SPINNER
1.35 mm - E Connector

The Robust Precision Interface
for DC to 90 GHz

HIGH FREQUENCY PERFORMANCE WORLDWIDE
www.spinner-group.com
The SPINNER Group

For more than 70 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 1,000 employees. Our international network of subsidiaries and distributors supports customers in over 40 countries.

RF Measurement

Today no development, production, testing or quality assurance department that deals with RF signals on coaxial lines can afford to dispense with up-to-date measurement equipment. Particularly with vector network analyzers, it is essential for them to use high-precision connectors, terminations and adapters.

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 that most users would not want to be without.

Precise measured values are especially important when transmitting high power levels. Other major applications include extensive testing of mobile communications systems such as GSM, UMTS or LTE and wireless data transmission, e.g. via WiMAX, WLAN or RFID.

SPINNER supplies coaxial measurement equipment of outstanding electrical and mechanical quality for use at frequencies from 1 kHz to 110 GHz.

Coaxial & Waveguide Measurement Devices

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

VNA Measurement
- Calibration and Verification Standards
- Air Lines
- Rotary Joints
- Articulated Lines
- Adapters
- Connector Gauges

Millimeter Wave Measurement
- Ruggedized Test Port Adapters
- 1.35 mm Connector “E Connector”
- Millimeter Waveguide-to-Coax-Adaptors
- EasyLaunch PCB Connectors
- EasySnake Flexible Dielectric Waveguides

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
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 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 connectors 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 1.00 mm coaxial connectors.

The 1.35 mm E Connector interface has been accepted for IEEE precision connector standard P287. A manufacturer-independent supply of the new 1.35 mm E Connector is therefore ensured.
Why the E Connector?

**W Connector (1.00 mm Connector)**
- Single-mode operation to 110 GHz (120 GHz)
- Drawbacks
  - Unintended unlocking caused by coarse coupling thread (M 4 x 0.7)
  - Possible connector damage due to (largely tolerated) eccentricities
  - Unnecessarily small / fragile for “low-frequency” applications (70 to 90 GHz)

**E Connector (1.35 mm Connector)**
- Single-mode operation to 65 GHz (70 GHz)
- Robust, reliable design

**Design Goals**
- Frequency range DC to 90 GHz (92 GHz), E-band
- Highly robust
  - Minimum service life of 3000 cycles
  - Locked by a threaded coupling nut that adequately prevents unintended opening
- “Thru-male“ capability, i.e. pin diameter must coincide with the inner conductor of the standard 0.047-inch semi-rigid cable (MIL-DTL-17/151; largest cable covering the E-band; H₁₁-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 testing
  - 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 0.047-inch semi-rigid cable and other standard cables
  => Enables high-quality low-budget jumper cables with captive connector
## Comparison of Connector Systems

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>1.85 mm</th>
<th>1.35 mm</th>
<th>1.00 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper operating frequency</td>
<td>65 (70) GHz</td>
<td>90 (92) GHz</td>
<td>110 (120) GHz</td>
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<tr>
<td>Cut-off frequency</td>
<td>72 GHz</td>
<td>99 GHz</td>
<td>133 GHz</td>
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<tr>
<td>Outer conductor diameter</td>
<td>1.85 mm</td>
<td>1.35 mm</td>
<td>1.00 mm</td>
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<tr>
<td>Inner conductor diameter</td>
<td>0.8036 mm</td>
<td>0.586 mm</td>
<td>0.434 mm</td>
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<tr>
<td>Pin diameter</td>
<td>511 µm</td>
<td>290 µm</td>
<td>250 µm</td>
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<tr>
<td>Thread</td>
<td>M 7 x 0.75</td>
<td>M 5.5 x 0.5</td>
<td>M 4 x 0.7</td>
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<tr>
<td>Coupling torque</td>
<td>0.9 N m (IEEE)</td>
<td>0.9 N m</td>
<td>0.45 N m (IEEE)</td>
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<tr>
<td>Flat wrench size</td>
<td>8 mm</td>
<td>8 (7) mm</td>
<td>6 mm</td>
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<tr>
<td>Optional push-pull locking</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Connections</td>
<td>5000 (IEEE)</td>
<td>&gt; 3000</td>
<td>3000 (IEEE)</td>
</tr>
</tbody>
</table>

### Interface

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- ✔️ Optimized for frequently used bands
- ✔️ Allows „thru-male“ design with multiple cables
- ✔️ Thread and coupling torque prevents unintended opening
Creating a Suitable Environment

- Rotary Joints
- Dial Gauge
- PCB Launch Connectors
- SMD Connectors
- Air Lines
- mmWave-to-Coax Adapters
- Calibration Standards
- Adapters
- Cable Connectors
- Panel Connectors
- Ruggedized Adapters
- Offset Shorts

90 GHz E Connector
<table>
<thead>
<tr>
<th>Description</th>
<th>BN</th>
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<tbody>
<tr>
<td>High-precision calibration kit</td>
<td>BN 534936</td>
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<tr>
<td>Precision adapter 1.35 mm male to 1.00 mm male</td>
<td>BN 534917R000</td>
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<tr>
<td>Precision adapter 1.35 mm male to 1.00 mm female</td>
<td>BN 534918R000</td>
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<td>Precision adapter 1.35 mm female to 1.00 mm male</td>
<td>BN 534919R000</td>
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<tr>
<td>Precision adapter 1.35 mm female to 1.00 mm female</td>
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<td>Precision adapter 1.85 mm male to 1.35 mm male</td>
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<td>Precision adapter 1.85 mm male to 1.35 mm female</td>
<td>BN 534922R000</td>
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<tr>
<td>Precision adapter 1.85 mm female to 1.35 mm male</td>
<td>BN 534923R000</td>
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<tr>
<td>Precision adapter 1.85 mm female to 1.35 mm female</td>
<td>BN 534924R000</td>
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<tr>
<td>Precision adapter waveguide WR 10 to 1.35 mm female</td>
<td>BN 533124</td>
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<tr>
<td>Precision adapter waveguide WR 12 to 1.35 mm female</td>
<td>BN 533126</td>
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<tr>
<td>Precision adapter waveguide WR 15 to 1.35 mm female</td>
<td>BN 533128</td>
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<tr>
<td>Precision adapter waveguide WR 10 to 1.35 mm male</td>
<td>BN 533134</td>
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<tr>
<td>Precision adapter waveguide WR 12 to 1.35 mm male</td>
<td>BN 533135</td>
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<tr>
<td>Precision adapter waveguide WR 15 to 1.35 mm male</td>
<td>BN 533136</td>
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<tr>
<td>Precision adapter waveguide WR 10 to 1.35 mm female ruggedized</td>
<td>BN 533151</td>
</tr>
<tr>
<td>Precision adapter waveguide WR 12 to 1.35 mm female ruggedized</td>
<td>BN 533152</td>
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<tr>
<td>Precision adapter waveguide WR 15 to 1.35 mm female ruggedized</td>
<td>BN 533153</td>
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<tr>
<td>Rotary joint 1.35 mm female</td>
<td>BN 835082</td>
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<tr>
<td>Rotary joint 1.35 mm female with 3-hole flange</td>
<td>BN 8350BQ</td>
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<tr>
<td>Cable connector 1.35 mm for 0.047 inch semi-rigid cable (MIL-DTL-17/151)</td>
<td>BN 534942</td>
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<td>PCB launch connector 1.35 mm female</td>
<td>BN 533416</td>
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<td>Precision adapter 1.35 mm female ruggedized – 1.00 mm male ruggedized</td>
<td>BN 534974</td>
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<td>Precision adapter 1.35 mm female – 1.00 mm female ruggedized</td>
<td>BN 534975</td>
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<td>Dial gauge 1.35 mm male</td>
<td>BN 534940</td>
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<tr>
<td>Dial gauge 1.35 mm female</td>
<td>BN 534941</td>
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<td>Precision offset short male, 5.0mm</td>
<td>BN 534925R000</td>
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<tr>
<td>Precision offset short female, 5.0 mm</td>
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<td>Precision air line male-female, 16.3 mm</td>
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<tr>
<td>Precision air line male-female, 17.8 mm</td>
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<td>Precision air line female-female, 16.3 mm</td>
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<td>Precision air line female-female, 17.8 mm</td>
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<tr>
<td>Panel connector 1.35 mm female-female D-hole</td>
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<tr>
<td>Panel connector WR 12 to 1.35 mm female</td>
<td>BN 533159</td>
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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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