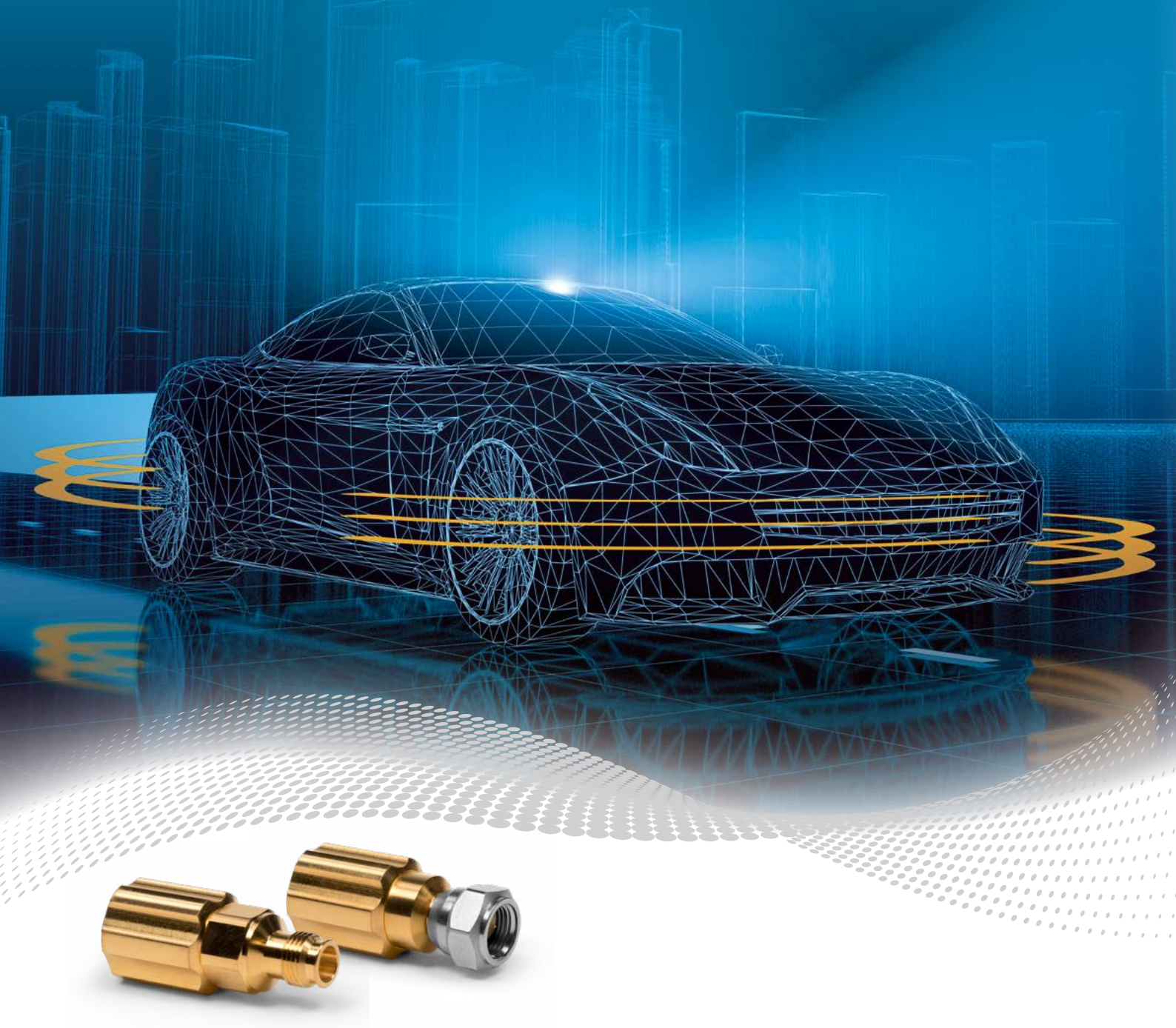


# SPINNER

## 1.35 mm - E Connector



The Robust Precision Interface for DC to 90 GHz



HIGH FREQUENCY PERFORMANCE WORLDWIDE  
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## 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 &amp; 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 GSM, LTE, 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
- 0.8 mm & 1.0 mm coaxial connector system
- 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

## The New Precision Coaxial Connector Between 1.85 and 1.0 mm



1.35 mm E Connector.  
The Best High-Precision Connector for E-Band Applications



**As the market for millimeter wave sensors for self-driving vehicles expands, the demand for proper RF connections in testing environments is also growing.**

Reliable coaxial interface connections are crucial for achieving good RF performance, especially in E-band applications. A common frustration in RF laboratories is unwanted unlocking of the 1.00 mm coaxial thread after performing time-consuming calibrations. This spawned the idea of a 1.35 mm connector the “E Connector” with a precise metric thread like the 1.85 mm connector plus an integrated time saving push-pull capability.

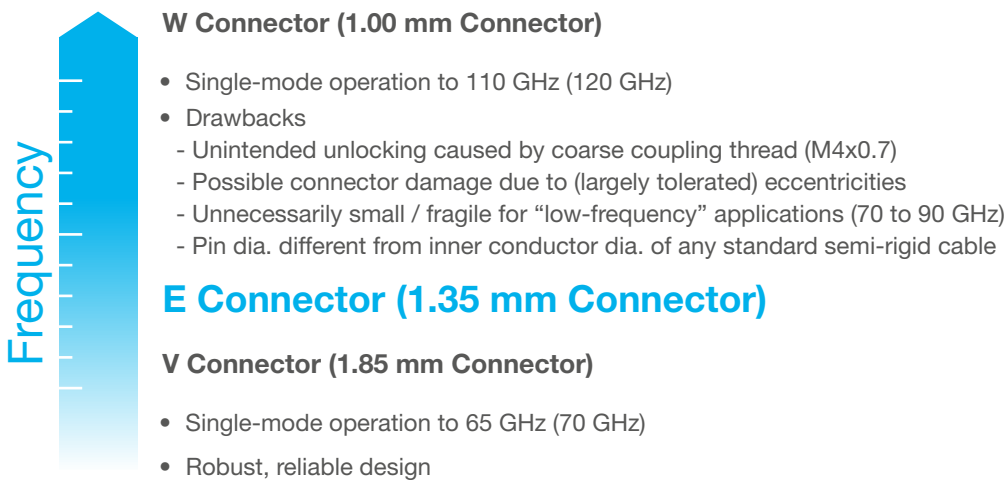
The E Connector is ideal for making high-performance RF measurements in the E-band without being held up by fragile 1.00 mm coaxial connector or wasting time reassembling WR 10 waveguides.

SPINNER designed the new 1.35 mm E Connector to close the gap between the 1.85 mm and the 1.00 mm coaxial connectors.

The 1.35 mm E Connector interface has been accepted for IEEE precision connector standard P287 and for IEC 61169-65 now.

A manufacturer-independent supply of the new 1.35 mm E Connector is therefore ensured.

## Why the E Connector?



## Design Goals

- **Operating frequency range DC to 90 GHz (92 GHz), E-band**
- **Highly robust mechanics**
  - Minimum service life of 3000 cycles
  - Locked by a threaded coupling nut that adequately prevents unintended opening
- **„Through-male“ capability**, i.e. pin diameter must coincide with inner conductor of the standard 0.047-inch semi-rigid cable (MIL-DTL-17/151; biggest cable covering the E band;  $H_{11}$ -cutoff at 109 GHz)
- **Push-pull coupling as an option**
- **Precision interface with**
  - Accurate alignment with outer conductor
  - Well-defined reference plane
  - Maximized return loss
  - High connector repeatability (min. 45 dB)
  - Suitable for precision S-parameter measurement
  - Similar design to 1.85 mm connector

## Special Design Features

- Only precision connector that ensures a pin gap in mated condition
  - **Prevents near field effects from impairing connector repeatability**
- Only precision connector that applies a common reference to all eccentricity tolerances
  - **Prevents tolerance chains**
- Only precision connector for higher frequencies with a provision for push-pull locking
  - **Enables time and cost savings**
- Pin diameter equals center conductor of UT47 and other standard cables
  - **Enables high-quality low-budget jumper cables with captivated connector**
- Same wrench as most precision connectors (3.5 mm, 2.92 mm, 2.40 mm, 1.85 mm)
  - **Convenience**

## Comparison of Connector Systems

Technical Data	1.85 mm	1.35 mm	1.0 mm
Top operating frequency	65 (70) GHz	90 (92) GHz	110 (120) GHz
Cut-off frequency	72 GHz	99 GHz	133 GHz
Outer conductor diameter	1.85 mm	1.35 mm	1.00 mm
Inner conductor diameter	0.8036 mm	0,586 mm	0.434 mm
Pin diameter	511 µm	290 µm	250 µm
Thread	M7x0.75	M5.5x0.5	M4x0.7
Coupling torque	0.9 N m (IEEE)	0.9 N m	0.45 N m (IEEE)
Flat wrench size	8 mm	8 (7) mm	6 mm
Optional push-pull locking	No	Yes	No
Connections	5000 (IEEE)	>3000	3000 (IEEE)
Interface			

- Optimized for frequently used bands
- Allows „through-male“ design with multiple cables
- Thread and coupling torque prevents unintended opening
- Push-Pull-Coupling as an option

# Creating a Suitable Environment for 90 GHz E Connector



1 Calibration Kits



2 Offset Shorts



3 Inter-Type Adapters



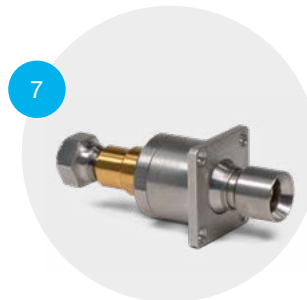
4 Ruggedized Adaptors



5 Waveguide to Coaxial-Adaptors



6 PCB Launch Connectors



7 EasyDock



8 Panel Connectors



9 Rotary Joints



10 Cable Connectors



11 Dial Gauges

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## High Precision Calibration Kit



- High-end S-parameter measurements
- Open, Short, Load and Through (OSLT): each one in male and female version including through adapters, one with male-to-male and one with female-to-female connections
- Optionally a male-to-female is available

Part Number	Interface	Open Phase deviation, max.	Short Phase deviation, max.	Load Return loss, min.	Through Return loss, min.
<b>BN 534936*</b>	1.35 mm	DC to 26.5 GHz $\leq 2.0^\circ$ 26.5 to 50 GHz $\leq 3.5^\circ$ 50 to 70 GHz $\leq 5.0^\circ$ 70 to 90 GHz $\leq 7.0^\circ$	DC to 26.5 GHz $\leq 2.0^\circ$ 26.5 to 50 GHz $\leq 3.0^\circ$ 50 to 70 GHz $\leq 4.5^\circ$ 70 to 90 GHz $\leq 6.0^\circ$	DC to 4 GHz $\geq 36$ dB 4 to 10 GHz $\geq 31$ dB 10 to 26.5 GHz $\geq 25$ dB 26.5 to 70 GHz $\geq 22$ dB 70 to 90 GHz $\geq 20$ dB	DC to 4 GHz $\geq 32$ dB 4 to 26.5 GHz $\geq 30$ dB 26.5 to 40 GHz $\geq 25$ dB 40 to 70 GHz $\geq 23$ dB 70 to 90 GHz $\geq 21$ dB
<b>Set Components</b>					
	male	<b>BN 534931R000</b>	<b>BN 534929R000</b>	<b>BN 534927R000</b>	<b>BN 534933R000</b>
	female	<b>BN 534932R000</b>	<b>BN 534930R000</b>	<b>BN 534928R000</b>	<b>BN 534934R000</b>
<b>Accessory</b>	male-female				<b>BN 534935R000</b>

\* Calibration data in formats for the common VNAs are included in the kit.  
It includes individual calibration coefficients for every kit to achieve the best possible performance.

## Precision Offset Short



Part Number	Interface Type	Frequency Range	Phase Deviation, max.
<b>BN 534925R000</b>	1.35 mm male	DC to 90 GHz	2.5° @ DC to 40 GHz 3.5° @ 40 to 90 GHz
<b>BN 534926R000</b>	1.35 mm female		

## Precision Inter-Type Adapters



Part Number	Interface Type A	Interface Type B	Frequency Range	Return Loss, min.
<b>BN 534951</b>	1.35 mm male	0.8 mm male	DC to 90 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 90 GHz
<b>BN 534950</b>	1.35 mm male	0.8 mm female		
<b>BN 534955</b>	1.35 mm female	0.8 mm male		
<b>BN 534954</b>	1.35 mm female	0.8 mm female		
<b>BN 534917R000</b>	1.35 mm male	1.0 mm male	DC to 90 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 90 GHz
<b>BN 534918R000</b>	1.35 mm male	1.0 mm female		
<b>BN 534919R000</b>	1.35 mm female	1.0 mm male		
<b>BN 534920R000</b>	1.35 mm female	1.0 mm female		
<b>BN 534921R000</b>	1.85 mm male	1.35 mm male	DC to 70 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 70 GHz
<b>BN 534922R000</b>	1.85 mm male	1.35 mm female		
<b>BN 534923R000</b>	1.85 mm male	1.35 mm male		
<b>BN 534924R000</b>	1.85 mm male	1.35 mm female		



## Precision Coaxial Inter-Type Adapters Ruggedized



The ruggedized coaxial interface includes a large threaded body that is designed to stabilize the advanced coaxial 1.35-mm test port during testing.

Part Number	Interface Type A	Interface Type B	Frequency Range	Return Loss, min.
BN 534974	RUG-1.35 mm male	RUG-1.0 mm female	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
BN 534975	1.35 mm female	RUG-1.0 mm female		
BN 535121	RUG-1.85 mm female	1.35 mm female	DC to 70 GHz	28 dB @ DC to 20 GHz 20 dB @ 20 to 50 GHz 17 dB @ 50 to 70 GHz
BN 535122	RUG-1.85 mm female	1.35 mm male		

## Precision Waveguide-to-Coaxial Adapters



Precision interface with

- Well-defined reference plane
- Maximized return losses
- High connector repeatability (min. 45 dB)
- Suitable for precision measurement of S-parameters

Part Number	Interface type A	Interface type B	Direction	Frequency Range	Return Loss, min.
BN 533124	R 900 (WR 10)	1.35 mm female	In-line	75 to 90 GHz	16 dB @ 75 to 90 GHz
BN 533125	R 900 (WR 10)	1.35 mm female	Right-angle		
BN 533126	R 740 (WR 12)	1.35 mm female	In-line	60 to 90 GHz	16 dB @ 60 to 90 GHz
BN 533127	R 740 (WR 12)	1.35 mm female	Right-angle		
BN 533128	R 620 (WR 15)	1.35 mm female	In-line	50 to 75 GHz	16 dB @ 50 to 75 GHz
BN 533129	R 620 (WR 15)	1.35 mm female	Right-angle		
BN 533134	R 900 (WR 10)	1.35 mm male	In-line	75 to 90 GHz	16 dB @ 75 to 90 GHz
BN 533135	R 740 (WR 12)	1.35 mm male	In-line	60 to 90 GHz	16 dB @ 60 to 90 GHz
BN 533136	R 620 (WR 15)	1.35 mm male	In-line	50 to 75 GHz	16 dB @ 50 to 75 GHz

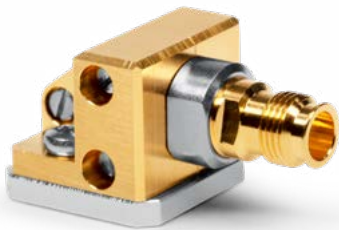
## Precision Waveguide-to-Coaxial Adapters Ruggedized



The ruggedized coaxial interface includes a large threaded body that is designed to stabilize the advanced coaxial 1.35-mm test port during testing.

Part Number	Interface Type A	Interface Type B	Direction	Frequency Range	Return Loss, min.
BN 533151	R 900 (WR 10)	RUG-1.35 mm female	In-line	75 to 90 GHz	16 dB @ 75 to 90 GHz
BN 533152	R 740 (WR 12)	RUG-1.35 mm female		60 to 90 GHz	16 dB @ 60 to 90 GHz
BN 533153	R 620 (WR 15)	RUG-1.35 mm female		50 to 75 GHz	16 dB @ 50 to 75 GHz

## PCB-Launch-Connector EasyLaunch



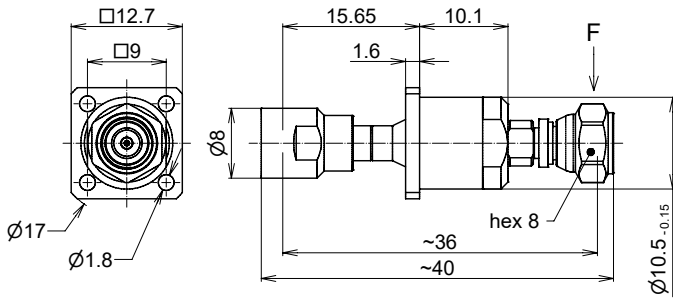
### Features

- Variable positioning for maximum flexibility in compact board design
- Excellent RF performance for the highest frequencies
- Solderless and reusable
- Keeps the micro stripline free of damage through FCC\* technology

Part Number	Interface Type	Frequency Range	Return Loss, min.
BN 533416	1.35 mm female	DC to 90 GHz	23 dB @ DC to 26.5 GHz 16 dB @ 26.5 to 50 GHz 10 dB @ 50 to 90 GHz

\* flattened center conductor

# SPINNER EasyDock – 1.35 mm Blind Mate Adapter



### Features

- Unique smallest floating E-Band Connector DC-90 GHz
- Outstanding number of matings
- Design allows smallest cluster in multipole applications

### Applications

- Multiple test arrays in semiconductor test automation
- Jig Operated Test Applications in Production Lines

Part Number	BN 535301	BN 535302
Coaxial DUT port interface connector	1.35 mm male blind mate	
Coaxial outgoing (analyzer) port interface connector	1.35 mm male	1.35 mm female
Version	blind mate/push-pull non locking, four-hole flange	
Frequency range	DC to 90 GHz	
Return loss, min.	25 dB @ DC - 26.5 GHz 20 dB @ 26.5 - 70 GHz 15 dB @ 70 - 90 GHz	

Maximum allowable misalignment corrections		
Transversal	±0.5 mm	
Axial	2.5 mm 1 mm	
Angular	±0.5°	
Matings	10,000	



## Panel Connector



### Features

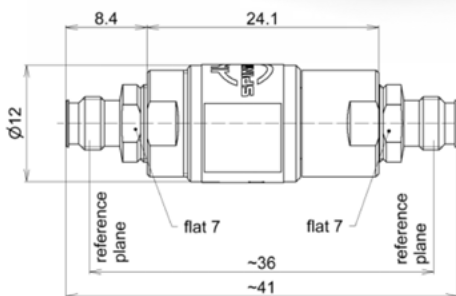
- Ultra-wideband bulkhead coaxial adapter DC-90 GHz
- Narrow band waveguide to coax adapter

### Applications

- 5G mmW
- Antenna Chamber testing
- SatCom

Part Number	Interface Type A	Interface Type B	Frequency Range	Return Loss, min.
BN 534990	1.35 mm female bulkhead	1.35 mm female	DC to 90 GHz	24 dB @ DC to 26.5 GHz 18 dB @ 26,5 to 70 GHz 15 dB @ 70 to 90 GHz
BN 533159	R 740 (WR 12) bulkhead	1.35 mm female	DC to 90 GHz	16 dB @ 60 to 90 GHz

## Rotary Joint



### Features

- Ultra-wideband single rotary joint DC-92 GHz
- Low form factor
- 300 rpm max.

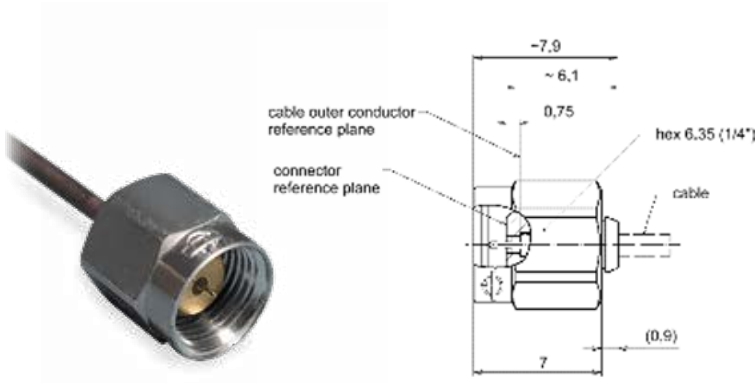
### Applications

Avoidance of torques on high precision measuring cables used in antenna chambers for product testing of

- 5G mmW
- SatCom
- Automotive radar

Part Number	Interface type A	Interface type B	Frequency Range	VSWR, max.
BN 835082	1.35 mm female	1.35 mm female	DC to 92 GHz	1.20 dB @ DC to 26.5 GHz 1.40 dB @ 26.5 to 70 GHz 1.60 dB @ 70 to 90 GHz
BN 835082C0001	1.35 mm female	1.35 mm female with 3-hole flange	DC to 92 GHz	

## Cable Connectors for Cable UT-047



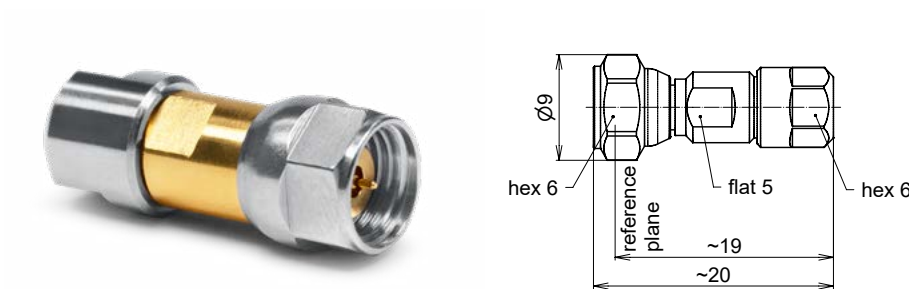
### Features

“Thru male” design: Pin diameter equals center conductor of MIL-DTL-17/151 and other standard cables – enables high-quality low-budget jumper cables

Part Number	Interface Type A	Cable Type	Frequency Range	Return Loss, min.
BN 534942	1.35 mm male	Semi-Rigid UT-047 (MIL-DTL-17/151)	DC to 90 GHz	17 dB @ DC to 90 GHz
BN 534942C0001*				

\* Version with 10° solder cup

## Cable Connectors for Cable UT-047 and UT-047-LL



Part Number	Interface Type	Cable Type	Frequency Range	Return Loss, min.
BN 534947	1.35 mm female	Semi-Rigid UT-047 (MIL-DTL-17/151)	DC to 90 GHz	17 dB @ DC to 90 GHz
BN 534948	1.35 mm female panel 4-hole			
BN 534949	1.35 mm male			
BN 534981	1.35 mm male	Semi-Rigid UT-047-LL (MIL-DTL-17/151)	DC to 90 GHz	17 dB @ DC to 90 GHz
BN 534982	1.35 mm female			

## Dial Gauge



- Designed to properly gauge the contact pin locations and pin depth of the connectors used
- Marked tolerance limits for different connector grades
- Calibration standard for zero reset

Part Number	Interface type	Gauge range	Scale marking	Measurement accuracy
BN 534940	1.35 mm male per IEEE Std 287	0.1 mm	0.001 mm	0.003 mm
BN 534941	1.35 mm female per IEEE Std 287	0.1 mm	0.001 mm	0.003 mm

## Torque Wrench



- Preset with the precise torque needed for 1.35 mm connectors
- Softpads inside the jaw prevents any damaging of the precision connectors coupling nut
- Spare softpads included

Part Number	Wrench size	Wrench use	Preset Torque
BN 238741	8.0 mm	1.35 mm, 1.85 mm, 2.4 mm, 2.92 mm, 3.5 mm	90 N·cm ±9

## Available Products

BN	Description
<b>BN 534936</b>	High Precision Calibration Kit
<b>BN 534951</b>	Precision Adapter 1.35 mm male to 0.8 mm male
<b>BN 534950</b>	Precision Adapter 1.35 mm male to 0.8 mm female
<b>BN 534955</b>	Precision Adapter 1.35 mm female to 0.8 mm male
<b>BN 534954</b>	Precision Adapter 1.35 mm female to 0.8 mm female
<b>BN 534917R000</b>	Precision Adapter 1.35 mm male to 1.00 mm male
<b>BN 534918R000</b>	Precision Adapter 1.35 mm male to 1.00 mm female
<b>BN 534919R000</b>	Precision Adapter 1.35 mm female to 1.00 mm male
<b>BN 534920R000</b>	Precision Adapter 1.35 mm female to 1.00 mm female
<b>BN 534921R000</b>	Precision Adapter 1.85 mm male to 1.35 mm male
<b>BN 534922R000</b>	Precision Adapter 1.85 mm male to 1.35 mm female
<b>BN 534923R000</b>	Precision Adapter 1.85 mm female to 1.35 mm male
<b>BN 534924R000</b>	Precision Adapter 1.85 mm female to 1.35 mm female
<b>BN 533124</b>	Precision Adapter Waveguide R 900 (WR 10) to 1.35 mm female
<b>BN 533126</b>	Precision Adapter Waveguide R 740 (WR 12) to 1.35 mm female
<b>BN 533128</b>	Precision Adapter Waveguide R 620 (WR 15) to 1.35 mm female
<b>BN 533134</b>	Precision Adapter Waveguide R 900 (WR 10) to 1.35 mm male
<b>BN 533135</b>	Precision Adapter Waveguide R 740 (WR 12) to 1.35 mm male
<b>BN 533136</b>	Precision Adapter Waveguide R 620 (WR 15) to 1.35 mm male
<b>BN 533151</b>	Precision Adapter Waveguide R 900 (WR 10) to RUG-1.35 mm female
<b>BN 533152</b>	Precision Adapter Waveguide R 740 (WR 12) to RUG-1.35 mm female
<b>BN 533153</b>	Precision Adapter Waveguide R 620 (WR 15) to RUG-1.35 mm female
<b>BN 835082</b>	Rotary Joint 1.35 mm female
<b>BN 835082C0001</b>	Rotary Joint 1.35 mm female with 3-hole flange
<b>BN 534942</b>	Cable Connector 1.35 mm for 0.0047 semi-rigid cable (MIL-DTL-17/151)
<b>BN 534942C0001</b>	Cable Connector 1.35 mm for Cable UT-047
<b>BN 534947</b>	Cable connector 1.35 mm female for UT-047 semi-rigid cable (MIL-DTL-17/151)
<b>BN 534948</b>	Cable connector 1.35 mm female, D-hole panel mounting, for UT-047 semi-rigid cable (MIL-DTL-17/151)
<b>BN 534949</b>	Cable connector 1.35 mm male for UT-047 semi-rigid cable (MIL-DTL-17/151)
<b>BN 534981</b>	Cable connector 1.35 mm male for UT-047-LL semi-rigid cable (MIL-DTL-17/151)
<b>BN 534982</b>	Cable connector 1.35 mm female for UT-047-LL semi-rigid cable (MIL-DTL-17/151)
<b>BN 533416</b>	PCB-Launch-Connector 1.35 mm female
<b>BN 534974</b>	Precision Adapter RUG-1.35 mm female to RUG-1.00 mm male
<b>BN 534975</b>	Precision Adapter 1.35 mm female to RUG-1.00 mm female
<b>BN 535121</b>	Precision Adapter RUG-1.85 mm female to 1.35 mm female
<b>BN 535122</b>	Precision Adapter RUG-1.85 mm female to 1.35 mm male
<b>BN 534940</b>	Dial Gauge 1.35 mm male
<b>BN 534941</b>	Dial Gauge 1.35 mm female
<b>BN 534925R000</b>	Precision Offset Short male, 5.0 mm
<b>BN 534926R000</b>	Precision Offset Short female, 5.0 mm
<b>BN 534990</b>	Panel Connector 1.35 mm female-female D-hole
<b>BN 533159</b>	Panel Connector R 740 (WR 12) to 1.35 mm female
<b>BN 238741</b>	Torque Wrench 8 mm 90 N cm +/-9
<b>BN 535301</b>	EasyDock 1.35 mm male blind mate to 1.35 mm male
<b>BN 535302</b>	EasyDock 1.35 mm male blind mate to 1.35 mm female



## HIGH FREQUENCY PERFORMANCE WORLDWIDE

SPINNER designs and builds cutting-edge radio frequency systems, setting performance and longevity standards for others to follow. The company's track record of innovation dates back to 1946, and many of today's mainstream products are rooted in SPINNER inventions.

Industry leaders continue to count on SPINNER's engineering excellence to drive down their costs of service and ownership with premium-quality, off-the-shelf products and custom solutions. Headquartered in Munich, Germany, the global frontrunner in RF components remains the first choice in simple-yet-smart RF solutions.

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