

Keysight 281A/B Adapters

Operating and
Service Manual

Notices

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Keysight Technologies certifies that this product met its published specifications at the time of shipment. Keysight further certifies that its calibration measurements are traceable to the United States National Institute of Standard and Technology (formerly National Bureau of Standards), to the extent allowed by that organization's calibration facility, and to the calibration facilities of other International Standards Organization members.

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Safety Earth Ground









This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Before Applying Power




Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by an autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

| | | | |
|---|--|---|---|
|  | <p>This symbol indicates that you should refer to the instrument's instruction manual for important information.</p> |  | <p>This symbol indicates hazardous voltages.</p> |
|  | <p>The laser radiation symbol is marked on products that have a laser output.</p> |  | <p>This symbol indicates that the instrument requires alternating current (ac) input.</p> |
|  | <p>This symbol indicates that the power line switch is ON.</p> |  | <p>This symbol indicates that the power line switch is OFF or in STANDBY position.</p> |

Regulatory Markings

| | | | |
|---|--|--|---|
|  | <p>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.</p> |  | <p>The RCM mark is a registered trademark of the Australian Communications and Media Authority.</p> |
|  | <p>The CSA mark is a registered trademark of the Canadian Standards Association.</p> | <p>ISM 1-A</p> | <p>This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4). This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB du Canada</p> |

Waste Electrical and Electronic Equipment (WEEE) Directive

This instrument complies with the WEEE Directive marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit <http://about.keysight.com/en/companyinfo/environment/takeback.shtml> for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/adapters
(product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
(worldwide contact information for repair and service)

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1 Introduction

Product Overview 16

This chapter provides an overview of the Keysight 281A/B Adapters.

Product Overview

Keysight 281 adapters provide a convenient means of coupling between waveguide and coaxial systems. Power can be transmitted in either direction, and each adapter covers the full frequency range of its waveguide size with an SWR of less than 1.30. The flanges are lapped to a slight, controlled convexity to assure minimum leakage at the waveguide joint. A probe transforms the waveguide impedance to the 50- Ω impedance of coaxial line. Complete specifications for the adapters are given in [Table 3-1](#).

Examples of the waveguide flange and coaxial connectors used on these adapters are shown in [Figure 1-1](#). One type of flange and two types of coaxial connectors are used: Type N female connectors (which are compatible with connectors conforming to MILS-71), are available on all 281A adapters and Amphenol precision 7-mm connectors (available on the 281B adapters). The 7-mm connector features precise alignment, a clearly defined reference plane, and low RF leakage. In addition, any pair can be connected together without an adapter. Option 013 adapters have stainless steel Type N female connectors and are available on the P281B.

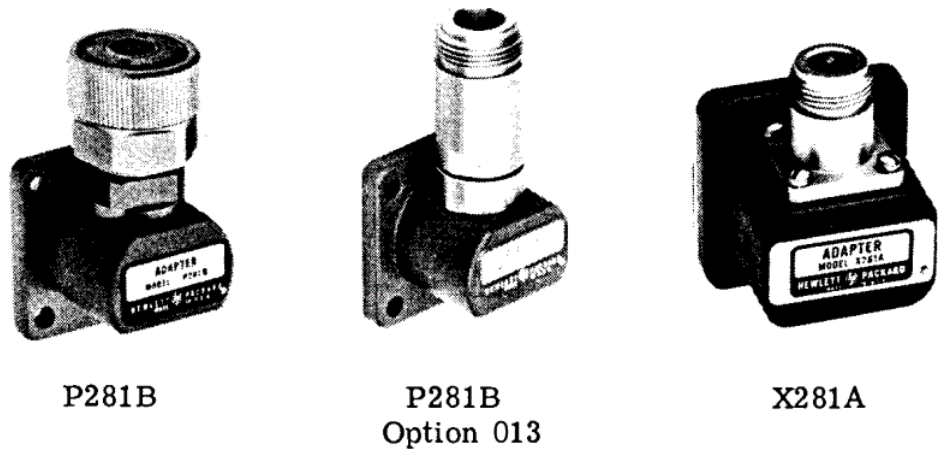


Figure 1-1 Adapters showing flange types and coaxial connector styles

2 Installation

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This chapter provides you important information on how to check and prepare your instrument for operation.

Initial Inspection

- 1 Unpack and inspect the shipping container and its contents thoroughly to ensure that nothing was damaged during shipment. If the shipping container or cushioning material is damaged, the contents should be checked both mechanically and electrically. Check for mechanical damage such as scratches or dents. If the shipping container is not damaged, check the packaging material for signs of stress that indicate rough handling in transit. If the adapter appears undamaged, perform the electrical check.

The electrical performance of the adapter should be checked as soon as possible after receipt against the specifications shown in [Table 3-1](#) on page 22. If the adapter does not perform within the specifications, see the following steps for recommended claim procedure and repackaging the instrument.

- 2 If the contents are damaged or defective, contact your nearest Keysight Technologies Service and Support Office. Refer to [“Sales and Technical Support”](#) on page 7. Keysight Technologies will arrange for repair or replacement of the damaged or defective equipment. Keep the shipping materials for the carrier’s inspection.
- 3 If you are returning the instrument under warranty or for service, repackaging the instrument requires original shipping containers and materials or their equivalents. Keysight Technologies can provide packaging materials identical to the original materials. Refer to [“Sales and Technical Support”](#) on page 7 for the Keysight Technologies nearest to you. Attach a tag indicating the type of service required, return address, model number, and serial number. Mark the container **FRAGILE** to assure careful handling. In any correspondence, refer to the instrument by its model number and serial number.

- 4 If you are repackaging the instrument with commercially available materials, use the following general instructions:
 - a Wrap the adapter in heavy paper or plastic. (If shipping to an Keysight Technologies office or service center, attach a tag indicating the type of service required, return address, model number, and serial number.)
 - b Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.
 - c Use enough shock-absorbing material (3 to 4-inch layer) around all sides of the adapter to provide firm cushioning and prevent movement inside the container.
 - d Seal the shipping container securely.
 - e Mark the shipping container **FRAGILE** to assure careful handling.

Operation

Protect flanges

Care should be taken to protect the face of the flange from any damage that would prevent close surface-to-surface contact. Any burring, denting, or scratching will increase RF leakage and the reflection coefficient of the joint. The supplied plastic cover should be used to protect the flange when the adapter is not in use.

Operating procedure

Use the following procedure when you connect an adapter to a waveguide.

- 1** Make sure the rectangular ports are oriented the same way (i.e., not “cross-guided”).
- 2** Align ports carefully to minimize reflections.
- 3** Clamp or bolt flanges securely together so that pressure is evenly distributed over the contacting surfaces. Loose joints and flange distortion result in leakage and mismatch.

Performance test

The maximum SWR for the adapters are listed in [Table 3-1](#) on page 22. When making these measurements, the test results must be less than those listed in [Table 3-1](#) plus the measurement uncertainty of the measurement system. Measurements may be made using a standard reflectometer setup. To ensure satisfactory performance, make sure flanges and coaxial connectors are not damaged or worn.

3 Specifications

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This chapter provides the specifications of the Keysight 281A/B Adapters.

General Specifications

Physical specifications

| Model | X281A | P281B |
|--------|-------------------|------------------|
| Weight | 0.1 kg (1/4 lb) | 0.1 kg (3/16 lb) |
| Length | 37 mm (1-7/16 in) | 26 mm (1 in) |

Specification

Table 3-1 Specifications

| Model | X281A | P281B |
|--------------------------------------|---------------|----------------------|
| Frequency range (GHz) ^[a] | 8.20 to 12.40 | 12.40 to 18.00 |
| Fits waveguide size: | | |
| Nom. OD (in.) | 1 x 1/2 | 0.702 - 0.391 |
| EIA | WR90 | WR62 |
| Equivalent flange | UG135/U | UG419/U |
| Coaxial connector ^[b] | N female | APC-7 ^[c] |

[a] Maximum reflection coefficient: 0.11 (1.25 SWR) over entire frequency range.

[b] Typical maximum power handling capability for the Type N and APC-7 connectors is 200 W (refer to caution below).

[c] Option 013 furnished with stainless steel Type N female connector.

CAUTION

The power that can be handled will be a function of the size of the center conductor. The majority of the heat flow will be via conduction. The weak point is the coax portion. The waveguide portion is capable of higher power. These numbers are assuming an ambient temperature of 25 °C and an altitude of sea level. Higher ambient temperatures and altitude would degrade power-handling capability.

Mechanical Characteristic

Connector types

Type N connectors

Two versions of the Type N coaxial connector are used on the adapters: one is used on the 281A model, and the other is used in the 281B Option 013 model.

The version on the 281A model is plated brass and is compatible with connectors conforming to MIL-C-71. The version on the 281B Option 013 model is stainless steel and is compatible with connectors conforming to MIL-C-71 or MIL-C-39012.

Dimensions of these connectors are given in [Figure 3-1](#) and [Table 3-2](#).

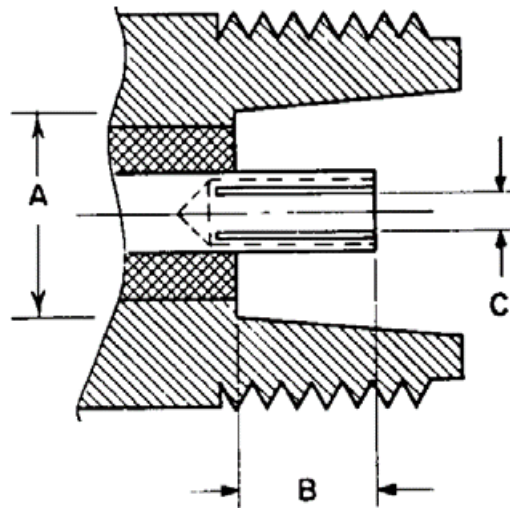


Figure 3-1 Dimensions of Type N connectors

Table 3-2 Dimensions of Type N connectors

| Model | 281A | 281B |
|-------|-----------|-----------|
| A | 0.316 min | 0.316 min |
| | 0.320 max | 0.320 max |
| B | 0.188 min | 0.204 min |
| | 0.206 max | 0.207 max |
| C | 0.063 min | 0.063 min |
| | 0.066 max | 0.066 max |

Precision 7 mm connectors

Except for Option 013, the 281B model adapter has an APC-7 precision 7-mm coaxial connector. These connectors rely on uniform end-to-end contact of both conductors for electrical continuity. Consequently, the condition of the contacting surfaces is critical: they should be kept clean and smooth. To prevent damage when the adapter is not in use, the connector's threaded sleeve should be fully extended.



This information is subject to change without notice. Always refer to the Keysight website for the latest revision.

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