R&S®SZM
FREQUENCY MULTIPLIER FAMILY

Specifications

Specifications
Version 02.00

ROHDE&SCHWARZ
Make ideas real

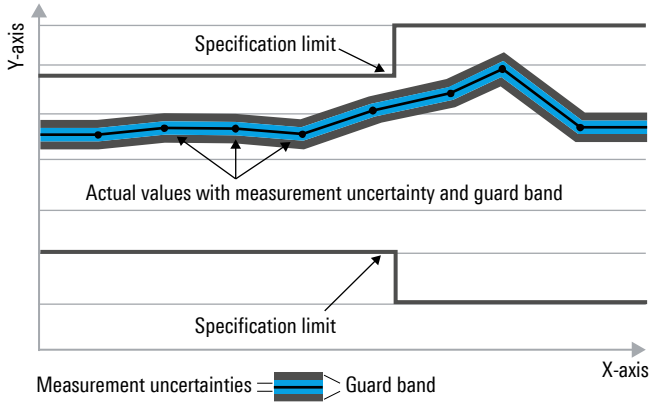
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours of storage at ambient temperature followed by 30 minutes of 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 R&S®SZM frequency multipliers are available for the following frequency bands:

- 50 GHz to 75 GHz (R&S®SZM75)
- 60 GHz to 90 GHz (R&S®SZM90)
- 75 GHz to 110 GHz (R&S®SZM110)
- 90 GHz to 140 GHz (R&S®SZM140)
- 110 GHz to 170 GHz (R&S®SZM170)

The R&S®SZM frequency multipliers include the following accessories:

- External DC power supply
- User manual
- Hex ball driver 3/32
- USB cable
- Waveguide flange screws and dowel pins (4 × UNC4-40 7.6; 4 × UNC4-40 9.24; 2 × IEEE dowel pins)
- USB flash drive with setting values for micrometer screw (if R&S®SZM is equipped with mechanically controlled attenuator)

The R&S®SZM frequency multipliers can be equipped with the following options:

	Mechanically controlled attenuator [1]	Electronically controlled attenuator [1, 2, 3]	High output power [3]	Isolator	Waveguide-to-waveguide adapter (test port adapter)
R&S®SZM75	●	●	●	●	●
R&S®SZM90	●	●	●	●	●
R&S®SZM110	●	●	–	●	●
R&S®SZM140	●	–	–	●	●
R&S®SZM170	●	–	–	●	●

● = installed, – = not installed

For the R&S®SZM controlled via USB by the R&S®SMA100B RF and microwave signal generator, the R&S®SMAB-K554 multiplier control option (1420.9884.02) must be installed on the R&S®SMA100B.

[1] Either a mechanically or an electronically controlled attenuator can be installed.

[2] The electronically controlled attenuator can be installed once or twice.

[3] If the high power option is installed, the electronically controlled attenuator can be installed only once.

Specifications

RF performance

Frequency

Output frequency range	R&S®SZM75	50 GHz to 75 GHz	
	R&S®SZM90	60 GHz to 90 GHz	
	R&S®SZM110	75 GHz to 110 GHz	
	R&S®SZM140	90 GHz to 140 GHz	
	R&S®SZM170	110 GHz to 170 GHz	
Input frequency range and multiplication factor	R&S®SZM75	12.50 GHz to 18.75 GHz	× 4
	R&S®SZM90	15.00 GHz to 22.50 GHz	× 4
	R&S®SZM110	18.75 GHz to 27.50 GHz	× 4
	R&S®SZM140	15.00 GHz to 23.33 GHz	× 6
	R&S®SZM170	13.75 GHz to 21.25 GHz	× 8
Waveguide designator	R&S®SZM75	WR-15	
	R&S®SZM90	WR-12	
	R&S®SZM110	WM-2540 (WR-10)	
	R&S®SZM140	WM-2032 (WR-8)	
	R&S®SZM170	WM-1651 (WR-6.5)	
Connector type (anti cocking flange)	R&S®SZM75	Rohde & Schwarz precision waveguide flange (compatible with UG-387/U-M and IEEE 1785.2)	
	R&S®SZM90		
	R&S®SZM110		
	R&S®SZM140		
	R&S®SZM170		

Level

Output				
R&S®SZM75 [4]	with R&S®SZM-B75I/-B75T options			
	–	–	–	> 9 dBm
	-B75H	–	–	> 20 dBm
	-B75H	-B75M	-	> 20 dBm
	-B75H	–	-B75E	> 18 dBm
	–	-B75M	–	> 9 dBm
	–	–	-B75E	> 7 dBm
	–	–	2 × -B75E	> 5 dBm
R&S®SZM90 [5]	with R&S®SZM-B90I/-B90T options			
	–	–	–	> 10 dBm
	-B90H	–	–	> 17 dBm
	-B90H	-B90M	–	> 17 dBm
	-B90H	–	-B90E	> 16 dBm
	–	-B90M	–	> 10 dBm
	–	–	-B90E	> 9 dBm
	–	–	2 × -B90E	> 7 dBm
R&S®SZM110 [6]	with R&S®SZM-B110I/-B110T options			
75 GHz to ≤ 90 GHz	–	–	–	> 14 dBm
> 90 GHz to 110 GHz				> 12 dBm
75 GHz to ≤ 90 GHz	–	-B110M	–	> 14 dBm
> 90 GHz to 110 GHz				> 12 dBm
75 GHz to ≤ 90 GHz	–	–	-B110E	> 12 dBm
> 90 GHz to 110 GHz				> 10 dBm
75 GHz to ≤ 90 GHz	–	–	2 × -B110E	> 10 dBm
> 90 GHz to 110 GHz				> 8 dBm
R&S®SZM140 [7]	with R&S®SZM-B140I/-B140T options			
	–	–	–	> 8 dBm
	–	-B140M	–	> 7 dBm
R&S®SZM170 [8]	with R&S®SZM-B170I/-B170T options			
	–	–	–	> 6 dBm
	–	-B170M	–	> 6 dBm

Maximum attenuation of mechanically controlled attenuator	R&S®SZM75 with R&S®SZM-B75M	40 dB
	R&S®SZM90 with R&S®SZM-B90M	40 dB
	R&S®SZM110 with R&S®SZM-B110M	40 dB
	R&S®SZM140 with R&S®SZM-B140M	40 dB
	R&S®SZM170 with R&S®SZM-B170M	40 dB
Maximum attenuation of electronically controlled attenuator	R&S®SZM75 with R&S®SZM-B75E [9]	15 dB or 30 dB
	R&S®SZM90 with R&S®SZM-B90E [9]	15 dB or 30 dB
	R&S®SZM110 with R&S®SZM-B110E [9]	15 dB or 30 dB
Level uncertainty	Specifications are measured with 7 dBm input power, specified level range depends on instrument configuration.	
	> –5 dBm	< 2 dB, < 1.5 dB (typ.)
	–5 dBm to > –25 dBm	< 2.5 dB (typ.)

Input		
Input power level for specified output power level		+6.7 dBm to +7.3 dBm
Input power damage level		> +10 dBm
Input connector type		2.92 mm, female

[4] Output power is reduced with R&S®SZM-B75T by 0.2 dB (typ.) and with R&S®SZM-B75I by 0.8 dB (typ.).

[5] Output power is reduced with R&S®SZM-B90T by 0.2 dB (typ.) and with R&S®SZM-B90I by 1 dB (typ.).

[6] Output power is reduced with R&S®SZM-B110T by 0.2 dB (typ.) and with R&S®SZM-B110I by 1 dB (typ.).

[7] Output power is reduced with R&S®SZM-B140T by 0.3 dB (typ.) and with R&S®SZM-B140I by 1.3 dB (typ.).

[8] Output power is reduced with R&S®SZM-B170T by 0.4 dB (typ.) and with R&S®SZM-B170I by 1.5 dB (typ.).

[9] The electronically controlled attenuator can be installed once or twice. If the high power option is installed, the electronically controlled attenuator can be installed only once.

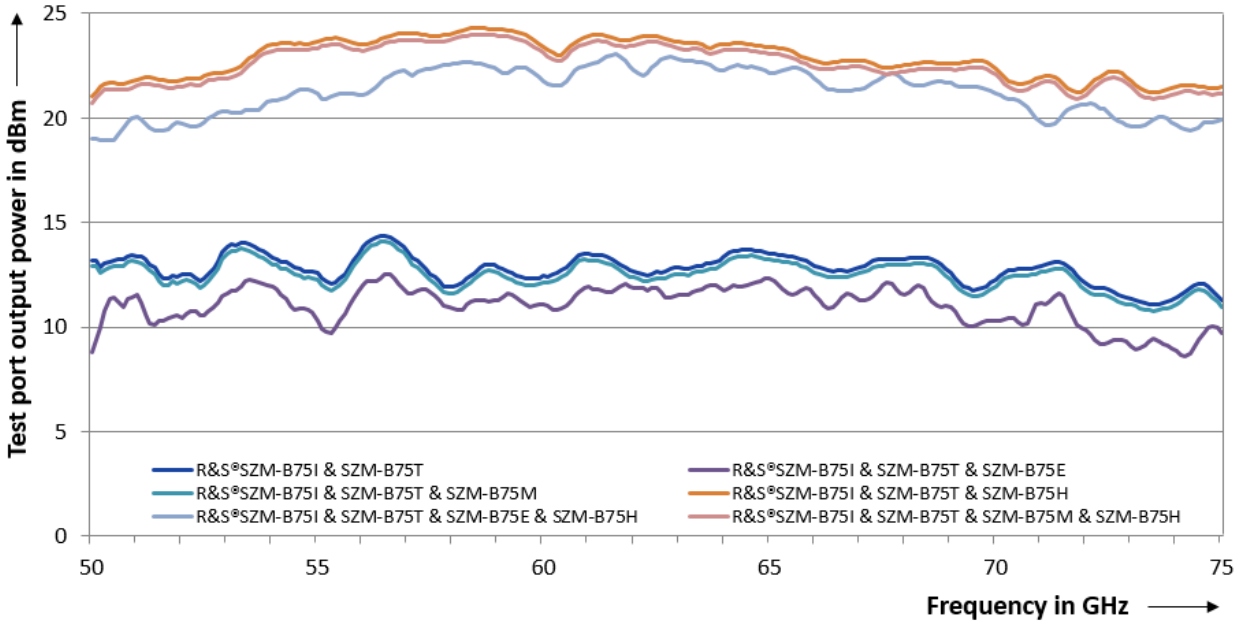
VSWR

RF port		
R&S®SZM75	with R&S®SZM-B75I	< 1.5 (typ.)
R&S®SZM90	with R&S®SZM-B90I	
R&S®SZM110	with R&S®SZM-B110I	
R&S®SZM140	with R&S®SZM-B140I	
R&S®SZM170	with R&S®SZM-B170I	

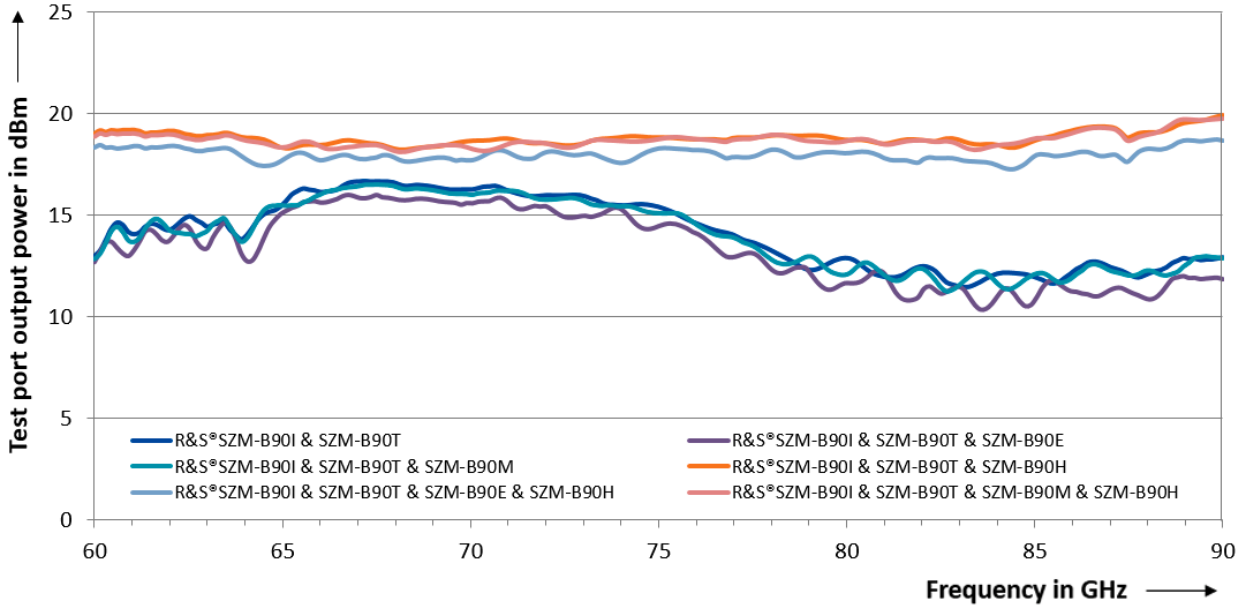
Spectral purity

Subharmonics (in-band)		
R&S®SZM75	50 GHz to < 51 GHz	< –18 dBc (typ.)
	51 GHz to 75 GHz	< –25 dBc (typ.)
R&S®SZM90	60 GHz to < 61 GHz	< –10 dBc (typ.)
	61 GHz to < 65 GHz	< –20 dBc (typ.)
	65 GHz to 90 GHz	< –25 dBc (typ.)
R&S®SZM110		< –25 dBc (typ.)
R&S®SZM140	90 GHz to 100 GHz	< –12 dBc (typ.)
	> 100 GHz to < 135 GHz	< –20 dBc (typ.)
	135 GHz to 140 GHz	< –12 dBc (typ.)
R&S®SZM170	110 GHz to 118 GHz	< –10 dBc (typ.)
	> 118 GHz to 125 GHz	< –15 dBc (typ.)
	> 125 GHz to 168 GHz	< –30 dBc (typ.)
	> 168 GHz to 170 GHz	< –20 dBc (typ.)

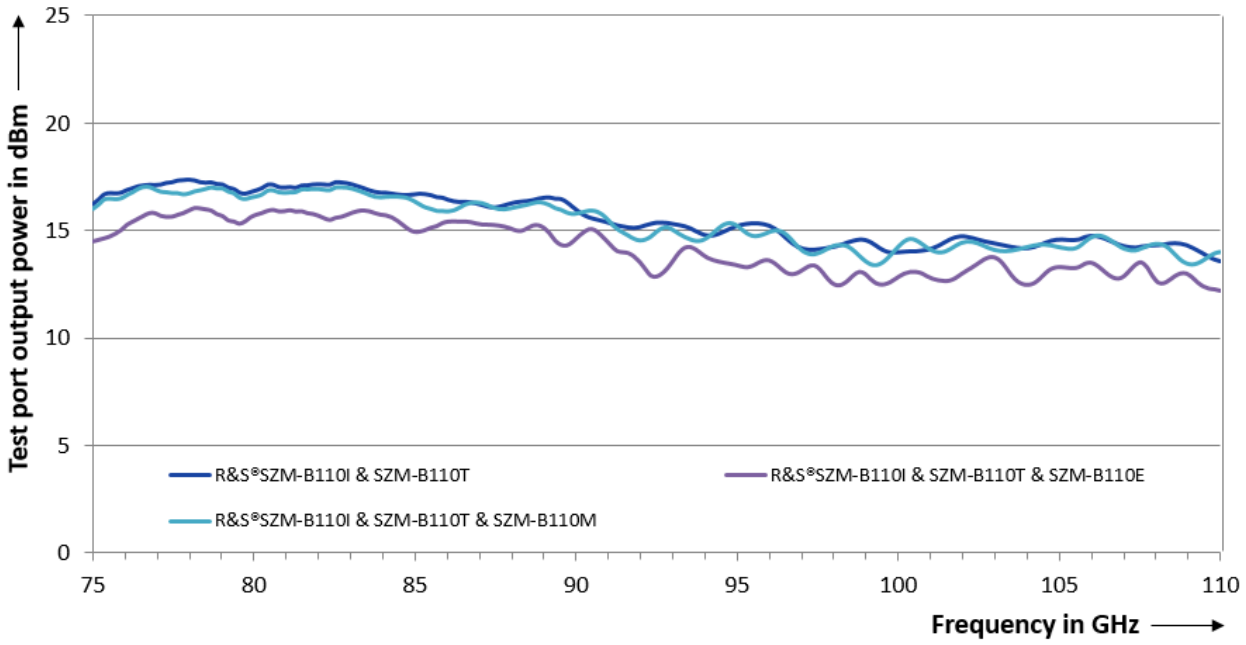
Output power plots



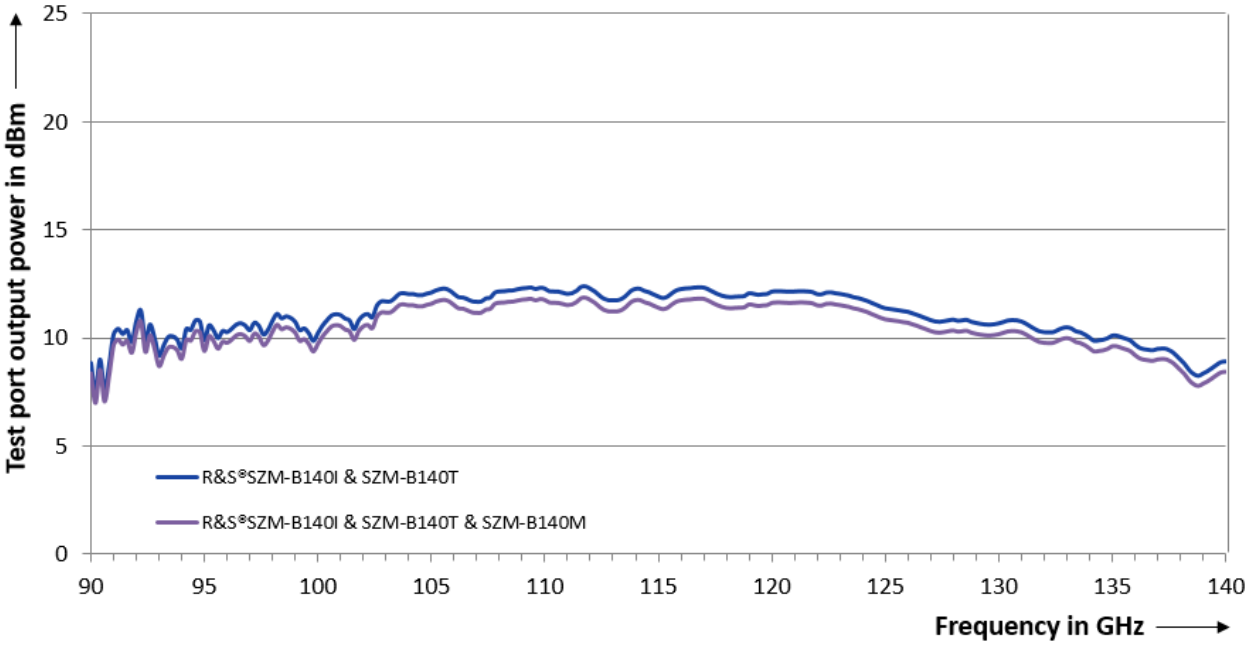
Typical output power of the R&S®SZM75



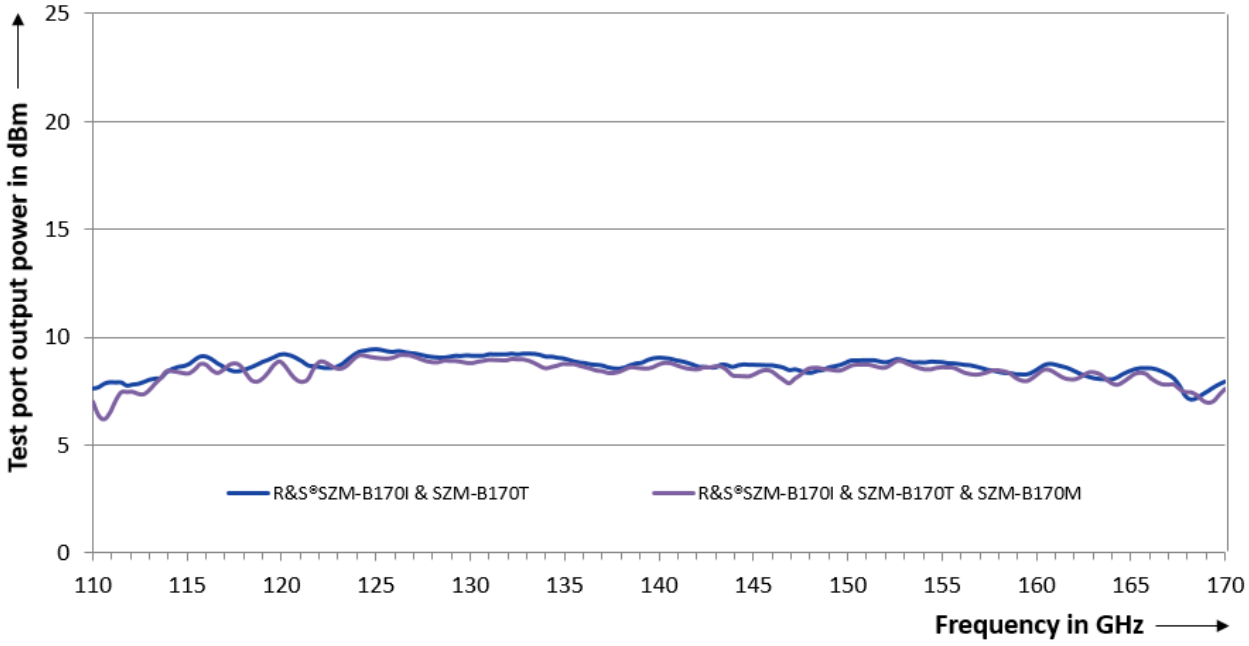
Typical output power of the R&S®SZM90



Typical output power of the R&S®SZM110



Typical output power of the R&S®SZM140



Typical output power of the R&S®SZM170

General data

DC power adapter		
AC input voltage range		100 V to 240 V (± 10 %)
AC supply frequency		50 Hz to 60 Hz (– 6 %/+ 5 %)
Connector type		DC barrel (m)
Power consumption	R&S®SZM75	10 W
	R&S®SZM90	10 W
	R&S®SZM110	10 W
	R&S®SZM140	6 W
	R&S®SZM170	12 W
Other adapters		
USB		universal serial bus (USB), type B
EMC		
Electromagnetic compatibility	EU: in line with EMC Directive 2014/30EC, UK: in line with Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091)	applied harmonized standards: • EN 61326-1 (industrial environment) • EN 55011 (class 1)
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	8 Hz to 500 Hz, acceleration: 1.2 g RMS, in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810, method 516, procedure I
Restriction of the use of hazardous substances in electrical and electronic equipment	EU: in line with RoHS Directive 2011/65/EC, UK: in line with Electrical and Electronic Equipment Regulations 2012 (S.I. 2012/3032)	applied harmonized standard: EN IEC 63000
Environmental conditions		
Temperature range	specified temperature range	+18 °C to +28 °C
	with R&S®SZM-B75E/-B90E/-B110E	+23 °C to +28 °C
	operating temperature range	+5 °C to +40 °C
	storage temperature range	–40 °C to +70 °C
Operation	permissible altitude	
	R&S®SZM	3000 m above sea level
	power supply	2000 m above sea level
Dimensions and weight		
Chassis dimensions (W × H × D)	without feet and feet-mount, without TPA	90 mm × 60 mm × 180 mm (3.54 in × 2.36 in × 7.09 in)
Full dimensions (W × H × D)	with feet and feet-mount, with waveguide	130 mm × 73 mm × 195 mm (5.12 in × 2.87 in × 7.68 in)
Number of feet		4
Feet height	user-adjustable	12.1 mm to 18.1 mm (0.48 in to 0.71 in)
Weight		2 kg (5 lb)
Shipping weight		5 kg (11 lb)
Calibration interval		
Recommended calibration interval	operation 40 h/week in the full range of the specified environmental conditions	3 years

Ordering information

Designation	Type	Order No.
Base unit		
Frequency multiplier, 50 GHz to 75 GHz	R&S®SZM75	1443.5004.02
Frequency multiplier, 60 GHz to 90 GHz	R&S®SZM90	1443.5104.02
Frequency multiplier, 75 GHz to 110 GHz	R&S®SZM110	1443.5204.02
Frequency multiplier, 90 GHz to 140 GHz	R&S®SZM140	1443.5304.02
Frequency multiplier, 110 GHz to 170 GHz	R&S®SZM170	1443.5404.02
Including DC power supply, user manual, USB cable, USB flash drive with setting values for micrometer screw (if R&S®SZM is equipped with mechanically controlled attenuator), hex ball driver 3/32, 4 × UNC4-40 7.6, 4 × UNC 4-40 9.24, 2 × IEEE dowel pins		
Hardware options		
R&S®SZM75		
Mechanically controlled attenuator	R&S®SZM-B75M	1443.5027.02
Electronically controlled attenuator	R&S®SZM-B75E	1443.5010.02
High output power	R&S®SZM-B75H	1443.5056.02
Isolator	R&S®SZM-B75I	1443.5040.02
Test port adapter, 40 mm	R&S®SZM-B75T	1443.5033.02
R&S®SZM90		
Mechanically controlled attenuator	R&S®SZM-B90M	1443.5127.02
Electronically controlled attenuator	R&S®SZM-B90E	1443.5110.02
High output power	R&S®SZM-B90H	1443.5156.02
Isolator	R&S®SZM-B90I	1443.5140.02
Test port adapter, 40 mm	R&S®SZM-B90T	1443.5133.02
R&S®SZM110		
Mechanically controlled attenuator	R&S®SZM-B110M	1443.5227.02
Electronically controlled attenuator	R&S®SZM-B110E	1443.5210.02
Isolator	R&S®SZM-B110I	1443.5240.02
Test port adapter, 40 mm	R&S®SZM-B110T	1443.5233.02
R&S®SZM140		
Mechanically controlled attenuator	R&S®SZM-B140M	1443.5327.02
Isolator	R&S®SZM-B140I	1443.5340.02
Test port adapter, 40 mm	R&S®SZM-B140T	1443.5333.02
R&S®SZM170		
Mechanically controlled attenuator	R&S®SZM-B170M	1443.5427.02
Isolator	R&S®SZM-B170I	1443.5440.02
Test port adapter, 40 mm	R&S®SZM-B170T	1443.5433.02
Recommended extras		
R&S®SZM control via USB by the R&S®SMA100B RF and microwave signal generator	R&S®SMAB-K554	1420.9884.02
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	R&S®ZCTW	1175.2014.02
Hex ball driver 3/32		1307.8670.00
Coaxial cable with K connectors, 50 Ω, length: 1.0 m		1348.3850.00

Warranty and service

Warranty		
Base unit		1 year
All other items		1 year
Service options		
	Service plans	**On demand**
Calibration	up to five years [10]	pay per calibration
Warranty and repair	up to five years [10]	standard price repair
Contact your Rohde & Schwarz sales office for further details.		

[10] For extended periods, contact your Rohde & Schwarz sales office.

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

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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

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