

Agilent X/P/K281C Adapters

**Including Options 006, 012,
013, 106**

**Operating and Service
Manual**

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Introduction

Product Overview 8

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This chapter provides an overview of the Agilent X/P/K281C Adapters.

Product Overview

The X281C, P281C, and K281C 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. A step-like internal structure transforms the waveguide impedance to the 50 Ω impedance of the coaxial line.

Options

Option 006

Option 006 adds two alignment holes to the waveguide flange. The dimensions of the Option 006 alignment holes are provided in the following table.

Table 1-1 Option 006 Alignment Hole Measurement Dimensions

Model	Alignment Hole Diameter "A"	Dimension "B"	Dimension "C"
X281C	3.175 mm (+0.014 to 0.0)	15.49 mm	16.26 mm
P281C	3.175 mm (+0.014 to 0.0)	12.62 mm	12.14 mm
K281C	2.381 mm (+0.014 to 0.0)	8.13 mm	8.51 mm

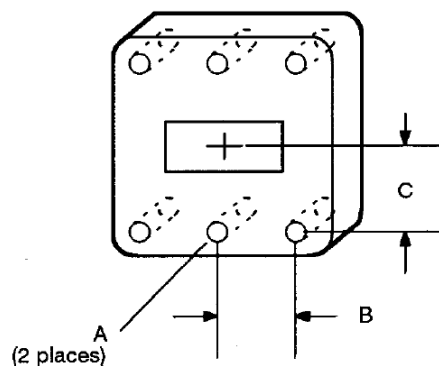


Figure 1-1 K281C Option 006 Waveguide Alignment Holes

Option 012

Option 012 for the X281C offers a Type-N (m) connector to replace the standard 7-mm connector.

Option 012 for the K281C offers a 3.5 mm (m) connector to replace the standard 3.5 mm (f) connector.

Option 013

Option 013 for the X281C offers a Type-N (f) connector to replace the standard 7-mm connector. Option 013 is not offered for the K281C and the P281C.

Option 106

Option 106 is only available for the K281C. It replaces the standard 3.5 mm (f) connector with a 3.5 mm (m) connector and adds two alignment holes to the waveguide flange. The dimensions of the alignment holes are identical to Option 006 for the K281C as shown in [Table 1-1](#).

Instruments Covered by Manual

The adapters covered by this manual have a two part serial number. The first four digits and letter constitute the serial number prefix. The last five digits form the sequential suffix that is unique to each adapter. The contents of this manual apply to adapters prefixed at 3032A and above.

2 Installation

Initial Inspection	12
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This chapter provides you important information on how to check and prepare your instrument for operation.

Initial Inspection

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.

Operation and Safety Precautions

Observe the following guidelines before connecting or operating the adapter.

CAUTION

- Exceeding the allowable energy and power levels may result in damage to the adapter or associated equipment.
 - 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 may increase RF leakage and the reflection coefficient of the waveguide connection. The supplied plastic cover should be used to protect the flange when the adapter is not in use.
 - 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.
-

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; that is, 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 waveguide connections and flange distortion may result in leakage and mismatch.

Performance Test – SWR

The maximum SWR for the adapters are shown in [Table 3-1](#) and [Figure 3-1](#). When making these measurements, the test results must be less than those listed in [Table 3-1](#) plus the measurement uncertainty of the measuring 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.

Adjustments

Adjustments should not be made unless the adapter does not meet specifications, or unless the unit has been physically damaged.

3 Specification

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This chapter provides the specifications of the Agilent X/P/K281C Adapters.

General Specifications

Physical Specifications

Model	X281C	P281C	K281C
Net weight	210 g (7.20 oz)	110 g (4.0 oz)	40 g (1.3 oz)
Dimensions:			
Length	73 mm (2.9 in)	52 mm (2.0 in)	35 mm (1.4 in)
Width	41 mm (1.6 in)	33 mm (1.3 in)	22 mm (0.9 in)
Height	61 mm (2.4 in)	55 mm (2.2 in)	38 mm (1.5 in)
Waveguide size:			
Nominal outer diameter	25.40 x 12.70 (mm) 1.00 x 0.50 (in)	17.83 x 9.93 (mm) 0.70 x 0.39 (in)	12.70 x 6.35 (mm) 0.50 x 0.25 (in)

Specifications

Specifications refer to the performance standards or limits against which the adapter is tested.

Typical characteristics are included for additional information only and they are not specifications. These are denoted as “typical”, “nominal”, or “approximate” and are printed in italic.

Table 3-1 Specifications

Model	X281C	P281C	K281C
Frequency range (GHz)	8.2 to 12.4	12.4 to 18	18 to 26.5
SWR*	< 1.05	< 1.06	< 1.07
(Typical SWR)	(< 1.03)	(< 1.04)	(< 1.05)
Operating temperature	0 to +55 °C	0 to +55 °C	0 to +55 °C

Table 3-1 Specifications (continued)

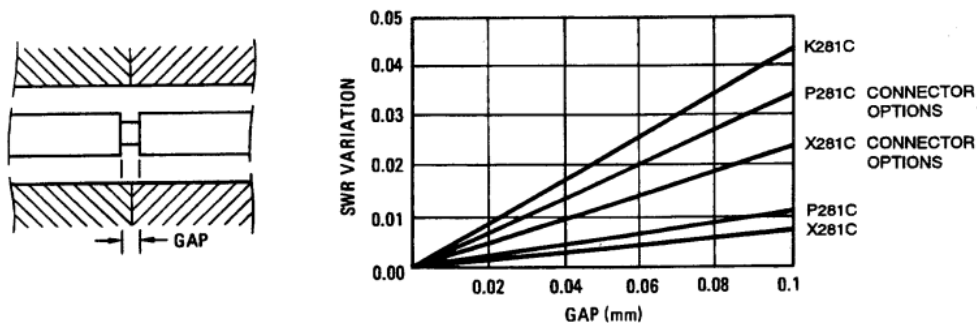
Model	X281C	P281C	K281C
Typical insertion loss	0.08 dB	0.10 dB	0.12 dB
Maximum peak power [†]	200 W	200 W	100 W
EIA	WR90	WR62	WR42
Equivalent flange type	UG-135/U	UG-419/U	UG-597/U
Alignment holes	4 holes (6 holes for option 006 [‡])		
Connector type:			
Standard	7-mm	7-mm	3.5 mm female
Option 012	N-male	Not available	3.5 mm male
Option 013	N-female	Not available	Not available
Option 106	Not available	Not available	3.5 mm male with 6 alignment holes

* Specifications in this table are measured with no gap between the full diameters of the male and female center conductors.

† 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.

‡ Option 006 is only available for the standard connector type.

Figure 3-1 shows the variation in SWR introduced by the center conductor gap.

**Figure 3-1** Typical SWR Variation Versus Center Conductor Gap

Mechanical Characteristic

Mechanical characteristics, such as center conductor protrusion and pin depth, are not warranted performance specifications.

They are however important supplemental characteristics related to the electrical performance of the devices.

Pin Depth

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

Figure 3-2, Figure 3-3, and Figure 3-4 show a visual representation of proper pin depth for connector types for standard and option models.

Table 3-2 Connector Types for Standard and Options

Model	X281C	P281C	K281C
Standard/Option 006	<i>7-mm</i>	<i>7-mm</i>	<i>3.5 mm female</i>
Option 012	<i>N-male</i>	<i>Not available</i>	<i>3.5 mm male</i>
Option 013	<i>N-female</i>	<i>Not available</i>	<i>Not available</i>
Option 106	<i>Not available</i>	<i>Not available</i>	<i>3.5 mm male</i>

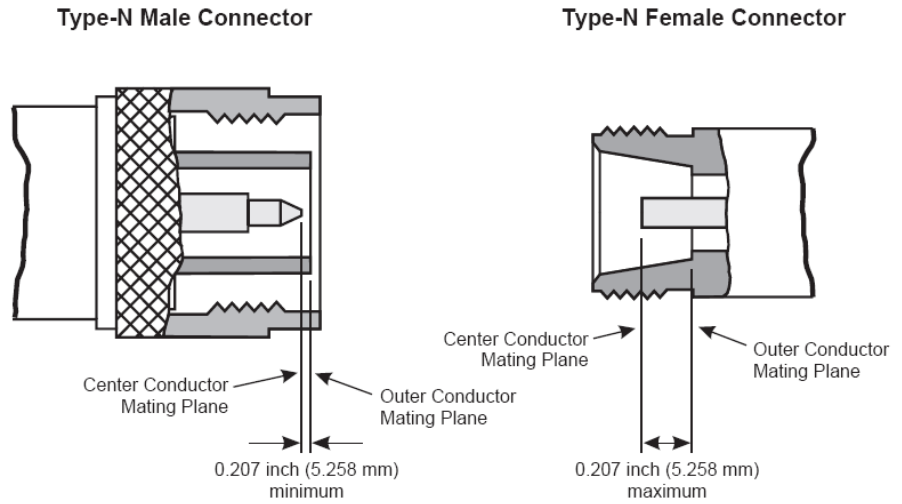


Figure 3-2 Type-N Connectors

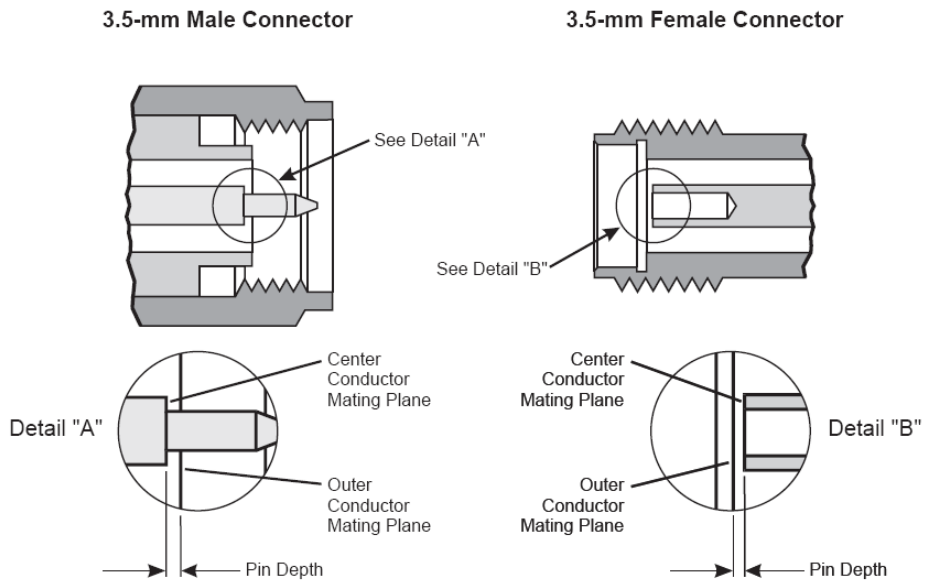


Figure 3-3 3.5-mm Connectors

3 Specification

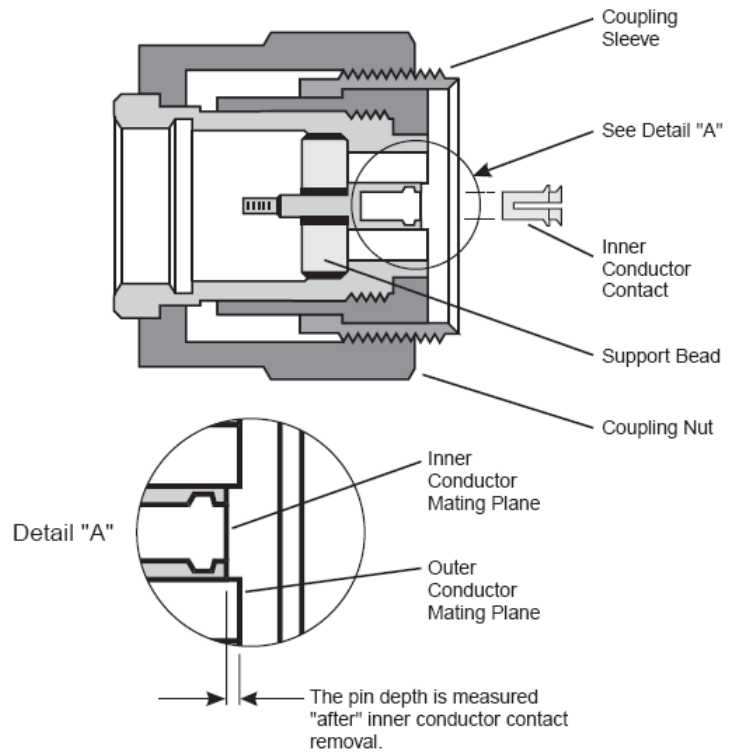


Figure 3-4 7-mm Connector

Environmental Specifications

The Agilent X/P/K281C adapters are designed to fully comply with Agilent Technologies's product operating environmental specifications. The following are the summarized environmental specifications for these adapters.

Table 3-3 Agilent X/P/K281C Environmental Specifications

Temperature

- | | |
|--------------------|-----------------|
| • Operating | 0 °C to 55 °C |
| • Storage/Shipment | -55 °C to 75 °C |
-

Relative Humidity

- | | |
|------------------------------|------------------------|
| • Operating/Storage/Shipment | <95% relative at 40 °C |
|------------------------------|------------------------|
-

Altitude

- | | |
|--------------------|---------------------|
| • Operating | <4600 m (15000 ft) |
| • Storage/Shipment | <15000 m (50000 ft) |
-

Store the adapters in a clean, dry environment.

Safety and Regulatory Markings

	This symbol indicates that you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	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.
 N10149	The C-Tick mark is a registered trademark of the Australian Spectrum Agency.
	The CSA mark is a registered trademark of the Canadian Standards Association.
ISM1-A	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
	This symbol indicates that the power line switch is ON.



This symbol indicates that the power line switch is OFF or in STANDBY position.

Declaration of Conformity

A copy of the Manufacturer's Declaration of Conformity for this instrument can be obtained by contacting your local Agilent Technologies sales representative.



4 Service Information

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“Replacing the Center Conductor Contact” on page 26

Replaceable Parts 27

This chapter provides service instructions and lists the available replaceable parts for the Agilent X/P/K281C Adapters.

Service Information

Replacing the Center Conductor Contact

Not all parts on the adapters are replaceable, but all of the adapters have a replaceable center conductor contact.

When you replace the center conductor contact, observe the following precautions:

- Before installing the new center conductor contact, apply Loctite sealant #222 to the threads of the center conductor.
- Do not use excessive force when tightening center conductor parts.

Model K281C (All Options)

To replace the center conductor, you will need a 5/64 inch hexagonal nut driver.

In some units, the center conductor mounting hole was made oversized to allow for a slight adjustment. When the center conductor is replaced in these units, it may be necessary to readjust and retest if the unit does not meet specifications.

If the mounting hole appears to be oversized, mount the center conductor toward one end of the adapter as far as it will go. If the adapter fails the performance test, move the center conductor toward the opposite end and then retest.

Replaceable Parts

Replaceable parts for the P281C adapter are shown below. Refer to [Table 4-1](#), [Table 4-2](#), and [Table 4-3](#) for identification of parts and corresponding part numbers for all models. For ordering information, contact the nearest Agilent office listed in “[Contacting Agilent](#)” in the front matter of this manual.

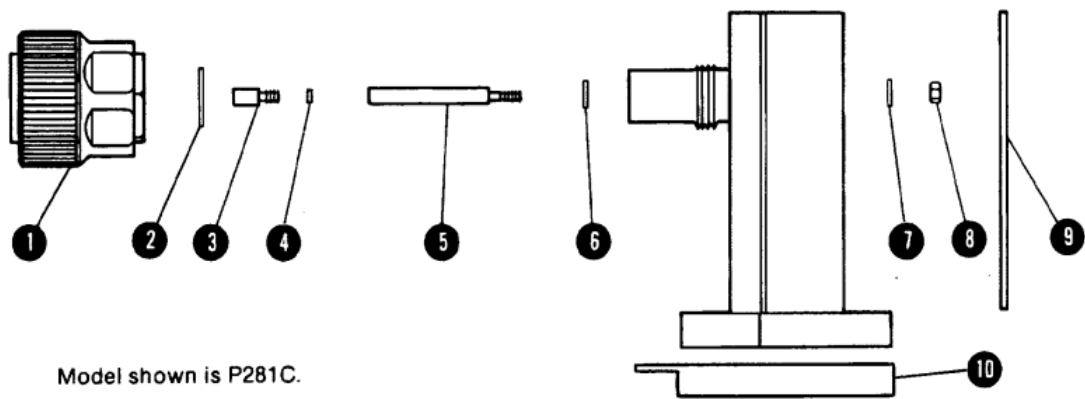


Figure 4-1 Replaceable Parts

NOTE

[Table 1-1](#) on page 8 gives dimensional tolerances for Option 006 that can be expected to yield satisfactory results. It may be necessary to try various combinations of spacers and shims to obtain proper dimensions. The use of at least one shim is recommended because of electro-chemical differences between the connector body and the adapter body. Refer to the appropriate table of replaceable parts for the thickness of shims and spacers.

CAUTION

Take care to avoid damaging parts. Burring, scratching, denting, or deforming parts may impair operating characteristics.

Table 4-1 X281C Replaceable Parts

Description	Part Number
X281C Standard/Option 006	
Connector body	1250-1466
Spacer	00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm)
Center conductor contact	85050-20001 (G-slotted) 85130-20002 (collet holder)
Shim	5020-8540 (0.013 mm), or 5020-8541 (0.025 mm)
Center conductor	Not replaceable
Spacer	Not replaceable
Washer	Not replaceable
Nut	Not replaceable
Blank label	Not replaceable
Flange cap	5040-0354
X281C Option 012	
Connector body	1250-0916 (Male) 1250-0918 (Nut) 1250-0016 (Ring)
Spacer	00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm)
Center conductor contact	5180-0988
Shim	5020-8540 (0.013 mm), or 5020-8541 (0.025 mm)
Center conductor	Not replaceable
Spacer	Not replaceable

Table 4-1 X281C Replaceable Parts (continued)

Description	Part Number
Washer	Not replaceable
Nut	Not replaceable
Blank label	Not replaceable
Flange cap	5040-0354
X281C Option 013	
Connector body	1250-0914
Spacer	00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm)
Center conductor contact	5180-0854
Shim	5020-8540 (0.013 mm), or 5020-8541 (0.025 mm)
Center conductor	Not replaceable
Spacer	Not replaceable
Washer	Not replaceable
Nut	Not replaceable
Blank label	Not replaceable
Flange cap	5040-0354

Table 4-2 P281C Replaceable Parts

Description	Part Number
P281C Standard/Option 006	
Connector body	1250-1466
Spacer	00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm)
Center conductor contact	85050-20001 (G-slotted) 85130-20002 (collet holder)
Shim	5020-8540 (0.013 mm), or 5020-8541 (0.025 mm)
Center conductor	Not replaceable
Spacer	Not replaceable
Washer	Not replaceable
Nut	Not replaceable
Blank label	Not replaceable
Flange cap	5040-0358

Table 4-3 K281C Replaceable Parts

Description	Part Number
K281C Standard/Option 006	
Connector body	1250-1507
Spacer	5021-9679 (0.013 mm), or 5021-9680 (0.025 mm), or 5021-9681 (0.051 mm)
Center conductor contact	00281-20043
Spacer	000281-20045
Washer	3050-0261
Nut	0608-0003
Blank label	Not replaceable
Flange cap	5040-0357
Required but not Supplied	
5/64 inch hexagonal nut driver	
K281C Option 012/Option 106	
Connector body	1250-1509
Spacer	5021-9679 (0.013 mm), or 5021-9680 (0.025 mm), or 5021-9681 (0.051 mm)
Center conductor contact	00281-20044
Spacer	000281-20045
Washer	3050-0261
Nut	0608-0003
Blank label	Not replaceable
Flange cap	5040-0357
Required but not Supplied	
5/64 inch hexagonal nut driver	

Table 4-3 K281C Replaceable Parts (continued)

Description	Part Number
Miscellaneous Items	
Loctite #222	0470-0573
Operating and Service Manual	00281-90043