RPG FS-Z60	27.0 mm × 24.15 mm × ~64 mm (1.06 in × 0.95 in × 2.51 in)
	RPG FS-Z75	27.0 mm × 22.0 mm × 102.0 mm (1.06 in × 0.87 in × 4.02 in)
	RPG FS-Z90	27.0 mm × 22.0 mm × 98 mm (1.06 in × 0.87 in × 3.86 in)
	RPG FS-Z110	27.0 mm × 22.0 mm × 96 mm (1.06 in × 0.87 in × 3,78 in)
	RPG FS-Z140	27.0 mm × 24.15 mm × ~94 mm (1.06 in × 0,95 in × 3.70 in)
	RPG FS-Z170	27.0 mm × 24.15 mm × ~85 mm (1.06 in × 0,95 in × 3.34 in)
	RPG FS-Z220	27.0 mm × 24.15 mm × ~84 mm (1.06 in × 0,95 in × 3.30 in)
	RPG FS-Z325	27.0 mm × 24.15 mm × ~73 mm (1.06 in × 0,95 in × 2.87 in)
Weight		190 g (meas.) 0.45 lb (meas.)

Ordering information

Designation	Type	Order No.
Harmonic mixers		
40 GHz to 60 GHz	RPG FS-Z60	1048.0171.02
50 GHz to 75 GHz	RPG FS-Z75	3638.2240.02
60 GHz to 90 GHz	RPG FS-Z90	3638.2270.02
75 GHz to 110 GHz	RPG FS-Z110	3638.2292.02
90 GHz to 140 GHz	RPG FS-Z140	3622.0708.02
110 GHz to 170 GHz	RPG FS-Z170	3622.0714.02
140 GHz to 220 GHz	RPG FS-Z220	3593.3250.02
220 GHz to 325 GHz	RPG FS-Z325	3593.3267.02
Recommended extras		
Cables		
Cable extension	R&S®HA-Z5M	1350.6660.02
Waveguide power splitters/combiners [1]		
50 GHz to 75 GHz	WPS 50-75	3656.9408.02
60 GHz to 90 GHz	WPS 60-90	3656.9489.02
Waveguide fixed attenuators [1]		
Waveguide tunable attenuators [1]		
60 GHz to 90 GHz	WTA 60-90	3624.4475.02
110 GHz to 170 GHz	WTA 110-170	3660.9667.02
140 GHz to 220 GHz	WTA 140-220	3593.3996.02
220 GHz to 325 GHz	WTA 220-330	3593.4005.02
260 GHz to 400 GHz	WTA 260-400	3665.7356.02
Waveguide to coaxial adapters [1]		
50 GHz to 75 GHz		
WR15 to 1 mm (f)	WCA75	3626.1044.02
WR15 to 1 mm (m)	WCA75	3626.1044.03
60 GHz to 90 GHz		
WR12 to 1 mm (f)	WCA90	3626.1050.02
WR12 to 1 mm (m)	WCA90	3626.1050.03
75 GHz to 110 GHz		
WR10 to 1 mm (f)	WCA110	3626.1067.02
WR10 to 1 mm (m)	WCA110	3626.1067.03
Waveguide Faraday isolators [1]		
50 GHz to 75 GHz	WFI 50-75	3660.4865.02
75 GHz to 110 GHz	WFI 75-110	3660.5384.02
Accredited calibration, for R&S®FS-Z60, R&S®FS-Z75, R&S®FS-Z90, R&S®FS-Z110	R&S®ACAFS-Z90	3598.1340.03

---

[1] For details refer to: www.radiometer-physics.de/products/mmwave-and-terahertz-products/passive-waveguide-components

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 accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	
Extended warranty with accredited calibration coverage, three years	R&S®AW3	
Extended warranty with accredited calibration coverage, four years	R&S®AW4	

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.

Extended warranty with accredited calibration (AW1 to AW4)
Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs [2] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

The RPG FS-Z60/-Z75/-Z90/-Z110 harmonic mixers are manufactured by Rohde & Schwarz:
Rohde & Schwarz GmbH & Co KG, Mühldorfstraße 15, 81671 München, Germany

The RPG FS-Z140/-Z170/-Z220/-Z325 harmonic mixers are manufactured for Rohde & Schwarz by:
RPG-Radiometer Physics GmbH, Werner-von-Siemens-Str. 4, 53340 Meckenheim, Germany

---

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

Rohde & Schwarz

The Rohde & Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test & measurement, technology systems and networks & cybersecurity. Founded more than 85 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

www.rohde-schwarz.com

Sustainable product design
► Environmental compatibility and eco-footprint
► Energy efficiency and low emissions
► Longevity and optimized total cost of ownership

Rohde & Schwarz training
www.training.rohde-schwarz.com

Rohde & Schwarz customer support
www.rohde-schwarz.com/support