Agilent / HP 85033E

2 Specifications

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Environmental Requirements

Table 2-1 Environmental Requirements

Parameter	Limits
Operating Temperature[a]	+15 °C to +35 °C (+59 °F to +95 °F)
Error-Corrected Temperature Range[b]	±1 °C of measurement calibration temperature
Storage Temperature	–40 °C to +75 °C (–40 °F to +167 °F)
Altitude	
Operation	< 4,500 meters (≈15,000 feet)
Storage	< 15,000 meters (≈50,000 feet)
Relative Humidity	Always Non-Condensing
Operation	0 to 80% (26 °C maximum dry bulb)
Storage	0 to 95%

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

Changes in temperature can affect electrical characteristics. Therefore, the operating temperature is a critical factor in performance. During a measurement calibration, the temperature of the calibration devices must be stable and within the range shown in Table 2-1.

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

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Mechanical Characteristics

Mechanical characteristics such as center conductor protrusion and pin depth are *not* 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 center conductor protrusion or improper pin depth when the kit leaves the factory.

"Gaging Connectors," on page 3-7 explains how to use gages to determine if the kit devices have maintained their mechanical integrity. (Refer to Table 2-3 on page 2-4 for typical and observed pin depth limits.)

Table 2-2 Mechanical Characteristics

Dimension	Typical Value
Inside diameter of outer conductor	3.5 ±0.0025 mm
Outside diameter of center conductor	1.5199 ±0.002 mm
Pin depth[a]: male devices	0 to 0.0127 mm
Pin depth[a]: female devices	–0.0025 to –0.0254 mm

a. See Figure 2-1 on page 2-4.

Pin Depth

Pin depth is the distance the center conductor mating plane differs from being flush with the outer conductor mating plane. See Figure 2-1. The pin depth of a connector can be in one of two states: either protruding or recessed. **Protrusion** is the condition when the center conductor extends beyond the outer conductor mating plane, and will measure a positive value on the connector gage. **Recession** is when the center conductor is set back from the outer conductor mating plane and will measure negative.

The pin depth value of each calibration device in this kit is not specified, but is an important mechanical parameter. The electrical performance of the device depends, to some extent, on its pin depth. The electrical specifications for each device in this kit take into account the effect of pin depth on the device's performance. Table 2-3 lists the typical pin depths and measurement uncertainties, and provides observed pin depth limits for the devices in the kit. If the pin depth of a device does not measure within the *observed* pin depth limits, it may be an indication that the device fails to meet electrical specifications. Refer to Figure 2-1 for a visual representation of proper pin depth (slightly recessed).

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Figure 2-1 Connector Pin Depth

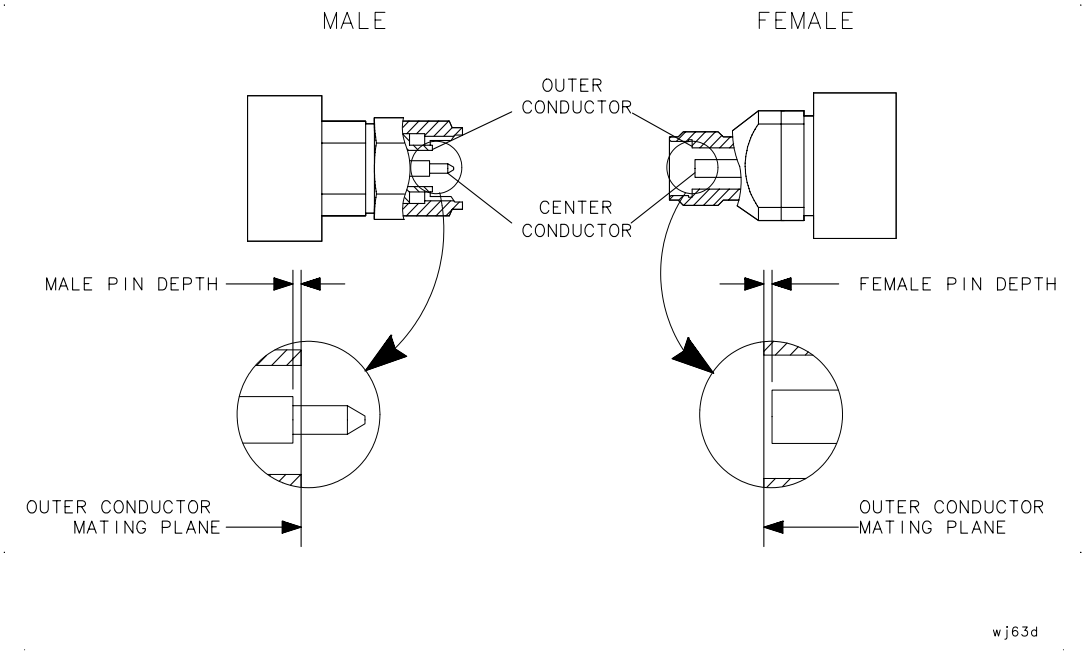

Table 2-3 Pin Depth Limits

Device	Typical Pin Depth	Measurement Uncertainty[a]	Observed Pin Depth Limits[b]
Opens	0 to –0.0127 mm 0 to –0.0005 in.	+0.0064 to –0.0064 mm +0.00025 to –0.00025 in.	+0.0064 to –0.0191 mm +0.00025 to –0.00075 in.
Shorts	0 to –0.0127 mm 0 to 0.0005 in.	+0.0041 to –0.0041 mm +0.00016 to –0.00016 in.	+0.0041 to –0.0168 mm +0.0016 to –0.00066 in.
Fixed Loads	–0.0025 to –0.0254 mm –0.0001 to –0.001 in.	+0.0041 to –0.0041 mm +0.00016 to –0.00016 in.	+0.0016 to –0.02953 mm +0.00006 to –0.00116 in.
Adapters (3.5 mm end)	–0.0025 to –0.0508 mm –0.0001 to –0.002 in.	+0.0041 to –0.0041 mm +0.00016 to –0.00016 in.	+0.0016 to –0.0549 mm +0.00006 to –0.00216 in.
Adapters (APC-7 end)	0 to -0.0508 mm 0 to -0.0020 in.	+0.0038 to -0.0038 mm -0.00015 to -0.00015 in.	+0.0038 to -0.0546 mm +0.00015 to -0.00215 in.
Adapters (type-N end)	0 to -0.0127 mm 0 to -0.0005 in.	+0.0038 to -0.0038 mm +0.00015 to -0.00015 in.	+0.0038 to -0.0165 mm +0.00015 to -0.00065 in.

a. Approximately +2 sigma to –2 sigma of gage uncertainty based on studies done at the factory according to recommended procedures.
b. Observed pin depth limits are the range of observation limits seen on the gage reading due to measurement uncertainty. The depth could still be within specifications.

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Electrical Specifications

The electrical specifications in Table 2-4 apply to the devices in your calibration kit when connected with an Agilent precision interface.

Table 2-4 Electrical Specifications for 3.5 mm Devices

Device	Specification	Frequency (GHz)
Broadband Loads	Return Loss ≥46 dB (ρ ≤0.005)	DC to ≤2
(male and female)	Return Loss ≥44 dB (ρ ≤0.006)	>2 to ≤3
	Return Loss ≥38 dB (ρ ≤0.013)	>3 to ≤9
Offset Opens[a]	±0.55 ° from Nominal	DC to ≤2
(male and female)	±0.65 ° from Nominal	>2 to ≤3
	±0.85 ° from Nominal	>3 to ≤6
	±1.00 ° from Nominal	>6 to ≤9
Offset Shorts[a]	±0.48 ° from Nominal	DC to ≤2
(male and female)	±0.50 ° from Nominal	>2 to ≤3
	±0.55 ° from Nominal	>3 to ≤6
	±0.65 ° from Nominal	>6 to ≤9

a. The specifications for the opens and shorts are given as allowed deviation from the nominal model as defined in the standard definitions (see Table A-3 in Appendix A).

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Supplemental Characteristics

Supplemental characteristics are provided as additional information that may be helpful in applying the devices. These characteristics are typical of most devices but are not warranted. Table 2-5 lists the typical characteristics of the adapters.

Table 2-5 Supplemental Electrical Characteristics of the Adapters

Adapter	Return Loss, Typical	Frequency (GHz)
Option 100		
3.5 mm female to female	Return Loss ≥32 dB (ρ ≤0.025)	DC to 26.5
Option 200		
3.5 mm male to male	Return Loss ≥32 dB (ρ ≤0.025)	DC to 26.5
Option 300		
3.5 mm male to female	Return Loss ≥32 dB (ρ ≤0.025)	DC to 26.5
Option 400		
Type-N male to 3.5 mm male	Return Loss ≥28 dB (ρ ≤0.040)	DC to 18
Type-N male to 3.5 mm female	Return Loss ≥28 dB (ρ ≤0.040)	DC to 18
Type-N female to 3.5 mm female	Return Loss ≥28 dB (ρ ≤0.040)	DC to 18
Type-N female to 3.5 mm male	Return Loss ≥24 dB (ρ ≤0.060)	DC to 18
Option 500		
3.5 mm male to APC-7	Return Loss ≥34 dB (ρ ≤0.20)	DC to 18
3.5 mm female to APC-7	Return Loss ≥28 dB (ρ ≤0.040)	DC to 18

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST) to the extent allowed by the institute's calibration facility, and to the calibration facilities of other International Standards Organization members. See "How Agilent Verifies the Devices in This Kit," on page 4-2 for more information.

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