

Environmental Requirements

NOTE Samples of this product have been type-tested in accordance with the Agilent Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation and end-use; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power-line conditions. Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.

Table 2-1 Environmental Requirements

Parameter	Required Values/Ranges
Temperature	
Operating ^a	+20 °C to +26 °C
Storage	-40 °C to +71 °C
Error-corrected range ^b	±1 °C of measurement calibration temperature
Altitude	
Operating	< 4,500 meters (*15,000 feet)
Storage	< 15,000 meters (*50,000 feet)
Relative humidity	Type tested, 0% to 95% at 40 °C, non-condensing

- a. The temperature range over which the calibration standards maintain conformance to their specifications.
- b. The allowable network analyzer ambient temperature drift during measurement calibration and during measurements when the network analyzer error correction is turned on. Also, the range over which the network analyzer maintains its specified performance while correction is turned on.

Temperature—What To Watch Out For

Due to the small dimensions of the devices, electrical characteristics will change with temperature. Therefore, the operating temperature is a critical factor in their performance, and must be stable before use.

IMPORTANT Avoid unnecessary handling the devices during use because your fingers are a heat source.

Mechanical Characteristics

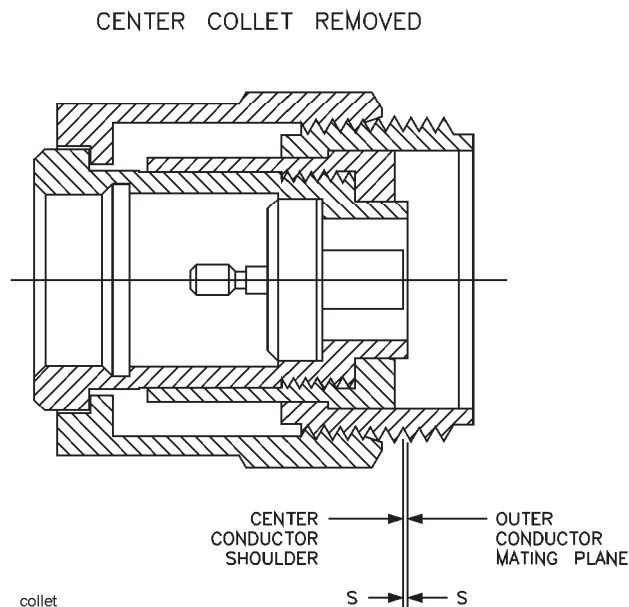
Mechanical characteristics such as center conductor protrusion and airline dimensions are *not warranted* performance specifications. They are, however, important supplemental characteristics related to electrical performance. Agilent Technologies verifies the mechanical characteristics of the devices in this kit with special gaging processes and electrical testing. This ensures that the device connectors do not exhibit any improper pin depth when the kit leaves the factory.

“Gaging Connectors” on page 3-6 explains how to use gages to determine if the kit devices have maintained their mechanical integrity. Refer to Table 2-2 on page 2-4 for typical and observed pin depth limits.

Center Conductors

In 7 mm connectors, the maximum allowable protrusion of the center conductor with the center conductor collet in place is 0.015 inches. The minimum protrusion required is 0.002 inches.

Figure 2-1 7 mm Attenuators



S = recession of the center conductor shoulder behind the outer conductor mating plane

NOTE The factory uncertainty of the numbers given in the following table is less than ± 0.0001 inch. Gage accuracy is also ± 0.0001 inch.

Table 2-2 Connector Pin Depths

Connectors	Allowable Recession	
	millimeters	inches
Attenuators center collet removed	0.0000 to +0.0500	0.000 to +0.0020
Airlines ^a center pin removed	+0.0025 ^b to -0.0100	+0.0001 ^b to -0.0004

- a. The relationship between the length of the inner conductor and the length of the outer conductor determines the airline center conductor recession. Refer to [“Gaging the Airline” on page 3-10](#).
- b. In this case, the center conductor is 0.0001 inch (0.0025 mm) longer than the outer conductor.

Using these mechanical dimensions, you can calculate the expected electrical performance with the equations in the following publications:

- Nelson, Robert E., and Marlene R. Coryell, "Electrical Parameters of Precision, Coaxial, Air-Dielectric Transmission Lines", U.S.National Bureau of Standards Monograph No. 96.
- Somlo, P.L., "The Computation of Coaxial Line Step Capacitances", IEEE Transactions on Microwave Theory and Techniques, Volume MTT-15, No. 1, January, 1967.

The measurement method in these publications provides a general idea of the expected device characteristic impedance. Variations in connector interfaces can have a large effect on your actual electrical measurements.

Airline Mechanical Characteristics

The dimensions of the airline outer conductor are shown in [Figure 2-2](#). This outer conductor is common to both airlines. Two conductors are provided with the kit.

The dimensions of the 50 Ω airline and the 25 Ω mismatch airline are shown in [Figure 2-3](#) and [Figure 2-4](#).

CAUTION The center and outer conductors of the airlines in this kit have been mechanically measured and matched. Do *not* use the center or outer conductors provided in this kit with a center or outer conductor from any other airline. Damage to the airline or attaching connector may result.

Figure 2-2 Airline Outer Conductor

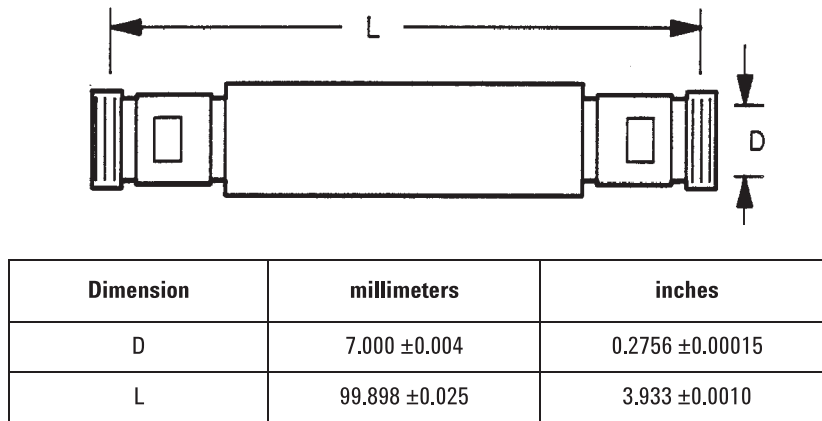


Figure 2-3 50 Ω Airline Center Conductor

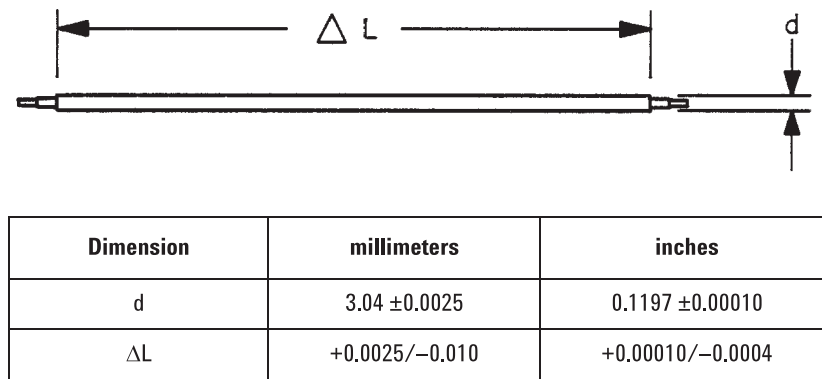
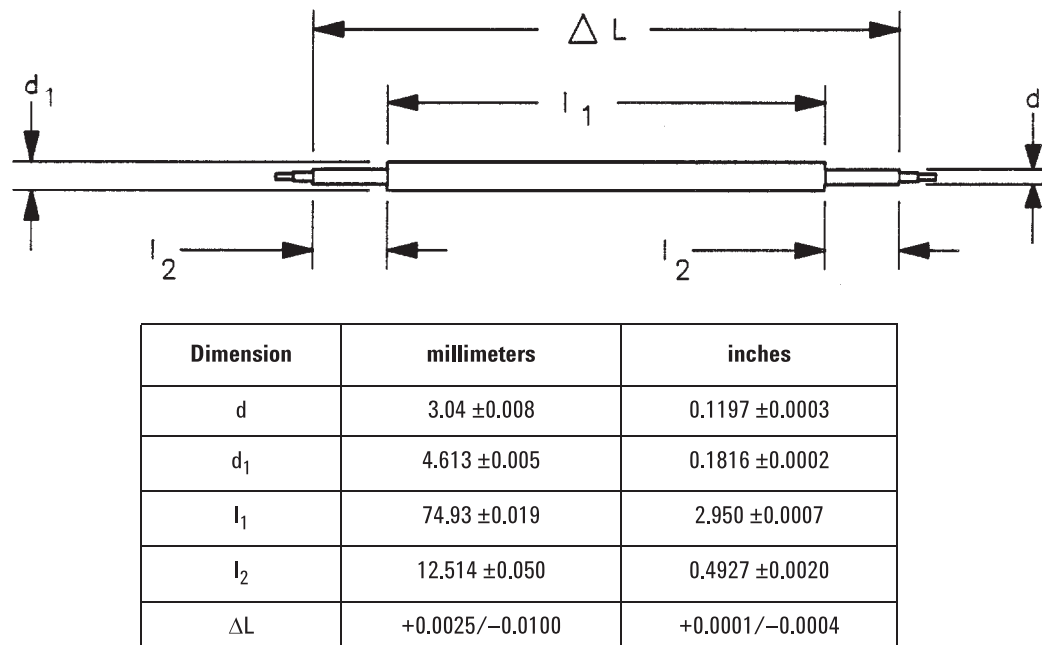


Figure 2-4 25 Ω Mismatch Airline Center Conductor



Electrical Specifications

At the factory, each verification device is electrically characterized on a PNA measurement system. These factory measurements are traceable to the National Institute of Standards and Technology (NIST) through mechanical and electrical paths (for more information on traceability, contact Agilent Technologies. Refer to [“Contacting Agilent” on page 5-5](#)).

The factory-measured data for each device is supplied in print and on USB drive with your kit.