

SPINNER

Ruggedized Test Port Adapters



Lower Friction - Higher Precision
Protect Your VNA Measurement Port



HIGH FREQUENCY PERFORMANCE WORLDWIDE
spinner-group.com



The SPINNER Group

For more than 75 years, the SPINNER Group has been setting new standards worldwide in high-frequency technology. Based in Munich with production facilities in Germany, Hungary and China, SPINNER currently has over 900 employees. Our international network of subsidiaries and distributors supports customers in over 40 countries.



TEST & MEASUREMENT



COMMUNICATION



BROADCAST



SATCOM/SPACE



WIND ENERGY



INDUSTRY



SUBSEA/OFFSHORE

RF Measurement

These days, up-to-date measurement equipment is essential for all development, production, testing and quality control departments that deal with RF signals on coaxial lines. Particularly for vector network analyzers, high-precision connectors, terminations, and adapters are a must.

The same statement applies to calibration kits and mechanical accessories such as gauges for checking mating face dimensions or torque wrenches for tightening coupling nuts. In all of these cases, SPINNER has established new, extremely high standards of precision which most users would not want to do without.

Precisely measured values are especially important when transmitting high power levels. Other major applications

include extensive testing of mobile communications systems such as LTE and 5G or 6G and wireless data transmission, e.g. via WiMAX, Wi-Fi and RFID.

SPINNER supplies coaxial measurement equipment of outstanding electrical and mechanical quality for use at frequencies up to 165 GHz.

Coaxial and Waveguide Measurement Devices

Coaxial & waveguide measurement devices made by SPINNER are needed for:

VNA / S-Parameter Measurement

- Calibration and verification standards
- Air lines
- Rotary joints
- Articulated lines
- Adapters
- Connector gauges

Millimeter Wave Measurement

- Ruggedized test port adapters
- mmWave waveguide-to-coaxial adapters
- 1.35 mm E Connector
- EasyLaunch PCB connectors
- EasySnake flexible dielectric waveguides
- Connectivity solutions for RF anechoic chambers

PIM Measurement and Test Automation

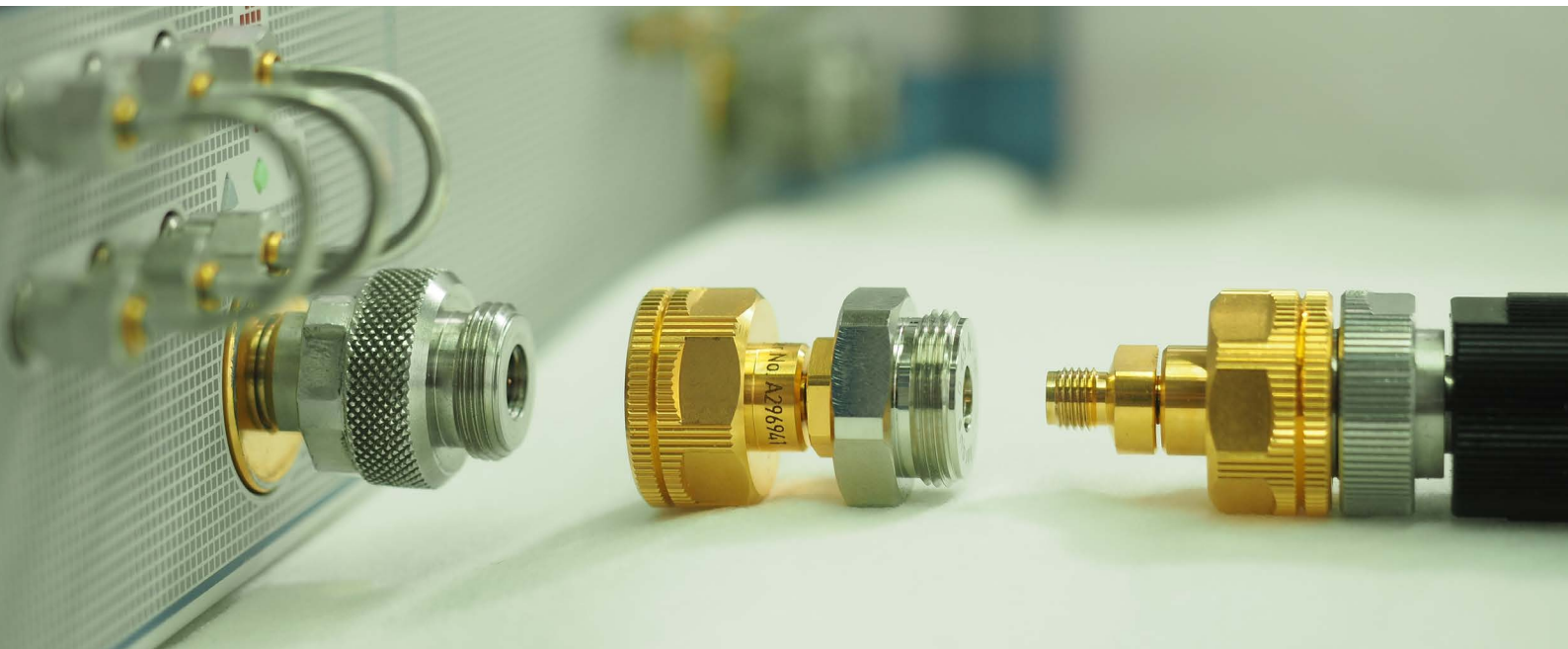
- EasyDock push-pull adapters
- Low PIM switches
- Low PIM test cables
- Low PIM rotary joints
- Low PIM loads
- Low PIM passive intermodulation standards



Connectivity Solutions for RF Anechoic Chambers

- Ruggedized test port adapters
- mmWave waveguide-to-coaxial adapters
- Panel feedthroughs
- Articulated lines
- EasySnake flexible dielectric waveguides
- Rotary joints

SPINNER Precision Ruggedized Test Port Adapters: Reduce Down Times and Costs!



Who isn't familiar with the situation? You need to measure something but discover that the last user failed to fix a defective port on the testing device. The outer thread is damaged, preventing you from properly attaching the test cable.

When a vector network analyzer, for example, is suddenly not available it can have expensive consequences. And repair costs are only part of the problem. The whole project can be at risk of running over budget because of the costs for renting and/or shipping a replacement, among other things.

The new high-precision ruggedized test port adapters from SPINNER – also known as port replicators, sacrificial adapters or throwaway connectors – effectively protect ports on your test equipment from accidental damage and wear.

You can greatly extend the useful life of your test equipment's integrated ports by repeatedly connecting and disconnecting cables at a sacrificial connector instead.

This also significantly extends the equipment's projected service life. Maintenance and servicing intervals can be extended and failures and repairs avoided. The risk of falling behind schedule on projects is minimized, and you can concentrate more effectively on finishing the work in time for a new product's planned market launch date.

- Usable on all network analyzers
- Effectively protects test ports from wear and damage
- Reduces OPEX by preventing downtimes and repairs
- Consistently dependable test results
- Allows the use of standard test cables
- Available for in-type and within-type 3.5 mm, 2.92 mm, 2.4 mm, 1.85 mm, 1.35 mm, and 1.0 mm precision coaxial connectors
- Adapters for 50 to 75 ohms

What is a “Ruggedized” Connector?



A ruggedized connector has an extra-large thread body to stabilize the test cable when connecting it to the test port of an RF measurement device. It surrounds and protects the sensitive coaxial connector that transmits RF signals by minimizing the potentially damaging axial and radial forces that the port is subjected to.

Another commonly used expression is “NMD plug connector”. NMD stands for “network measurement division”, a reference to the original Hewlett Packard department (now called Keysight) that used to make network analyzers.

These connectors also let you directly attach an appropriate precision coaxial plug with standard thread.

Lower Friction, Higher Precision!

An additional ball bearing in the coupling nut of the SPINNER ruggedized test port adapter prevents direct friction of the outer conductor. This prevents metal dust

from being created where the coupling nut and outer conductor meet and stops undesirable twisting of the outer conductor when tightening the coupling nut in some pairings. Rotational stability is consistently ensured, and no dust or other debris is constantly ground into the opposite connector.

The advantages of these new precision adapters from SPINNER are as clear as day!

Features



- ✓ Ruggedized versions are available for combining with all popular standard coaxial connectors.
=> **Fewer adapters needed in the lab**



- ✓ The outer conductor can't be accidentally twisted.
=> **Guaranteed rotational stability**



- ✓ The outer conductor or coupling nut can't abrade, preventing metal dust from being ground into the contact surfaces.
=> **The test port stays like new**



- ✓ Ceramic ball bearings reduce the test port adapter's thermal conductivity.
=> **Less temperature drift of the test equipment from the objects being measured**



- ✓ Excellent phase and amplitude stability
=> **Lastingly reliable and reproducible test results**



- ✓ The robust design reduces externally applied forces.
=> **Ideal protection of sensitive test ports**



- ✓ Ruggedized test port adapter from 50 to 75 ohms available
=> **Simplified test setup for transmission equipment**

Overview

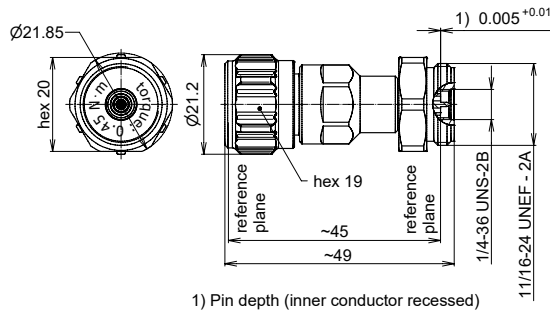
SPINNER offers ruggedized test port adapters for 1.00 / 1.35 / 1.85 / 2.4 / 2.92 and 3.5 mm coaxial interfaces in a wide variety of versions – besides standard coaxial series, now also for our waveguide series for the V, E, W, and F bands.

SPINNER is replacing the older terms “NDM” and “ruggedized” with the abbreviation “RUG-“, which is prefixed to the names of coaxial connectors. The adapter designations used in this brochure don’t follow the usual approach of proceeding from large to smaller interfaces, but following the functionality from VNA to DUT. The robust VNA connector is therefore named first with the exception of the transition for the VNA with type Nmale port..

50 Ohm and 50 Ohm to 75 Ohm

Interface 1 (VNA Port)	Interface 2 / Size (to DUT)	SPINNER article no. Interface 2 / Gender				
		Waveguide	RUG male	RUG female	male	female
Type N male	2.4 mm		BN 535115			
	3.5 mm		BN 535116			
RUG-3.5 mm female	Type N				BN 535108	
	Type N75				BN 876790	BN 876793
	3.5 mm				BN 535120	BN 535119
RUG-3.5 mm male	3.5 mm				BN 535124	BN 535123
RUG-2.4 mm female	Type N				BN 535107	
	3.5 mm		BN 535111		BN 535106	BN 535104
	2.92 mm		BN 535110		BN 535105	BN 535103
	2.4 mm				BN 535118	BN 535117
RUG-1.85 mm female	Type N				BN 535102	BN 534998
	2.2-5 mm				BN 535101	BN 534997
	NEX10®				BN 535100	BN 534996
	3.5 mm		BN 535114			BN 534995
	2.92 mm		BN 535113			BN 534994
	2.4 mm		BN 535112			BN 534993
	1.85 mm		BN 534991			BN 534992
1.35 mm				BN 535122	BN 535121	
RUG-1.35 mm female	R 620 (WR 15)	BN 533153				
	R 740 (WR 12)	BN 533152				
	R 900 (WR 10)	BN 533151				
RUG-1.0 mm female	1.35 mm		BN 534974			BN 534975
	1.0 mm			BN 535128	BN 535127	BN 535129
	R 620 (WR 15)	BN 533143				
	R 740 (WR 12)	BN 533142				
	R 900 (WR 10)	BN 533141				
	R 1.2k (WR 8)	BN 533140				
RUG-1.0 mm male	1.0 mm				BN 534976	
	R 620 (WR 15)	BN 533163			BN 535126*	
	R 740 (WR 12)	BN 533162				
	R 900 (WR 10)	BN 533161				

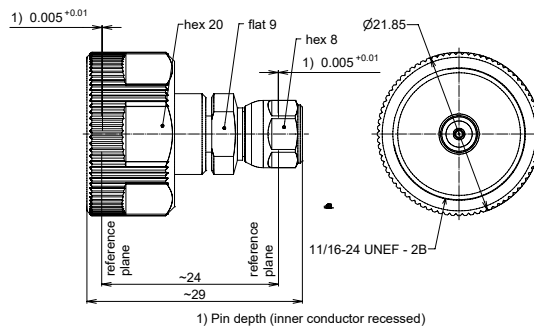
RUG-3.5 mm Precision Inter-Type Test Port Adapters



1) Pin depth (inner conductor recessed)

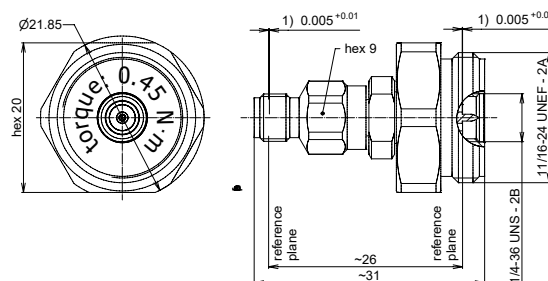
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535116	Type N male	RUG 3.5 mm male	DC to 18 GHz	38 dB @ DC to 2 GHz
BN 535108	RUG-3.5 mm female	Type N male		34 dB @ 2 to 6 GHz
				28 dB @ 6 to 12 GHz
				23 dB @ 12 to 18 GHz

RUG-3.5 mm Precision Within-Type Test Port Adapters



1) Pin depth (inner conductor recessed)

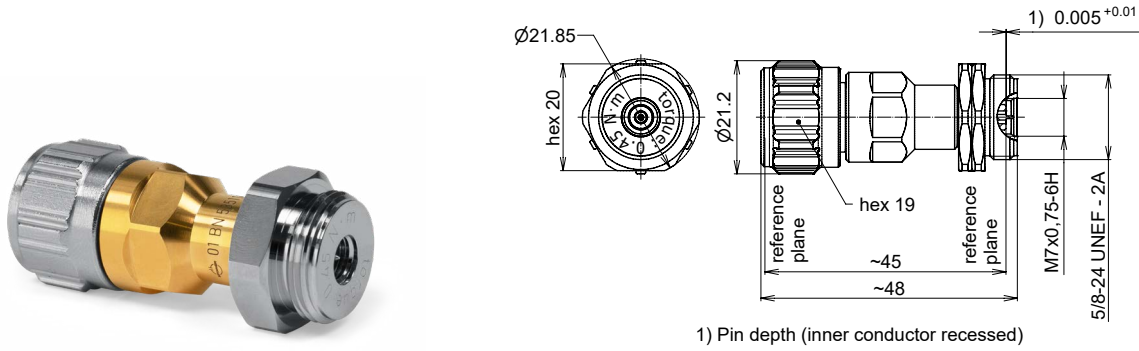
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535119	RUG-3.5 mm female	3.5 mm female	DC to 33 GHz	34 dB @ DC to 4 GHz
BN 535120		3.5 mm male		30 dB @ 4 to 26.5 GHz
				26 dB @ 26.5 to 33 GHz



1) Pin depth (inner conductor recessed)

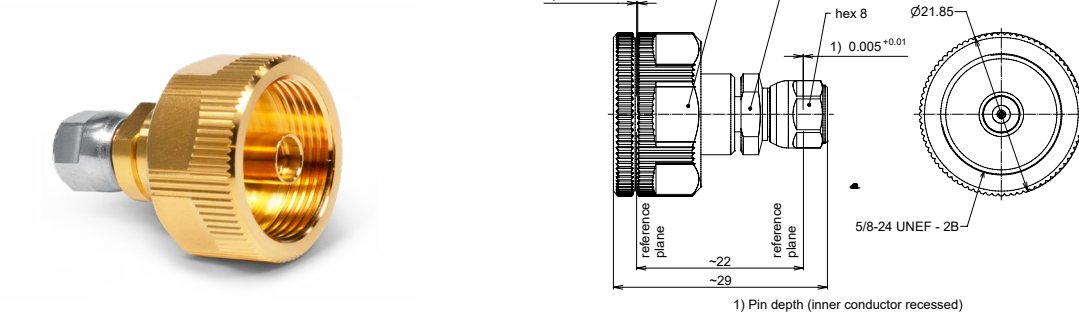
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535123	RUG-3.5 mm male	3.5 mm female	DC to 33 GHz	34 dB @ DC to 4 GHz
BN 535124		3.5 mm male		30 dB @ 4 to 26.5 GHz
				26 dB @ 26.5 to 33 GHz

RUG-2.4 mm Precision Inter-Type Test Port Adapters



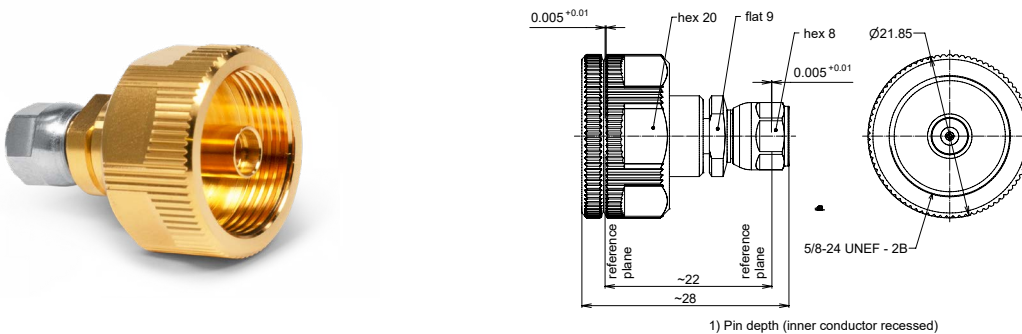
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535115	Type N male	RUG-2.4 mm male	DC to 18 GHz	38 dB @ DC to 2 GHz
BN 535107	RUG-2.4 mm female	Type N male		34 dB @ 2 to 6 GHz
BN 535111		RUG-3.5 mm male	28 dB @ 6 to 12 GHz	
BN 535110		RUG-2.92 mm male	23 dB @ 12 to 18 GHz	
			DC to 32 GHz	32 dB @ DC to 4 GHz
			DC to 44 GHz	28 dB @ 4 to 18 GHz
				23 dB @ 18 to 32 GHz
				20 dB @ 32 to 44 GHz

RUG-2.4 mm Precision Inter-Type Test Port Adapters



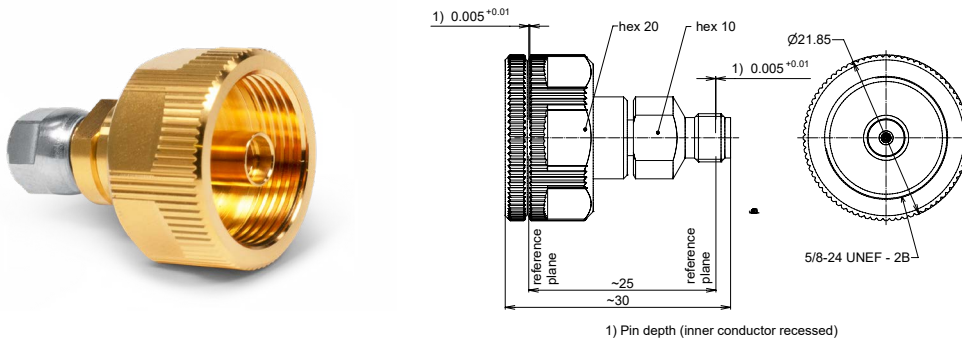
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535106	RUG-2.4 mm female	3.5 mm male	DC to 33 GHz	33 dB @ DC to 4 GHz
BN 535104		3.5 mm female		30 dB @ 4 to 18 GHz
BN 535105		2.92 mm male	DC to 44 GHz	26 dB @ 18 to 26.5 GHz
BN 535103		2.92 mm female		23 dB @ 26.5 to 33 GHz
				32 dB @ DC to 4 GHz
				28 dB @ 4 to 18 GHz
				23 dB @ 18 to 32 GHz
				20 dB @ 32 to 44 GHz

RUG-2.4 mm Precision Within-Type Test Port Adapters



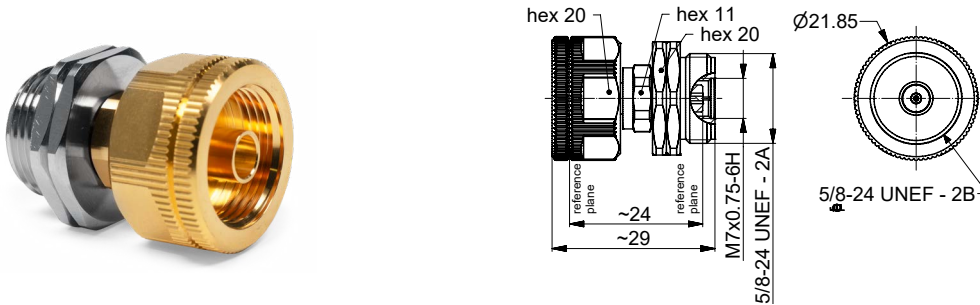
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535118	RUG-2.4 mm female	2.4 mm male	DC to 50 GHz	32 dB @ DC to 4 GHz
BN 535117		2.4 mm female		30 dB @ 4 to 10 GHz
				25 dB @ 10 to 26.5 GHz
				23 dB @ 26.5 to 40 GHz
				20 dB @ 40 to 50 GHz

RUG-1.85 mm Precision Inter-Type Test Port Adapters



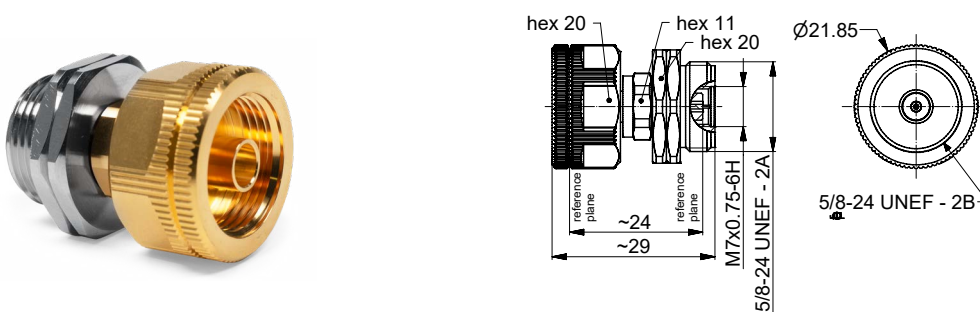
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535102	RUG-1.85 mm female	Type N male	DC to 18 GHz	38 dB @ DC to 2 GHz
BN 534998		Type N female		34 dB @ 2 to 6 GHz
BN 535101		2.2-5 male	DC to 20 GHz	28 dB @ 6 to 12 GHz
BN 534997		2.2-5 female		23 dB @ 12 to 18 GHz
BN 535100		NEX10® male		40 dB @ DC to 2 GHz
BN 534996		NEX10® female		34 dB @ 2 to 6 GHz
BN 534995		3.5 mm female	DC to 33 GHz	28 dB @ 6 to 12 GHz
BN 534994		2.92 mm female		25 dB @ 12 to 20 GHz
BN 534993		2.4 mm female	DC to 50 GHz	33 dB @ DC to 4 GHz
BN 535122		1.35 mm male		30 dB @ 4 to 18 GHz
BN 535121		1.35 mm female	DC to 70 GHz	26 dB @ 18 to 26.5 GHz
				23 dB @ 26.5 to 33 GHz
				32 dB @ DC to 4 GHz
				20 dB @ 4 to 18 GHz
			17 dB @ 18 to 26.5 GHz	
			14 dB @ 32 to 44 GHz	
			32 dB @ DC to 4 GHz	
			28 dB @ 4 to 18 GHz	
			23 dB @ 18 to 32 GHz	
			20 dB @ 32 to 44 GHz	
			18 dB @ 44 to 50 GHz	
			28 dB @ DC to 20 GHz	
			20 dB @ 20 to 50 GHz	
			17 dB @ 50 to 70 GHz	

RUG-1.85 mm Precision Inter-Type Test Port Adapters



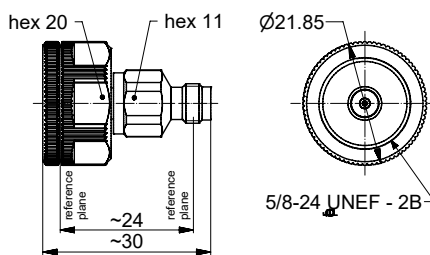
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535114	RUG-1.85 mm female	RUG-3.5 mm male	DC to 32 GHz	32 dB @ DC to 4 GHz 28 dB @ 4 to 18 GHz 23 dB @ 18 to 32 GHz
BN 535113		RUG-2.92 mm male	DC to 44 GHz	32 dB @ DC to 4 GHz 28 dB @ 4 to 18 GHz 23 dB @ 18 to 32 GHz 20 dB @ 32 to 44 GHz
BN 535112		RUG-2.4 mm male	DC to 50 GHz	32 dB @ DC to 4 GHz 28 dB @ 4 to 18 GHz 23 dB @ 18 to 32 GHz 20 dB @ 32 to 50 GHz

RUG-1.85 mm Precision Within-Type Test Port Adapter



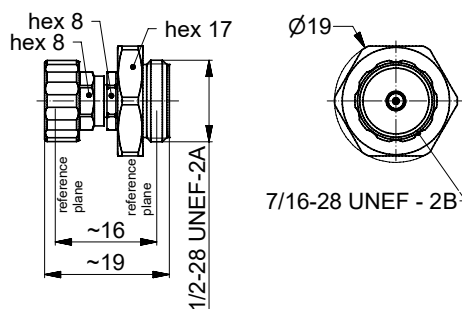
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 534991	RUG-1.85 mm male	RUG-1.85 mm female	DC to 70 GHz	32 dB @ DC to 4 GHz 30 dB @ 4 to 26.5 GHz 25 dB @ 26.5 to 40 GHz 23 dB @ 40 to 67 GHz 21 dB @ 67 to 70 GHz

RUG-1.85 mm Precision Within-Type Test Port Adapter

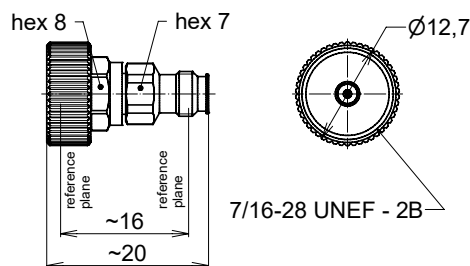


Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 534992	RUG-1.85 mm female	1.85 mm female	DC to 70 GHz	32 dB @ DC to 4 GHz 30 dB @ 4 to 26.5 GHz 25 dB @ 26.5 to 40 GHz 23 dB @ 40 to 67 GHz 21 dB @ 67 to 70 GHz

RUG-1.0 mm Precision Inter-Type Test Port Adapters



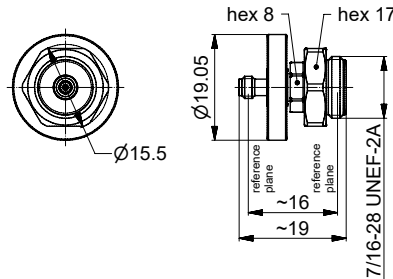
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 534974	RUG-1.0 mm female	RUG-1.35 mm male	DC to 90 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 70 GHz 14 dB @ 70 to 90 GHz



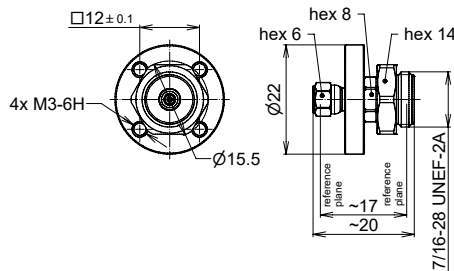
Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 534975	RUG-1.0 mm female	1.35 mm male	DC to 90 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 70 GHz 14 dB @ 70 to 90 GHz

RUG-1.0 mm Precision Within-Type Test Port Adapters

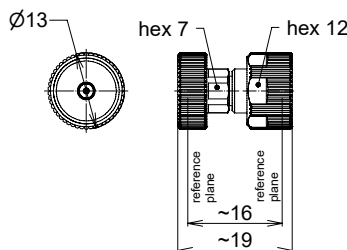
- Full bandwidth
- amongst others especially suitable to ANRITSU VNA broadband millimeter-wave module with “Adapter Mounting Bracket” to stabilize the sophisticated coaxial 1.00 mm test port



Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 534976	RUG-1.0 mm female	1.0 mm female	DC to 110 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 70 GHz 14 dB @ 70 to 110 GHz



Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535126	RUG-1.0 mm male	1.0 mm male 4-hole-flange	DC to 110 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 70 GHz 14 dB @ 70 to 110 GHz
BN 535127	RUG-1.0 mm female	1.0 mm male		
BN 535129		1.0 mm female		



Part Number	Interface type A	Interface type B	Frequency range	Return loss, min.
BN 535128	RUG-1.0 mm female	RUG-1.0 mm female	DC to 110 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 70 GHz 14 dB @ 70 to 90 GHz 12 dB @ 90 to 110 GHz

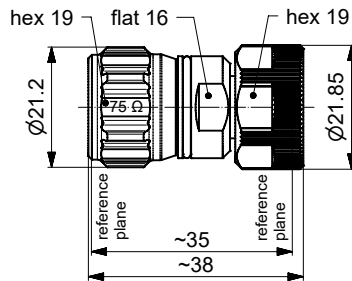
RUG-3.5 mm Precision Inter-Type Test Port Adapters, 50 to 75 Ohm

75 Ohm systems can be measured with a 50 Ohm Vector Network Analyzer using a 75 Ohm calibration kit and a proper unmatched mechanical adapter from 75 Ohm to 50 Ohm to avoid any damage on the inner conductor system.

For frequencies up to 20 GHz, which need be measured on a 26.5 GHz VNA with a ruggedized 3.5 mm test port, SPINNER provides a unique adapter from N 75 Ohm to ruggedized 3.5 mm male and female.

N 75 Ohm is a 75 Ohm interface not intermateable with Type N 50 Ohms versions.

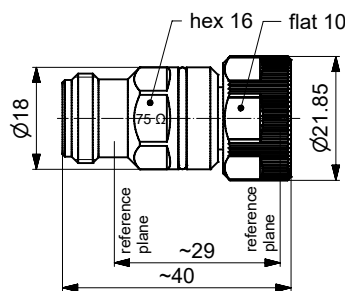
Please find details regarding the test setup 50 / 75 Ohm in our TD-00178 “Direct Access Units”



Precision interface with

- For frequencies from DC to 20 GHz
- Well-defined reference plane
- Maximized return losses
- High connector repeatability (min. 45 dB)
- Suitable for precision measurement of S-parameters
- Impedance 50 Ohm / 75 Ohm unmatched
- 3.5 mm interface is designed as a ruggedized version

Part Number	Interface type A	Interface type B	Frequency range
BN 876790	RUG-3.5 mm female (50 Ohm)	Type N male 75 Ohm	DC to 20 GHz



Part Number	Interface type A	Interface type B	Frequency range
BN 876793	RUG-3.5 mm female (50 Ohm)	Type N female 75 Ohm	DC to 20 GHz

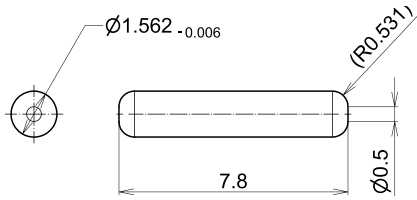
Precision Inter-Type mmW Waveguide-to-Coaxial-Adapters

1.0 mm and 1.35 mm Ruggedized

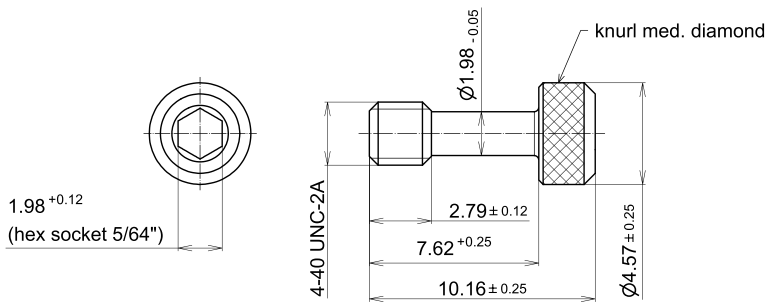


Part Number	Style	Description	Frequency range	Return loss
BN 533140	In-line	Precision waveguide-to-coaxial adapter R 1.2k (WR 8) to RUG-1.00 mm female	90 to 120 GHz	≥ 10 dB
BN 533141	In-line	Precision waveguide-to-coaxial adapter R 900 (WR 10) to RUG-1.00 mm female	Full W band	≥ 16 dB
BN 533142	In-line	Precision waveguide-to-coaxial adapter R 740 (WR 12) to RUG-1.00 mm female	Full E band	≥ 16 dB
BN 533143	In-line	Precision waveguide-to-coaxial adapter R 620 (WR 15) to RUG-1.00 mm female	Full V band	≥ 16 dB
BN 533161	In-line	Precision waveguide-to-coaxial adapter R 900 (WR 10) to RUG-1.00 mm male	Full W band	≥ 16 dB
BN 533162	In-line	Precision waveguide-to-coaxial adapter R 740 (WR 12) to RUG-1.00 mm male	Full E band	≥ 16 dB
BN 533163	In-line	Precision waveguide-to-coaxial adapter R 620 (WR 15) to RUG-1.00 mm male	Full V band	≥ 16 dB
BN 533151	In-line	Precision waveguide-to-coaxial adapter R 900 (WR 10) to RUG-1.35 mm female	75 to 90 GHz	≥ 16 dB
BN 533152	In-line	Precision waveguide-to-coaxial adapter R 740 (WR 12) to RUG-1.35 mm female	Full E band	≥ 16 dB
BN 533153	In-line	Precision waveguide-to-coaxial adapter R 620 (WR 15) to RUG-1.35 mm female	Full V band	≥ 16 dB

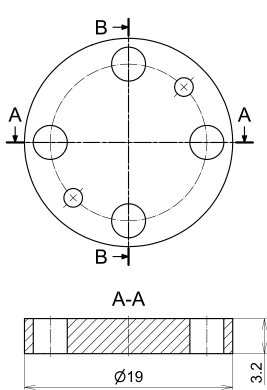
Accessories for mmW Waveguide-to-Coaxial Adapters



Part Number	Description
A61785	Aligning pin

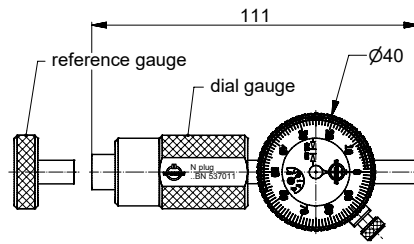


Part Number	Description
A61786	Socket-head cap screws 4-40 UNC



Part Number	Description
A62935	Protective cap

Dial Gauges



- Designed to properly gage the contact pin locations and pin depth of used Interfaces
- Marked tolerance limits for different connector grades
- Calibration standard to adjust to zero

Why use a gauge?

Proven RF measurement procedures require that all coaxial connectors on equipment, cables and terminations be routinely measured to detect mechanical tolerance variations that could affect electrical performance or damage the connector.

When using coaxial cables, it is particularly important for them to be tested before use to ensure that the assembled connector conforms to the relevant mechanical specification limits. There is otherwise a risk of damage to the calibration components, which would in turn result in costly downtimes and repairs.

Coaxial connectors should never be forced together when making a connection, since the apparent need to do so often indicates that they are defective, damaged, or incompatible.

Certain dimensions are critical for the mechanical integrity, non-destructive mating and electrical performance of the connector. The mating face is usually offset from the reference plane. This is done to reduce mechanical damage or misalignment when making connections.

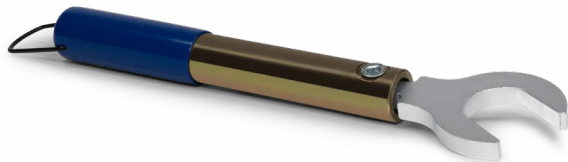
On a SPINNER dial gauge, the tolerance limits for the various connector standards are color-coded on the dial. This makes a good/bad assessment of the dimensions of precision connectors easy even without in-depth knowledge of the standard.

A so-called reference gauge for monitoring and calibrating the dial gauge is included in the scope of delivery.

Part Number	Interface type	Gauge range	Scale marking	Measurement accuracy
BN 537074	3.5 mm male	1 mm	0.001 mm	0.003 mm
BN 537075	3.5 mm female			
BN 537081	2.92 mm male			
BN 537082	2.92 mm female			
BN 537078	2.4 mm male			
BN 537079	2.4 mm female	0.1 mm		
BN 537083	1.85 mm male			
BN 537084	1.85 mm female			
BN 534940	1.35 mm male			
BN 534941	1.35 mm female			

Torque Wrenches

Properly tightening connectors improves every calibration and subsequent measurement.



- Preset with the precise torque needed for 1.35 mm, 1.85 mm, 2.4 mm, 2.92 mm, 3.5 mm and Type N Interfaces
- 8 mm version with soft pads on spanner flats avoiding scratches on precision connector surfaces
- Additional open-ended wrench included in set BN 238741

Why use a torque wrench?

RF torque wrenches are designed to help prevent over tightening the coupling nut of the sensitive coaxial precision connectors. The international standards specify a maximum tightening torque for each precision connector size, which must not be exceeded. These torque values differ considerably from those of the standard connectors. The user must therefore ensure that the correct torque value is applied to the connector.

SPINNER torque wrenches for precision connectors are therefore already preset to the correct torque. However, this alone is not enough for torque-controlled screwing with high accuracy. Even when using a torque wrench, both sides of the connector can be damaged if, for example, the connector covered by the coupling nut rotates unintentionally. To prevent this, the connector should be additionally held in its initial position with a simple open-ended wrench.

Reaching the set torque value is indicated by a clearly audible clicking of the torque wrench. From this point on, no further force should be applied. It is also not necessary to repeat the tightening process.

Torque wrenches for precision applications should be checked or calibrated regularly. An interval of 12 months is recommended. This service can be requested at our After-Sales-Service Center.

Part Number	Interface type	Wrench size	Preset torque	Calibration Certificate
BN 537091R000	Type N	19 mm	0.9 N·m	•
BN 154141R000	1.85 mm – 3.5 m	8 mm	0.9 N·m	•
BN 238741	1.35 mm, 1.85 mm, 2.4 mm, 2.92 mm, 3.5 mm	8 mm, softpads, storage box, with counterholder wrench	0.9 N·m	•

Accessories for Torque Wrenches

Part Number	Description
A45535	Spare soft pads for torque Wrench BN 238741

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