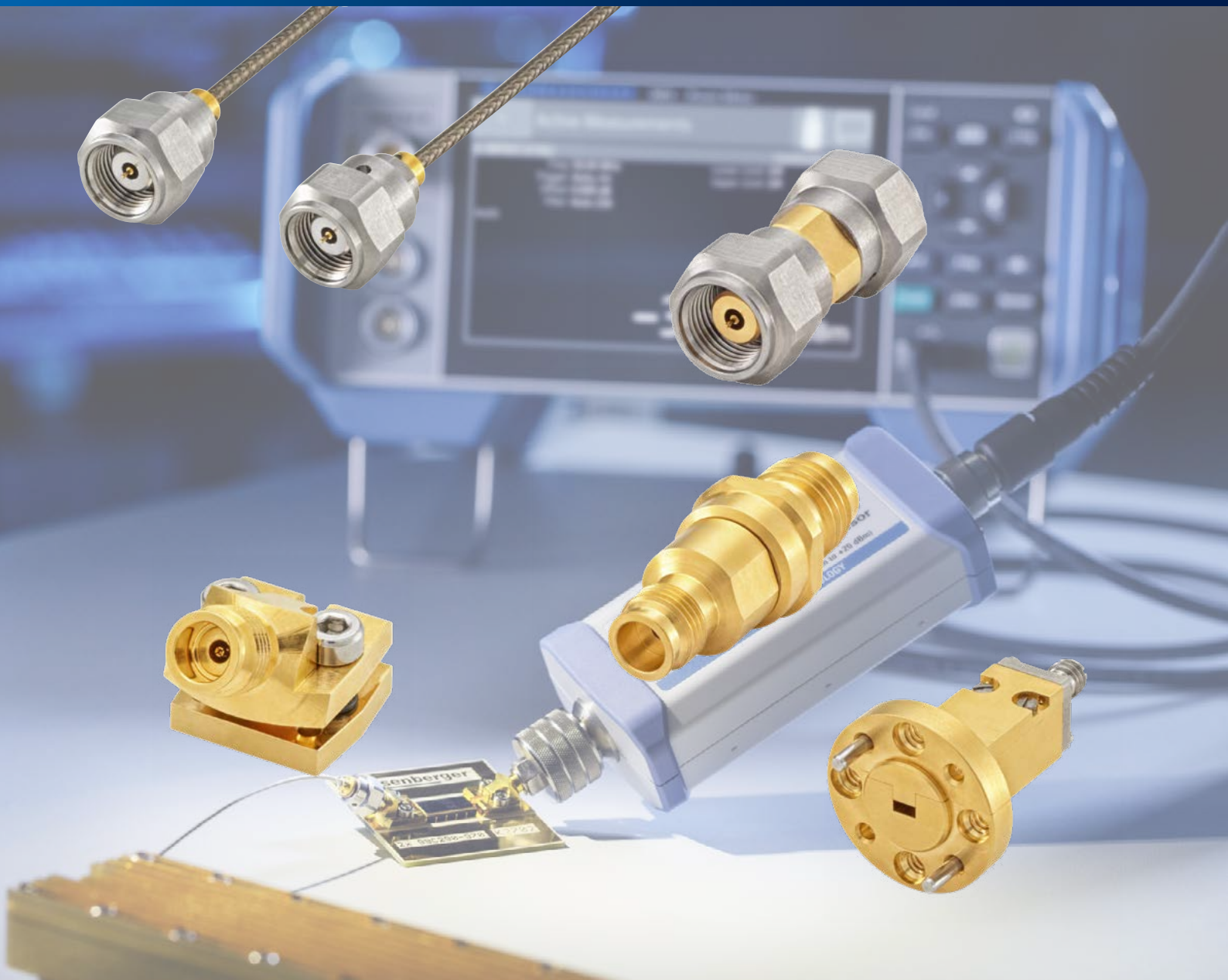
Rosenberger

Robust Precision Interface up to 90 GHz

RPC-1.35 Connectors and Cable Assemblies

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 12,000 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.

The New Precision Coaxial Connector Between 1.85 and 1.00 mm

RPC-1.35 Connectors

Because of 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.

Due to the standardization of the 1.35 mm interface by IEC (IEC 61169-65) and IEEE (IEEE STD 287), a manufacturer-independent supply of the 1.35 E connector is ensured.

RPC-1.85	RPC-1.35	RPC-1.00
70 GHz	**90 GHz**	**110 GHz**
IEC 61169-32 **V Connectors** ▪ Single-mode operation up to 65 GHz (70 GHz) ▪ Robust, reliable design	**IEC 61169-65** **E Connectors** ▪ Single-mode operation up to 90 GHz ▪ Robust, reliable design	**IEC 61169-31** **W Connectors** ▪ Single-mode operation up to 110 GHz ▪ Drawbacks – Unintended unlocking caused by coarse coupling thread M4 x 0.7 – Possible connector damage due to eccentricities – Unnecessarily small/fragile for applications in the range of 70 to 90 GHz – Pin diameter different from inner conductor diameter of any standard semi-rigid cable

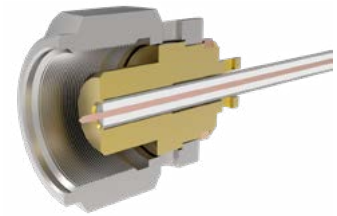
RPC-1.35 Characteristics

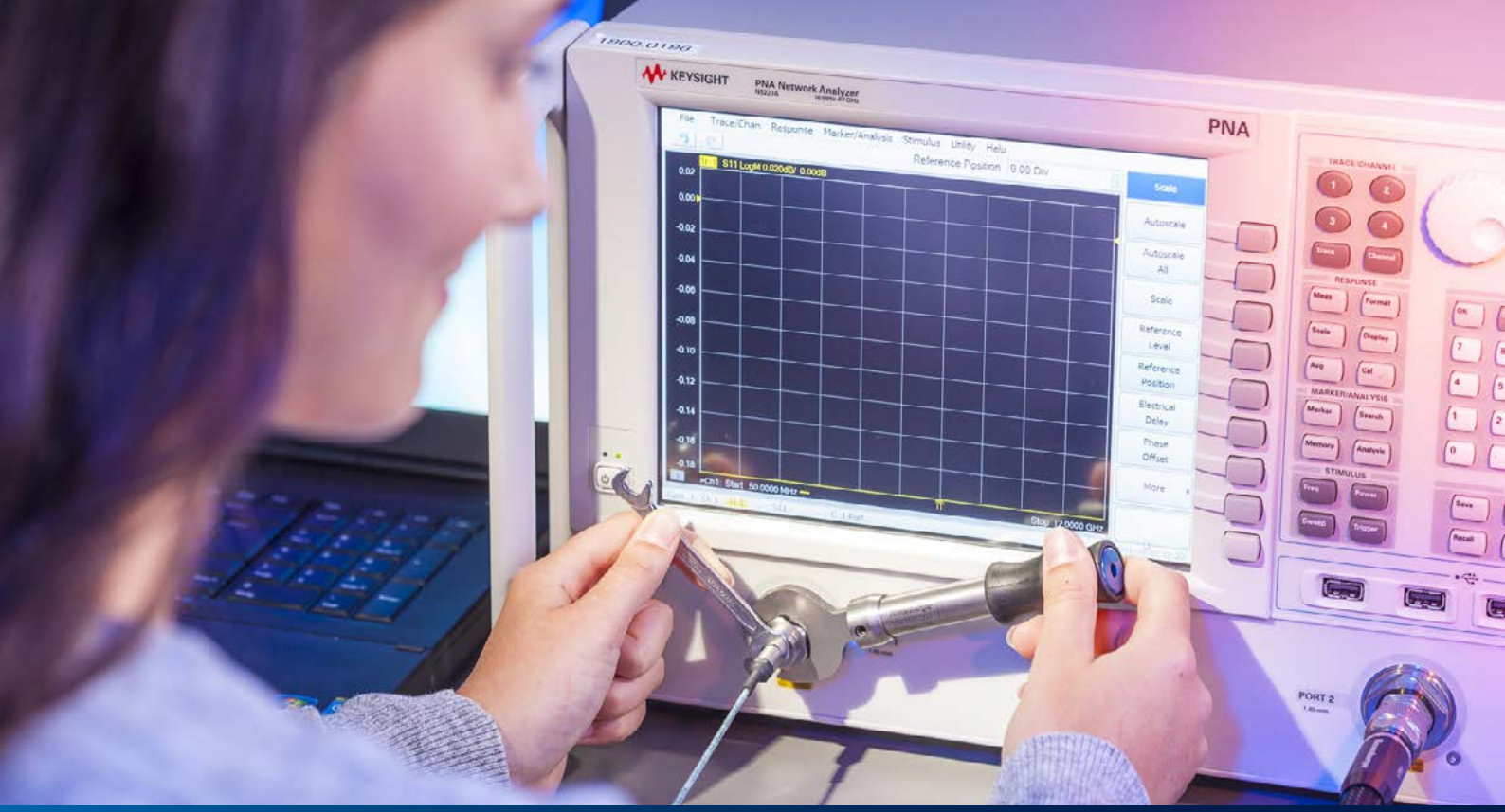
Target Specifications

- 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)



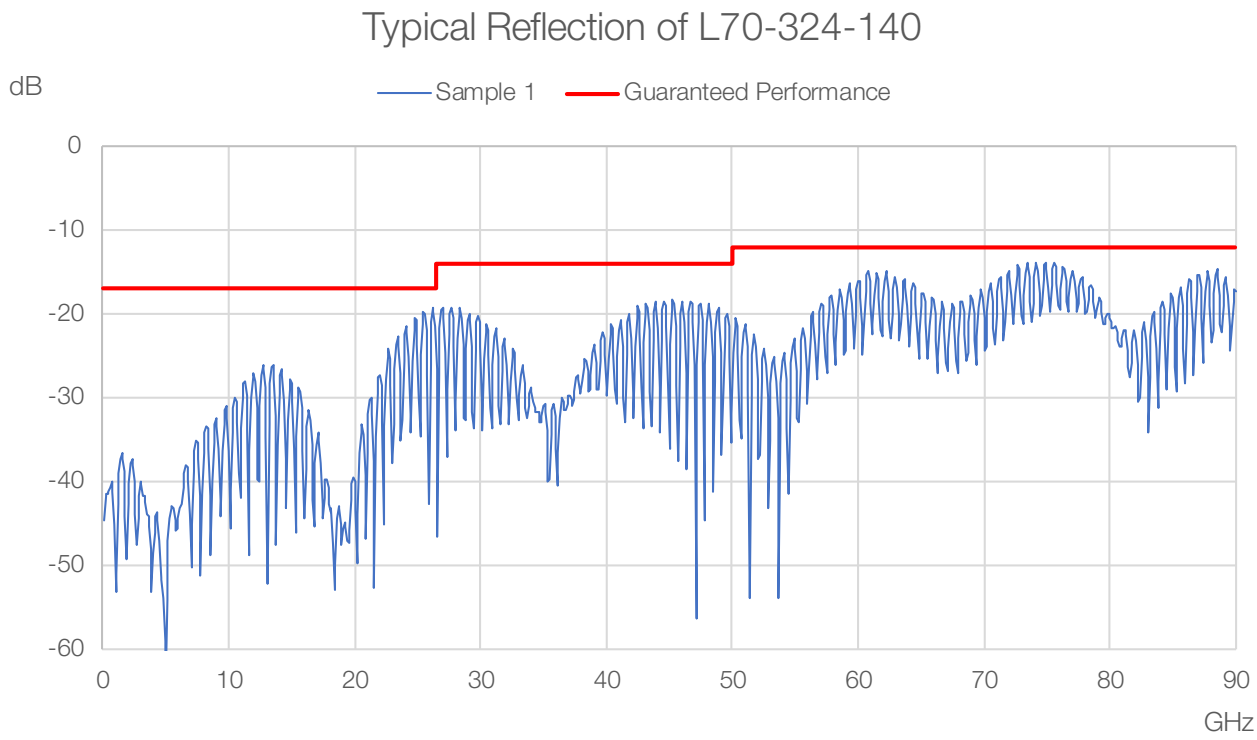


Comparison of Technical Data

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 µm	290 µm	250 µm
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



Product Portfolio

Semi-Rigid Cable Assemblies

Rosenberger No. [1]	Connector 1	Connector 2	Return Loss
L70-364-XXX	RPC-1.00 male	RPC-1.35 male	≥ 17 dB, DC to 50 GHz ≥ 14 dB, 50 GHz to 90 GHz
L70-374-XXX	RPC-1.00 male	RPC-1.35 female	
L70-375-XXX	RPC-1.00 female	RPC-1.35 male	
L70-376-XXX	RPC-1.00 female	RPC-1.35 female	
L70-419-XXX	RPC-1.35 female	RPC-1.35 male	
L70-420-XXX	RPC-1.35 female	RPC-1.35 female	
L70-421-XXX	RPC-1.35 male	RPC-1.35 male	
L70-380-XXX	RPC-1.35 male	RPC-1.85 male	≥ 17 dB, DC to 50 GHz ≥ 14 dB, 50 GHz to 70 GHz
L70-381-XXX	RPC-1.35 female	RPC-1.85 male	
L70-382-XXX	RPC-1.35 male	RPC-1.85 female	
L70-383-XXX	RPC-1.35 female	RPC-1.85 female	

1) XXX: Please fill in the requested length. Standard = 140 mm
Further cable assemblies available on request

Semi-Rigid, Low-Budget Jumper Cable

Rosenberger No. [1]	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

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

Flexible Cable Assemblies

Rosenberger No. [1)]	Connector 1	Connector 2	Return Loss
L70-347-XXX	RPC-1.00 male	RPC-1.35 male	≥ 17 dB, DC to 50 GHz ≥ 14 dB, 50 GHz to 90 GHz
L70-390-XXX	RPC-1.00 male	RPC-1.35 female	
L70-391-XXX	RPC-1.00 female	RPC-1.35 male	
L70-392-XXX	RPC-1.00 female	RPC-1.35 female	
L70-345-XXX	RPC-1.35 male	RPC-1.35 male	
L70-370-XXX	RPC-1.35 female	RPC-1.35 male	
L70-379-XXX	RPC-1.35 female	RPC-1.35 female	
L70-346-XXX	RPC-1.35 male	RPC-1.85 male	≥ 17 dB, DC to 50 GHz ≥ 14 dB, 50 GHz to 70 GHz
L70-387-XXX	RPC-1.35 female	RPC-1.85 male	
L70-388-XXX	RPC-1.35 male	RPC-1.85 female	
L70-389-XXX	RPC-1.35 female	RPC-1.85 female	

1) XXX: Please fill in the requested length. Standard = 140 mm
Further cable assemblies available on request

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

Product Portfolio

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 ≥ 17 dB, 26.5 GHz to 40 GHz ≥ 14 dB 40 GHz to 60 GHz ≥ 12 dB, 60 GHz to 90 GHz
P9K241-40ML5	Right Angle	Soldered PCB connector, female Edge mount	≥ 19 dB, DC to 26.5 GHz ≥ 17 dB 26.5 GHz to 40 GHz ≥ 14 dB, 40 GHz to 70 GHz ≥ 12 dB, 70 GHz to 90 GHz

Test PCBs

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

Launcher Jack for Glass-Bead

Rosenberger No.	Version	Remarks	Return Loss
P9K521-800D3	Bulkhead jack	For glass-bead of 0.127 mm pin diameter	≥ 21 dB, DC to 26.5 GHz ≥ 19 dB, 26.5 GHz to 40 GHz ≥ 17 dB, 40 GHz to 70 GHz ≥ 12 dB, 70 GHz to 90 GHz
01Z103-000D3	Glass-bead	Pin diameter 0.127 mm	≥ 17 dB, DC to 70 GHz ≥ 12 dB, 70 GHz to 90 GHz ≥ 10 dB, 90 GHz to 110 GHz

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 ≥ 19 dB, 20 GHz to 40 GHz ≥ 17 dB, 40 GHz to 90 GHz
P9S121-K00D3	Straight	RPC-1.35 male – RPC-1.35 female	
P9S121-S00D3	Straight	RPC-1.35 male – RPC-1.35 male	

Inter-Series Adaptors

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

Test-Port Adaptor

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

Product Portfolio

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	≥ 16 dB, DC to 40 GHz ≥ 14 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	≥ 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		
P9K900-387	Straight	RPC-1.35 female – WR-10	75 GHz to 90 GHz	
P9S900-387	Straight	RPC-1.35 male – WR-10		

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
01W002-000	Soldering fixture for 01Z103-000D3
P9W003-000	Mounting wrench for P9K521-800D3

Gauge Kit

The mechanical gauging of connectors is essential to ensure correct fit and to achieve the best performance. 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.

Rosenberger No.	Remarks
P9GK0KS-000	Gauge kits are delivered in a stable wooden box with gauge male/female incl. gauge block male / female

Calibration and Compact Calibration Kits

Rosenberger No.	Calibration Kits – Remarks
P9CK001-000	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
P9CK010-000	Industrial version with open, short, load as male and female, in-series adaptors male/male and female/female, torque wrench and combi wrench

Rosenberger No.	Interface	Compact Calibration Kits – Remarks
P9K30R-MSOD3	RPC-1.35 female	3-in-1 mechanical calibration kit combine an open, short and load in a compact unit for a complete MSO calibration of single port vector network analyzers
P9S30R-MSOD3	RPC-1.35 male	
P9K30R-MSOTD3	RPC-1.35 female	4-in-1 mechanical calibration kit combine open, short, load and thru in a compact unit for a complete MSOT calibration of two or more port vector network analyzers
P9S30R-MSOT3	RPC-1.35 male	

Rosenberger calibration kits are delivered in stable wooden boxes including factory calibration certificate.
Compact calibration kits come in a hard shell case with general coeficients on a standard definition card.
All parts from the calibration kits and gauge kits (calibration standards, calibration adaptors, gauges, tools) are also available as separate parts.
Further verification elements like mismatch and stepped thru on request.

Website

For more information refer to our website:
www.rosenberger.com/t&m

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