

Keysight 11923A 1.0 mm Connector Launch Assembly

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Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.









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	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
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	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
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1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.

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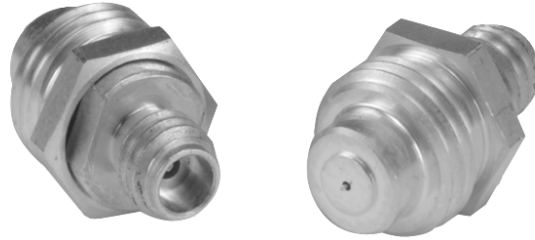
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1

General Information



Connector Launch Overview

The 11923A 1.0-mm female connector launch assembly is designed for ultra-high frequency (up to 110 GHz) coaxial signal transmission into a microstrip package. The launch assembly facilitates designing, building, testing, and troubleshooting high-frequency microcircuits, components, and custom prototypes.

The launch assembly threads into a package or fixture housing. The user is responsible for the machining of the package and installing the launch into the package. Procedures describing the necessary geometry for machining the package wall and instructions for mounting the launch are given in Chapter 3.

The launch assembly features a 1.0-mm female connector on one end and a gold-plated pin interface to the microcircuit on the other.

- The 1.0-mm center conductor is supported by a low-loss plastic bead. The connector interface utilizes an air dielectric for the highest accuracy and repeatability, and is designed to meet or exceed the IEE Std 287 Precision Coaxial Connector GPC grade specifications.
- The launch assembly contains a glass-to-metal seal soldered inside the launch housing. The gold-plated pin on the launch extends inside the package or fixture for connection onto the circuit.

Serial Numbers

A serial number label is attached to the foam-lined box containing the launch. The serial number is made up of five numbers and is unique to each adapter.

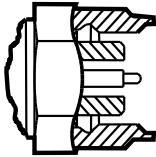
Incoming Inspection

Keysight Technologies will arrange for repair or replacement of incomplete or damaged shipments without waiting for a settlement from the transportation company. When you send a device to Keysight Technologies, include the following information:

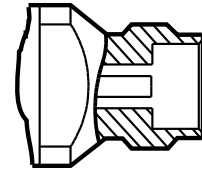
- Your company name and address.
- A technical contact person within your company, and the person's complete phone number.
- If you are returning one or more devices, include the part numbers and serial numbers.
- Indicate the type of service required.
- Include any applicable information.

Clarifying Connector Sex

In this manual, connectors are referred to in terms of their device sex.



Male Connector



Female Connector

Figure 1-1 Male and Female Connectors

2

Specifications

Electrical Specifications

Electrical specifications are performance standards or limits against which the launch assemblies are tested.

Table 2-1 *Electrical Specifications*

	Frequency	Value
Insertion loss	dc to 110 GHz	-1.0 dB

Supplemental Characteristics

Supplemental characteristics are values which are typically met by the majority of the launches tested at Keysight Technologies. These supplemental characteristics are intended to provide useful information. They are typical but non-warranted performance parameters.

Center Conductor Protrusion and Pin Depth

The supplemental mechanical characteristics such as center conductor protrusion and pin depth are important supplemental characteristics related to electrical performance. Pin depth is measured mechanically and verified by electrical testing. This ensures that the 1.0-mm connector does not exhibit any center conductor protrusion and has proper pin depth when it leaves the factory.

Table 2-2 *Supplemental Electrical Characteristics*

Characteristic	Frequency	Typical Value
Return loss	dc to 110 GHz	-16 dB
Maximum power	dc to 110 GHz	6 W

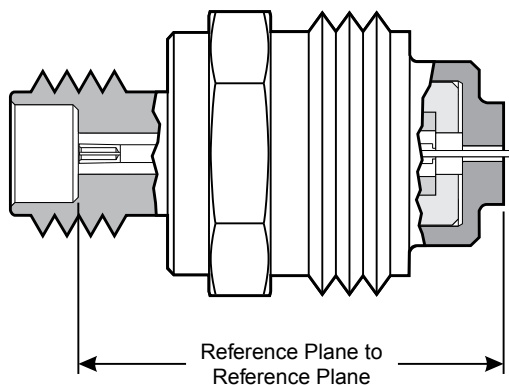


Table 2-3 Supplemental Mechanical Characteristics

Characteristic	Typical Value
Inside diameter of 1.0-mm outer conductor	1.000 ± 0.005 mm
Outside diameter of center conductor	0.434 ± 0.005 mm
Length of outer conductors ¹	10.34 mm (nominal)
Inside diameter of launch body feedthru	0.38 ± 0.010 mm
Outside diameter of launch pin	0.162 ± 0.005 mm
1.0-mm female connector pin depth	0 (flush) to 0.025 mm (maximum recession)
Launch pin extension	0.32 ± 0.05 mm
Flatness of reference plane	0.010 mm (worst case)
Flatness of end of launch body	0.010 mm (worst case)

1. Reference place to reference plane

Environmental Requirements

Table 2-4 Environmental Requirements

Parameter	Required Values/Ranges
Operating temperature	0 to 55 °C (32 to 131 °F)
Storage temperature	–40 to +75 °C (–40 to +167 °F)
Altitude	
Operation	< 15,000 meters (≈ 50,000 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 90%

Temperature—What To Watch Out For

Due to the critical dimensions and tight tolerances of the 1.0-mm connector, electrical characteristics will change with temperature. The operating temperature is a critical factor in the performance during measurements and between calibrations.

CAUTION

Remember your fingers are a heat source, so avoid handling the devices unnecessarily.

Specifications

3

Mounting the Launch

Creating the Package or Fixture Wall

The launch is designed to be threaded into a 5-mm thick package wall. The user is responsible for machining the package and installing the launch.

Figure 3-1 shows the machining detail for creating the package wall.

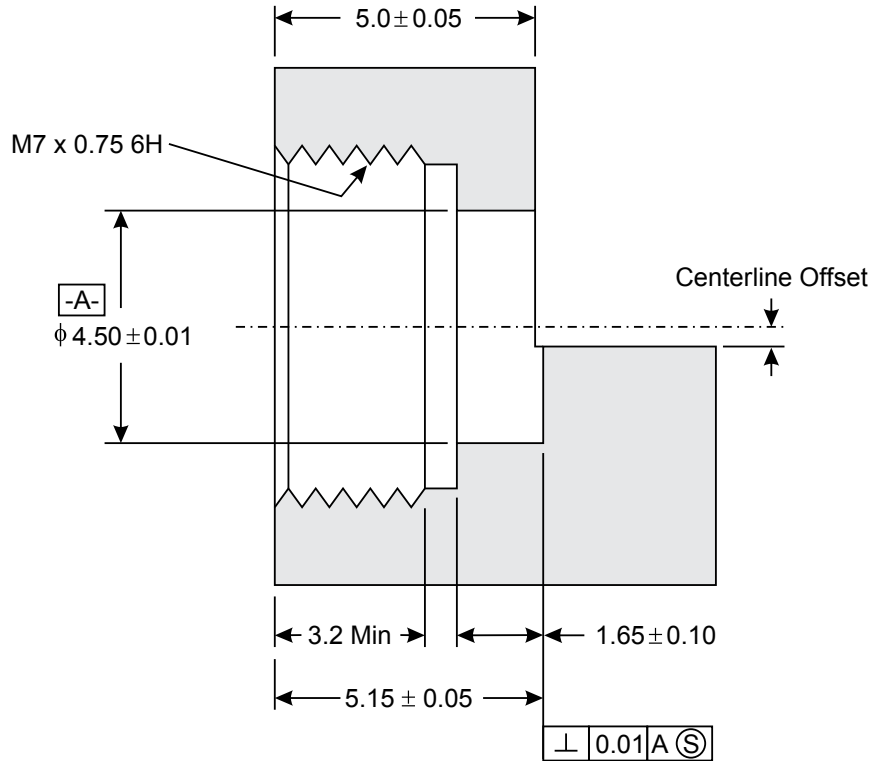


Figure 3-1 Section View of Machining Detail for the Package Wall

The following machining details are recommended to provide optimum connections. All measurements are in millimeters (mm).

- The bottom of the 4.50 diameter hole must be flat for proper grounding.
- The edge between the package floor and the 4.50 diameter hole must be carefully deburred with a minimum corner break.
- The centerline offset between the threaded and the package floor is calculated as follows:

$$\text{Offset} = \text{substrate thickness} + 0.081 \text{ (radius of pin)} + 0.075 \text{ (clearance for solder flow)}$$

- Gold plating is recommended for conductivity and corrosion protection.

Threading the Launch into the Package or Fixture

CAUTION

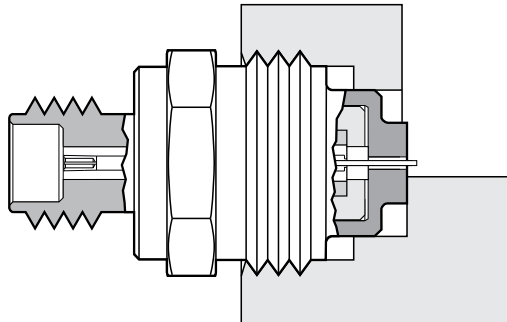
If you need a quasi-hermetic seal or you want to permanently retain the launch assembly in the package or fixture, epoxy may be applied to the threads of the launch prior to installation. Use heat to cure the epoxy, if necessary.

Do not overheat. The dielectric material in the support bead is capable of withstanding 125 °C for prolonged periods and 150 °C for short periods.

1. Hand thread the launch all the way into the package or fixture wall and then reverse thread 1/8 turn or 45 degrees of rotation to allow for final tightening with a torque wrench.
2. Use a 7-mm torque wrench* on the hex portion of the launch body to thread it into the package wall. Tighten the launch into the package with 56 N-cm (5 in-lb) of torque. Refer to “Using the Torque Wrench” on page 4-10 for the recommended procedure.

This is enough to create a slight deformation where the launch contacts the package floor to assure a good ground connection.

* This torque wrench is not available from Keysight Technologies. Refer to Table 5-1 for supplier information.



Mounting the Circuit Inside the Package

CAUTION

1. Clean all surfaces with alcohol and blow them dry with filtered compressed air.
2. For the best match, place the edge of the circuit 0.022 ± 0.008 mm from the end of the outer body of the launch. Refer to Figure 3-2.
3. Slide the circuit under the launch pin. Align it so that the launch pin is directly over the signal trace.
4. Affix the circuit to the package body with electrically conductive epoxy.

Do not overheat. The dielectric material in the support bead is capable of withstanding 125 °C for prolonged periods and 150 °C for short periods.

5. Complete the signal path by soldering the launch pin to the signal trace.

OR

Complete the signal path by gold ribbon bond attachment. For best performance, size the gold ribbon to match the dimensions of the launch pin and the signal trace.

NOTE

If solder is used, it is important to control the volume of the solder flow to match the size of the launch pin and the signal trace. Be careful to avoid too much solder (capacitive) or too little (inductive).

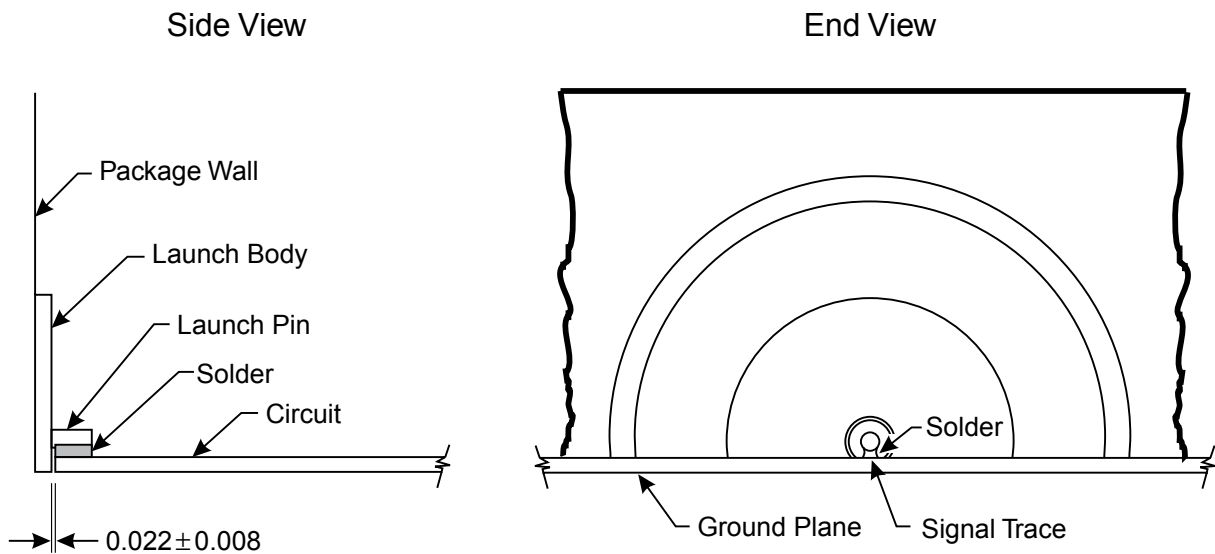


Figure 3-2 Circuit Mounting Detail

Mounting the Launch

4

Making Connections

Electrostatic Discharge

Protection against ESD (electrostatic discharge) is essential while cleaning, inspecting, or connecting any connector attached to a static-sensitive circuit (such as those found in test sets).

Static electricity builds up on the body, and can easily damage sensitive internal circuit elements when discharged by contact with the center conductor of a connector. Static discharges too small to be felt can cause permanent damage. Devices such as calibration and verification components, and devices under test can also carry an electrostatic charge.

- Always have a grounded antistatic mat in front of your test equipment and wear a grounded wrist strap attached to it.
- Ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port briefly to discharge static from your body.
- Discharge static electricity from a device before connecting it. Touch the device briefly (through a resistor of at least 1 M Ω) to either the outer shell of the test port, or to another exposed ground. This discharges static electricity and protects test equipment circuitry.

Preventive Maintenance

The best techniques for maintaining the integrity of 1.0-mm connectors is to include routine visual inspection (using 10X magnification), cleaning, and proper connection techniques using the procedures in the following sections.

Failure to detect and remove dirt or metallic particles on a mating plane surface can degrade repeatability and accuracy, and can damage any connector mated to it. Improper connections resulting from poor connection techniques can also damage these devices.

Connector cleaning supplies and electrostatic discharge safety supplies are *not* provided but can be ordered separately. For cleaning and inspection, a 10X magnifying glass is available. (Refer to [Chapter 5, "Replaceable Parts"](#) for ordering information.)

Visual Inspection

Visual inspection, and if necessary, cleaning should be done every time a connection is made. Metal particles from the connector threads may fall into the connector when it is disconnected. One connection made with a dirty or damaged connector can damage both connectors beyond repair.

Required Inspection Tools

A minimum magnification of 10X is required to inspect the mating surfaces, connector contacts, and concentricity of the 1.0-mm connectors. It is also necessary to use good lighting (such as a halogen task light) to see the damage on a connector. Use the guidelines in **“Obvious Defects or Damage”** when evaluating the integrity of your connectors.

Obvious Defects or Damage

Examine the connectors first for obvious defects or damage:

- Plating
 - Bare metal showing
 - Burrs or blisters
- Deformed threads
- Center Conductors
 - Bent
 - Broken
 - Misaligned
 - Concentricity

Connector nuts should move smoothly and be free of:

- Burrs
- Loose metal particles
- Rough spots

Any connector that has obvious defects should be discarded. See **Figure 4-1**, **Figure 4-2**, and **Figure 4-3** for visual inspection guidelines.

Connector Contacts

Refer to **Figure 4-1** for visual guidelines to aid you in evaluating the contact integrity of a connector.

Take careful note of the location of the cross hairs in relationship to the center of the following figures.

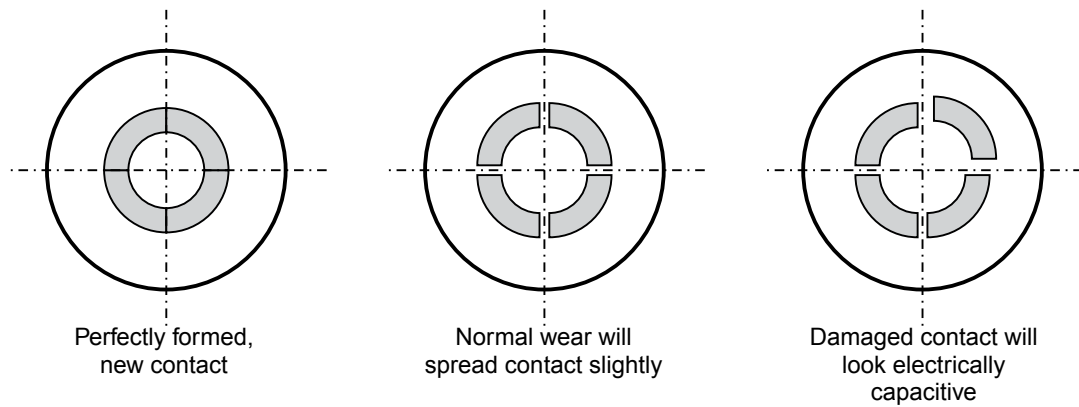


Figure 4-1 Contact Integrity

Concentricity

Figure 4-2 and **Figure 4-3** show the concentricity of both the male and female 1.0-mm connectors.

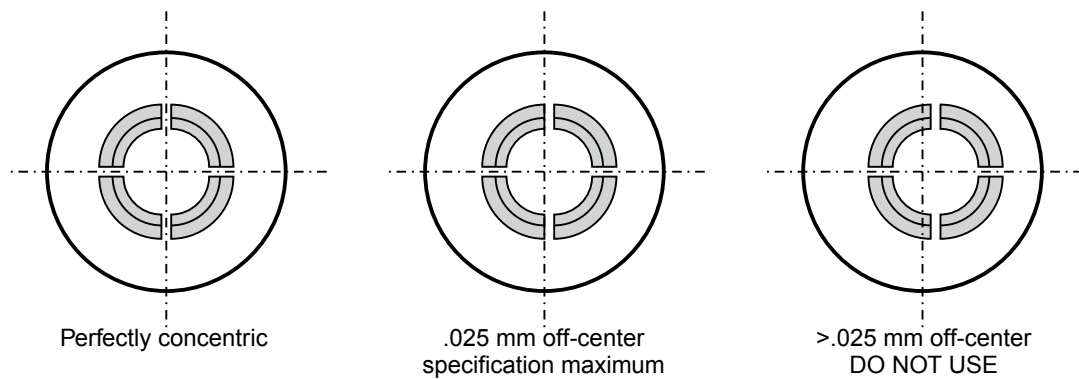


Figure 4-2 Concentricity - Female Connector

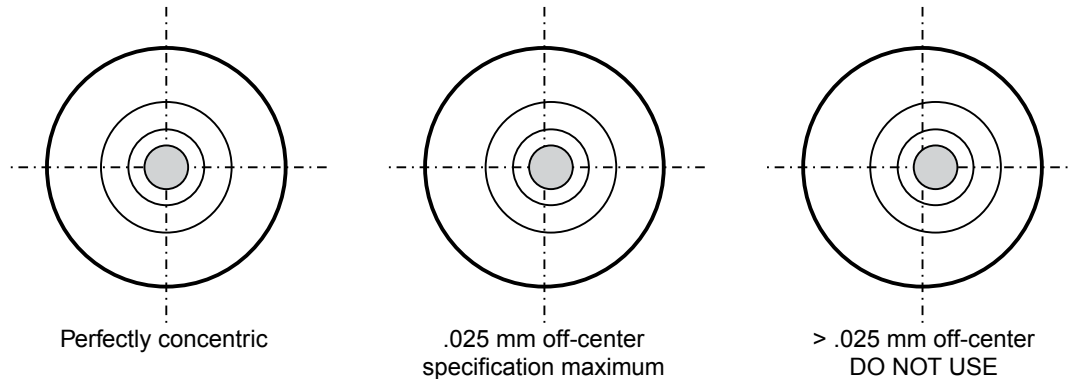


Figure 4-3 *Concentricity - Male Connector*

Mating Plane Surfaces

Flat contact between the connectors at all points on their mating plane surface is required for a good connections.

Look for deep scratches or dents, and for dirt and metal particles on the connector mating plane surfaces. Also look for “dings” on the mating plane surfaces of the center and outer conductors, and for signs of damage due to misalignment and excessive or uneven wear.

A light burnishing of the mating plane surface is normal. This is evident as light scratches, or shallow circular marks distributed more or less uniformly over the mating plane surface. Other small defects and cosmetic imperfections are also normal. None of these affect electrical or mechanical performance.

Clean and inspect the connector again if it shows:

- Deep scratches or dents
- Particles clinging to the mating plane surface
- Uneven wear

Damaged Connectors

Before you connect a new, undamaged connector in the same configuration, try to determine the cause of the damaged connector to eliminate other connector problems. Damaged connectors should be discarded.

Connector Wear

Connector wear eventually degrades performance. The more use a connector gets, the faster it wears and degrades. The wear is greatly accelerated when connectors are not kept clean. When your connectors become worn, replace them.

Pin Depth

Pin depth is the distance that the center conductor mating plane differs from being flush with the outer conductor mating plane. The pin depth of a connector can be in one of two states, either protruding or recessed.

Protrusion and Recession

- **Protrusion** - the center conductor *extends* beyond the outer conductor mating plane.

NOTE

At *no* time should the pin depth of the 1.0 mm connector be protruding.

- **Recession** - the center conductor is *set back* from the outer conductor mating plane.

The pin depth value of each connector was verified to be within factory specifications at shipment. The electrical performance of the connector depends, to some extent, on its pin depth. The electrical specifications take into account the effect of pin depth on the performance of the connector.

Figure 4-4 shows a visual representation of proper pin depth (slightly recessed).

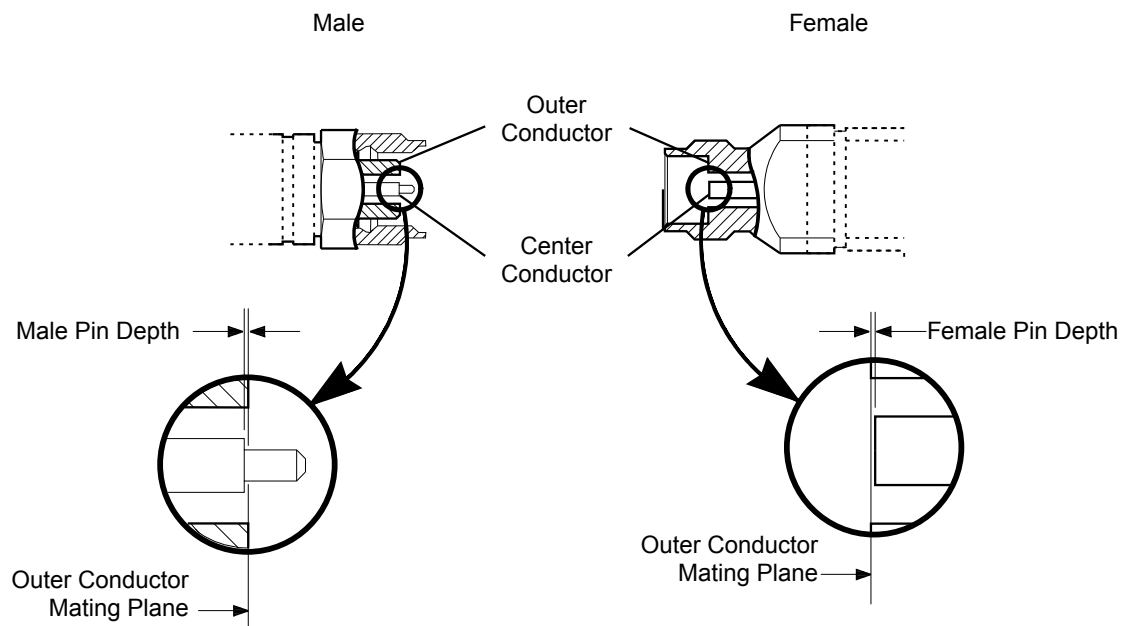


Figure 4-4 Connector Pin Depth

Connector Alignment

Good connections require a skilled operator. Instrument sensitivity and coaxial connector mechanical tolerances are such that slight errors in operator technique can have a significant effect on measurements and measurement uncertainties.

NOTE

The most common cause of measurement error is poor connections.

Follow these recommendations for optimum connection technique:

1. Clean and inspect (visually and mechanically) all of your connectors.
2. Carefully align the connectors. Look for flat physical contact at all points on the mating plane surfaces.

NOTE

If one of the 1.0-mm connectors is free to move, self-alignment is possible during connection. Self-alignment occurs because outer conductors engage before the center conductors (refer to [Figure 4-5](#) and [Figure 4-6](#)).

3. Make a gentle, preliminary connection.
4. When making a connection, turn *only* the connector nut. Do not rotate a device when you make a connection, and do not apply a lateral or horizontal (bending) force.
5. Use an open-end wrench to keep the device from rotating when you make a final connection with the torque wrench.

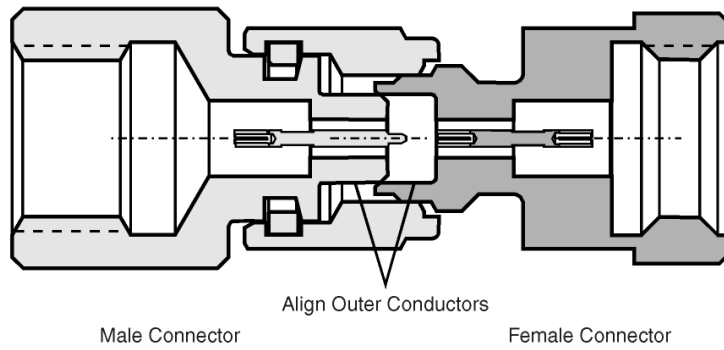


Figure 4-5 Alignment

Connector Misalignment

Forced misalignment could damage the female center conductor.

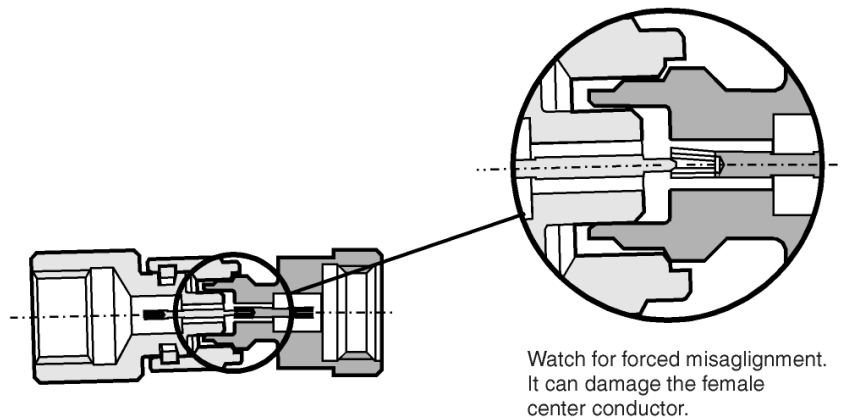


Figure 4-6 Forced Misalignment

NOTE

To achieve misalignment as shown in **Figure 4-6** you must use *excessive* force.

Cleaning Connectors

Supplies and Equipment Needed

The supplies and equipment that are needed to perform the cleaning procedures, and their Keysight Technologies part numbers are listed in [Table 5-1 on page 5-1](#).

NOTE

A minimum magnification of 10X is required for all inspections of the 1.0-mm connector parts.

Basic Cleaning Procedure

1. Inspect the connector for dust, dirt, metal fragments, oils or films, and debris.
2. Blow off any dust with a filtered, clean supply of compressed air.
3. Add a few drops of high-purity isopropyl alcohol to small cleaning swab (do not apply alcohol directly to the parts).

NOTE

When using isopropyl alcohol to clean connectors *do not* allow liquid to flow down inside the connector. This may cause measurement errors due to residue inside the connector. If possible keep the connector facing down.

4. *Gently* wipe connecting surfaces with the end of the cleaning swab (refer to [Figure 4-7](#)).
5. Blow dry with a clean supply of compressed air.
6. Inspect and repeat cleaning procedure if necessary.

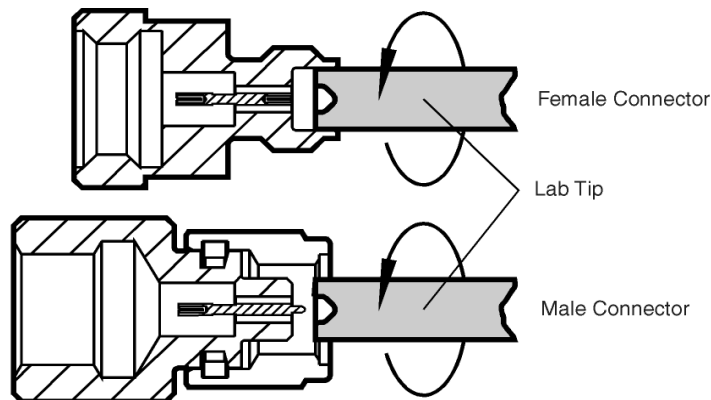


Figure 4-7 Cleaning Illustration

Connection Procedure

Connection Procedure

1. Ground yourself and all devices (wear a grounded wrist strap and work on an antistatic mat).
2. Visually inspect the connectors (refer to “[Visual Inspection](#)” on page 4-2).
3. If necessary, clean the connectors (refer to “[Cleaning Connectors](#)” on page 4-8).
4. Carefully align the connectors. The male connector center pin must slip concentrically into the contact fingers of the female connector (refer to [Figure 4-5](#) and [Figure 4-6](#)).
5. Push the connectors straight together. Do *not* twist or screw them together. As the center conductors mate, there is usually a slight resistance.

CAUTION

Do *not* twist one connector into the other (like inserting a light bulb). This happens when you turn the device body, rather than the connector nut. Major *damage* to the center conductor and the outer conductor can occur if the device body is twisted.

6. Initial tightening can be done by hand, or with an open-end wrench. Tighten until “snug” or where the connectors are first making contact. The preliminary connection is tight enough when the mating plane surfaces make uniform, light contact. Do *not overtighten* this connection.

At this point, all you want is for the outer conductors to make gentle contact on both mating surfaces. Use very light finger pressure (no more than 2 in-lbs of torque).

7. Relieve any side pressure on the connection from long or heavy devices or cables. This assures consistent torque (refer to “[Using the Torque Wrench](#)” on page 4-10).

Using the Torque Wrench

Using the torque wrench guarantees that a connection is not too tight. This will help prevent possible connector damage. It also guarantees that all connections are equally tight each time.

CAUTION

1. Static friction must *not* be present during torquing.
2. *Do not* pre-tighten so much that there is no rotation of the nut with the torque wrench. Leave about 1/8 turn or 45 degrees of rotation for the final tightening with the torque wrench.
3. Rotate *only* the connector nut when you tighten the connector. Use an open-end wrench to keep the body of the device from turning.

Required Wrenches

Table 4-1 provides information on the torque wrench required for making 1.0-mm connections and for the threading the launch into the package wall. Refer to Table 5-1 on page 5-1 for ordering information and part numbers.

Table 4-1 Torque Wrench Information

Connector Type	Torque Setting	Torque Tolerance	Backup Wrench
1.0 mm	45 N-cm (4 in-lb)	±5.4 N-cm (±0.5 in-lb)	6 mm/7 mm
Launch installation	56 N-cm (5 in-lb)	±5.4 N-cm (±0.5 in-lb)	

Torque Wrench Procedure

- To thread the launch into the package wall, use a 7-mm torque wrench on the hex portion of the launch and tighten the launch into the package wall with 56 N-cm (5 in-lb) of torque.
- To make 1.0-mm connections to the launch, use a 6-mm torque wrench to apply the recommended torque to the 1.0-mm male nut while holding the hex portion of the launch with a 7-mm open-end backup wrench.
- To make other 1.0-mm connections, use a 6-mm torque wrench and 6-mm backup wrench (refer to “Connection Procedure” on page 4-9).

Disconnection Procedure

To avoid lateral (bending) force on the connector mating plane surfaces, always support the devices and connections.

1. Use an open-end wrench to prevent the device body from turning.
2. Use another wrench to loosen the connector nut.
3. Complete the disconnection by hand, turning *only* the connector nut.

CAUTION

Do *not* twist one connector out of the other, (like removing a light bulb). Turn the connector nut, not the device body. Major damage to the center conductor and the outer conductor can occur if the device body is twisted.

4. Pull the connectors straight apart without twisting or bending.

Handling and Storage

- Store the connector launch assembly in the original foam-lined box which has the serial number label attached to it.
- Never store the assembly loose in a box, in a desk, or in a bench drawer. This is the most common cause of connector damage during storage.
- Keep connectors clean.
- Do not touch mating plane surfaces. Natural skin oils and microscopic particles of dirt are easily transferred to the connector interface and are very difficult to remove.
- Do not set connectors contact-end down on a hard surface. The plating and the mating plane surfaces can be damaged if the interface comes in contact with any hard surface.

5

Replaceable Parts

NOTE

There are no internal replaceable parts within the launch. The 1.0-mm connector is not considered field repairable. If a unit is in need of repair, a replacement must be purchased.

The following table lists the part numbers necessary for inspection, connection, and ESD protection. To order a listed part, note the description, part number, and the quantity desired. Telephone or send your order to the nearest Keysight Technologies sales and service office listed in [page -v](#).

Table 5-1 Replaceable Parts

Description	Part Number
Items Included With Launch	
<i>Operating and Service Manual</i>	11923-90001
Items Not Included With Launch	
10X magnifying glass	1000-1114
6-mm 4 in-lb torque wrench	8710-2079
6-mm open-end wrench	8710-2156
7-mm 5 in-lb torque wrench	TB OE 7-mm 5lbf-in ¹
7-mm open-end wrench	8710-1761
Cleaning swabs	9300-1745
Isopropyl alcohol (30 ml)	8500-5344
Grounding wrist strap	9300-1367
5-foot grounding cord (for wrist strap)	9300-0980
2 x 4 foot conductive table mat and 15-ft ground wire	9300-0797
ESD heel strap (for conductive floors)	9300-1126

1. Not available from Keysight Technologies. This part number may be ordered from Mountz, San Jose, CA.

Replaceable Parts

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