

Robust Precision Interface up to 90 GHz

## RPC-1.35 Connectors

TEST & MEASUREMENT





## Company Profile

### About Rosenberger

Rosenberger, a family owned company, is one of the world's leading manufacturers of impedance-controlled connectivity solutions in high-frequency, high-voltage and fiberoptic technology. Renowned companies in high-tech industries trust the precision and quality of Rosenberger products, e.g. mobile communication networks, data centers, test & measurement industries, automotive electronics, industrial and medical electronics, or aerospace engineering.

Worldwide, the Rosenberger group operates a global network of R&D, manufacturing and assembly locations as well as Rosenberger sales offices in Europe, Asia and North and South America where more than 10,000 employees develop, produce and sell our products.

### Test & Measurement

Rosenberger is a dependable and renowned development partner in industrial measurement technology. The fact that we work with leading global companies from the electronic measurement technology field reflects the way that others trust our research and development, our high-quality manufacturing, and not least our customer-orientated "Made in Germany" service. Rosenberger provides customized solutions – cost-optimized and timely – from the initial idea right through to volume production.

Rosenberger develops and produces a comprehensive range of cost-effective, high-quality and high-precision test & measurement products and services – microwave measurements & VNA calibrations, lab and factory testing, semiconductor test applications, PCB connections or network testing.



## RPC-1.35 - Precision Coaxial 1.35 mm Connectors

Due to the expanding market for 5G, industrial sensors in the E-Band, millimeter wave sensors for self-driving vehicles and WLAN IEEE 802.11ax and 802.11ay, there is a growing demand for proper RF-connections up to 90 GHz.

For achieving good RF performance, especially for applications in the range of 60 to 90 GHz (E-Band) a reliable coaxial interface connection is crucial. The unwanted unlocking of 1.00 mm coaxial thread which results in time-consuming calibrations are a common frustration in RF laboratories. The idea of a 1.35 mm connector, the E Connector, with a precise metric thread like the 1.85 mm connector and an integrated time-saving push-pull capability arise from these issues.

The 1.35 mm connector is perfect to carry out high-performance RF measurements in the E-Band without delays through fragile 1.00 mm coaxial connectors or reassembling WR 10 waveguide.

A working group consisting of:

- Physikalisch-Technische-Bundesanstalt PTB (Germany's national metrology institute)
- Rosenberger Hochfrequenztechnik GmbH & Co. KG
- Rohde & Schwarz GmbH & Co. KG
- Spinner GmbH

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

The standardization of the 1.35 mm interface is in progress for IEC (IEC 61169-65) and for IEEE (IEEE Std 287), therefore a manufacturer-independent supply of the new 1.35 E Connector is ensured.

RPC-1.85	RPC-1.35	RPC-1.00
<b>70 GHz</b>	<b>90 GHz</b>	<b>110 GHz</b>
<p><b>IEC 61169-32</b></p> <p><b>V Connectors</b></p> <ul style="list-style-type: none"> <li>Single-mode operation up to 65 GHz (70 GHz)</li> <li>Robust, reliable design</li> </ul>	<p><b>IEC 61169-65 (in progress)</b></p> <p><b>E Connectors</b></p> <ul style="list-style-type: none"> <li>Single-mode operation up to 90 GHz</li> <li>Robust, reliable design</li> </ul>	<p><b>IEC 61169-31</b></p> <p><b>W Connectors</b></p> <ul style="list-style-type: none"> <li>Single-mode operation up to 110 GHz</li> <li>Drawbacks <ul style="list-style-type: none"> <li>Unintended unlocking caused by coarse coupling thread M4 x 0.7</li> <li>Possible connector damage due to eccentricities</li> <li>Unnecessarily small/fragile for applications in the range of 70 to 90 GHz</li> <li>Pin diameter different from inner conductor diameter of any standard semi-rigid cable</li> </ul> </li> </ul>

## RPC-1.35 Characteristics

### Target Specifications

- Operating frequency DC up to 90 GHz, E-Band
- Highly robust mechanics
  - minimum 3000 mating cycles
  - locking by threaded coupling nut that sufficiently secures against unintended opening
- Precision interface
  - well-defined reference plane
  - maximized return loss
  - high connector repeatability
  - suitable for precision S-parameter measurement
  - design similar to 1.85 mm connector
- "thru male" capability, i.e. pin diameter must coincide with inner conductor of standard 0.047-inch semi-rigid cable (largest cable covering the E-Band)
- Push-pull coupling as an option

### Special Design Features

- Only precision connector which ensures a pin gap in mated condition to avoid near field effects from impairing connector repeatability
- Only precision connector which uses a common reference for all eccentricity tolerances to prevent for a tolerance chain
- Only precision connector for higher frequencies with a provision for push-pull locking
- High-quality low budget jumper cables possible, because pin diameter is equal to center conductor of 0.047-inch semi-rigid cables.
- Can be used with the same torque wrench as most precision connectors (3.50 mm, 2.92 mm, 2.40 mm, 1.85 mm)





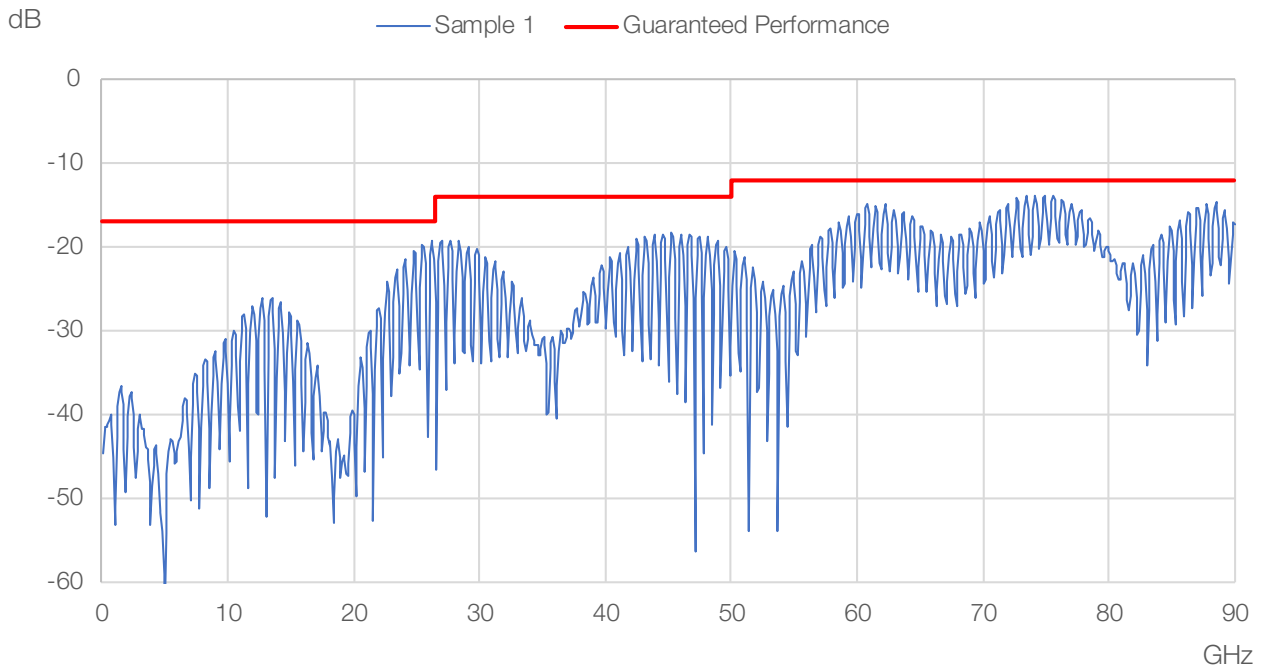
## Comparison of Technical Data

Technical Data	1.85 mm/V Connector	1.35 mm/E Connector	1.00 mm/W Connector
Upper operating frequency	65 (70) GHz	90 GHz	110 GHz
Cut-off frequency	72 GHz	98 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 $\mu\text{m}$	290 $\mu\text{m}$	250 $\mu\text{m}$
Thread	M7 x 0.75	M5.5 x 0.5	M4 x 0.7
Coupling torque	0.9 Nm	0.9 Nm	0.45 Nm
Flat wrench size	8 mm	8 mm	6 mm
Optional push-pull locking	No	Yes	No
Mating Cycles	> 500 (IEC)	> 3000	> 500 (IEC)
			

### Advantages 1.35 mm Connector Series

- Optimized for frequently used bands
- Allows "thru male" design with multiple cables
- Thread and coupling torque prevents unintended opening

## Typical Reflection of L70-324-140



## Product Portfolio

### Semi-Rigid Cable Assemblies

Rosenberger No. <sup>1)</sup>	Connector 1	Connector 2	Return Loss
L70-324-XXX	RPC-1.35 male	RPC-1.35 male	≥ 17 dB, DC to 26.5 GHz ≥ 14 dB, 26.5 GHz to 50 GHz ≥ 12 dB, 50 GHz to 90 GHz

### Flexible Cable Assemblies

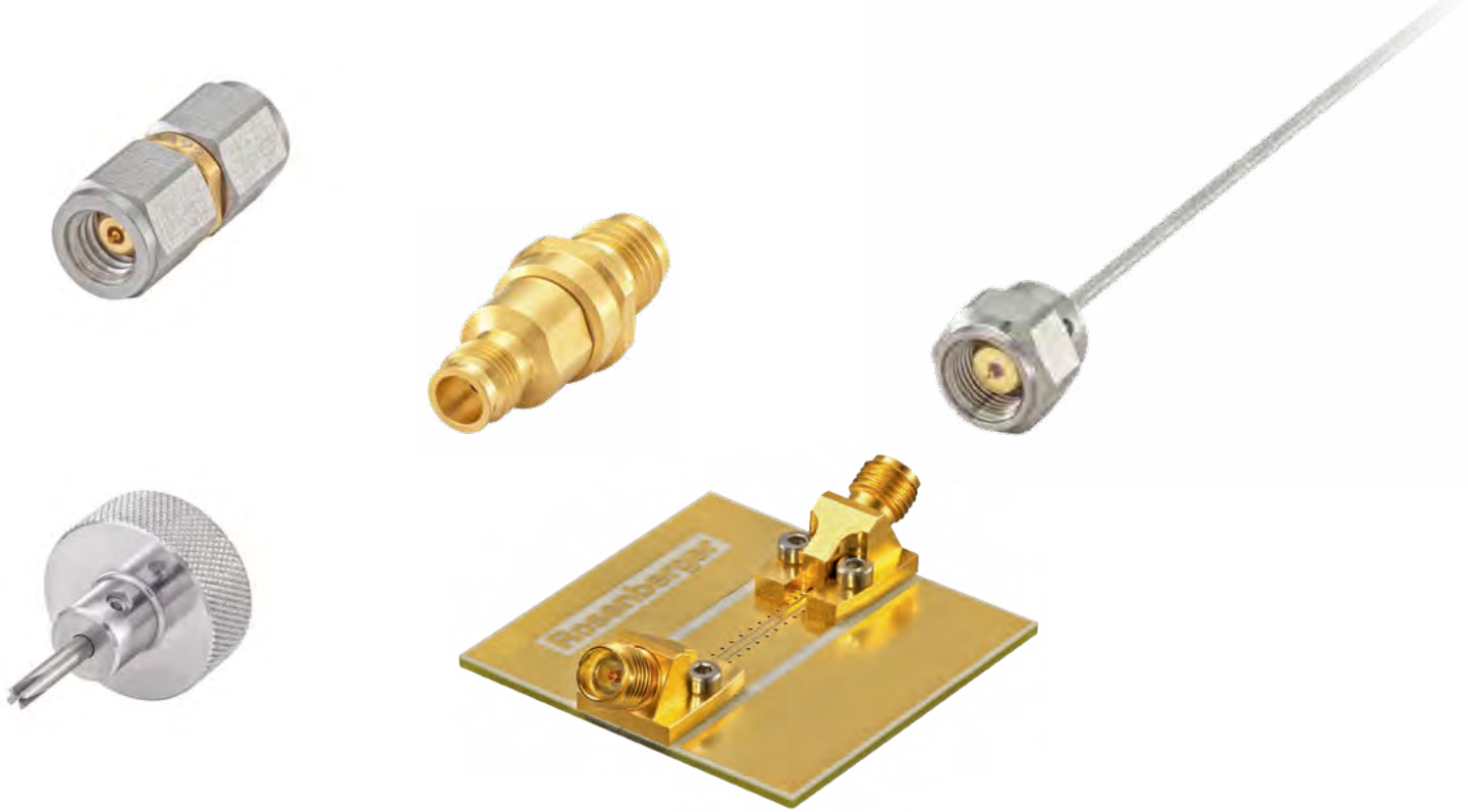
Rosenberger No. <sup>1)</sup>	Connector 1	Connector 2	Return Loss
L70-345-XXX	RPC-1.35 male	RPC-1.35 male	≥ 17 dB, DC to 50 GHz ≥ 14 dB, 50 GHz to 90 GHz
L70-346-XXX	RPC-1.35 male	RPC-1.85 male	≥ 17 dB, DC to 50 GHz ≥ 14 dB, 50 GHz to 70 GHz
L70-347-XXX	RPC-1.00 male	RPC-1.35 male	≥ 17 dB, DC to 50 GHz ≥ 14 dB, 50 GHz to 90 GHz

1) XXX: Please fill in the requested length. Standard = 140 mm

### PCB Connectors

Rosenberger No.	Version	Remarks	Return Loss
P9K80A-40ML5	30° Angle	Solderless PCB connector, female  Can be screwed anywhere on the board without soldering	≥ 21 dB, DC to 26.5 GHz ≥ 19 dB, 26.5 GHz to 40 GHz ≥ 17 dB, 40 GHz to 60 GHz ≥ 14 dB, 60 GHz to 70 GHz ≥ 12 dB, 70 GHz to 90 GHz
P9K241-40ML5	Right Angle	Soldered PCB connector, female Edge mount	≥ 20 dB, DC to 40 GHz ≥ 14 dB, 40 GHz to 70 GHz ≥ 12 dB, 70 GHz to 90 GHz

For specific details refer to the technical data sheets in our online catalog.  
[www.rosenberger.com/ok](http://www.rosenberger.com/ok)

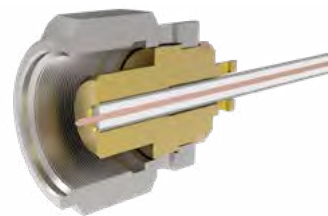


### Test PCBs

Rosenberger No.	Connector	Return Loss
PCB-K2702D-SB	2 x P9K80A-40ML5	≥ 12 dB, DC to 70 GHz
PCB-S2402-SB	2 x P9K241-40ML5	≥ 10 dB, 70 GHz to 90 GHz

### Cable Connectors

Rosenberger No.	Version	Remarks	Return Loss
P9S101-270E	Straight	Cable inner contact is connector pin Pin diameter matches semi rigid cable 0.047"	≥ 23 dB, DC to 26.5 GHz ≥ 20 dB, 26.5 GHz to 50 GHz ≥ 18 dB, 50 GHz to 90 GHz



### Tools

Rosenberger No.	Remarks
P9W001-000	Soldering fixture for outer conductor of P9S101-270E
P9W002-000	Cutting bit to sharp the center conductor 0.047-inch semi-rigid cable
03W008-000	Combi Wrench with 5 mm, 6 mm, 7 mm and 8 mm across flats
03W021-000	Torque Wrench with 8 mm across flats, 0.90 Nm



## Product Portfolio

### In-Series Adaptors

Rosenberger No.	Version	Interface	Return Loss
P9K121-K00D3	Straight	RPC-1.35 female – RPC-1.35 female	≥ 28 dB, DC to 20 GHz
P9S121-K00D3	Straight	RPC-1.35 male – RPC-1.35 female	≥ 19 dB, 20 GHz to 40 GHz
P9S121-S00D3	Straight	RPC-1.35 male – RPC-1.35 male	≥ 17 dB, 40 GHz to 90 GHz

### Inter-Series Adaptors

Rosenberger No.	Version	Interface	Return Loss
P9K101-K00D3	Straight	RPC-1.35 female – RPC-1.00 female	≥ 28 dB, DC to 20 GHz
P9S101-S00D3	Straight	RPC-1.35 male – RPC-1.00 male	≥ 20 dB, 20 GHz to 40 GHz
P9K108-K00D3	Straight	RPC-1.35 female – RPC-1.85 female	≥ 17 dB, 40 GHz to 90 GHz
P9S108-S00D3	Straight	RPC-1.35 male – RPC-1.85 male	≥ 28 dB, DC to 20 GHz
			≥ 20 dB, 20 GHz to 50 GHz
			≥ 17 dB, 50 GHz to 70 GHz





### Floating Adaptor

Rosenberger No.	DUT Device Under Test	Adaptor		Return Loss
		Connector Floating – Side	Connector Fixed – Port Side	
P9K721-S23S3	RPC-1.35 female	RPC-1.35 male	RPC-1.35 female	$\geq 16$ dB, DC to 40 GHz $\geq 14$ dB, 40 GHz to 90 GHz

### Test-Port Adaptor

Rosenberger No.	Interface	Return Loss
01KR1P9-K0AS3	RPC-1.00 female, ruggedized – RPC-1.35 female	$\geq 28$ dB, DC to 20 GHz $\geq 19$ dB, 20 GHz to 40 GHz $\geq 17$ dB, 40 GHz to 90 GHz

### Waveguide-to-Coaxial Adaptors

Rosenberger No.	Version	Interface	Frequency Range	Return Loss
P9K620-385	Straight	RPC-1.35 female – WR-15	50 GHz to 75 GHz	$\geq 16$ dB
P9S620-385	Straight	RPC-1.35 male – WR-15		
P9K740-387	Straight	RPC-1.35 female – WR-12	60 GHz to 90 GHz	
P9S740-387	Straight	RPC-1.35 male - WR-12		



## Product Portfolio

### Gauge Kit

The mechanical gauging of connectors is essential to ensure correct fit and to achieve the best performance. This means that all coaxial connectors fitted on all equipment, cables and terminations etc. should be gauged on a regular basis in order to detect any out of tolerance conditions that may impair the electrical performance. Inner conductor protrusion can damage the equipment and recession can influence the electrical measurement. For details please see the operating manual.

Rosenberger No.	Remarks
P9GK0KS-010	Rosenberger gauge kits are delivered in a stable wooden box with gauge male/female incl. gauge block male/female

### Calibration Kits

Rosenberger calibration kits are delivered in stable wooden boxes including factory calibration certificate.

Rosenberger No.	Remarks
P9CK001-150	Full version with open, short, load in male and female, in-series adaptors male/male and female/female, torque wrench, combi wrench and gauges male/female incl. gauge block male/female
P9CK010-150	Industrial version with open, short, load as male and female, in-series adaptors male/male and female/female, torque wrench and combi wrench

All parts from the calibration kits and gauge kits (calibration standards, calibration adaptors, gauges) are also available as separate parts.





## Website

For more information refer to our website:  
[www.rosenberger.com/t&m](http://www.rosenberger.com/t&m)

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Certified by IATF 16949 · DIN EN 9100 · ISO 9001 · ISO 14001

Order No.

pA 405951 · Info356RPC1.35FlyEN

2000/2019

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