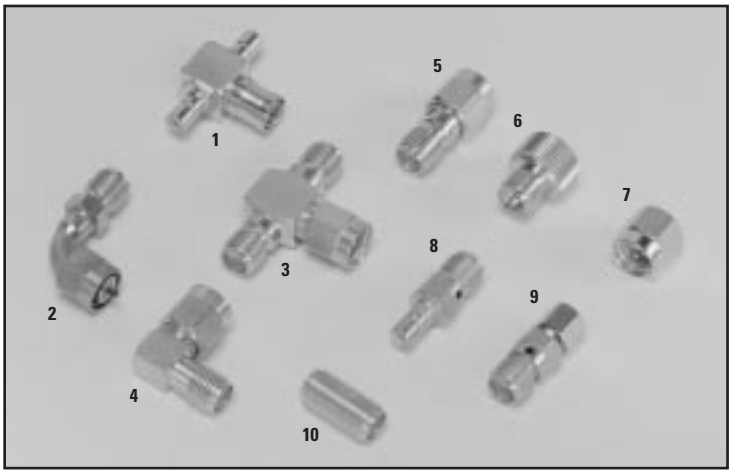
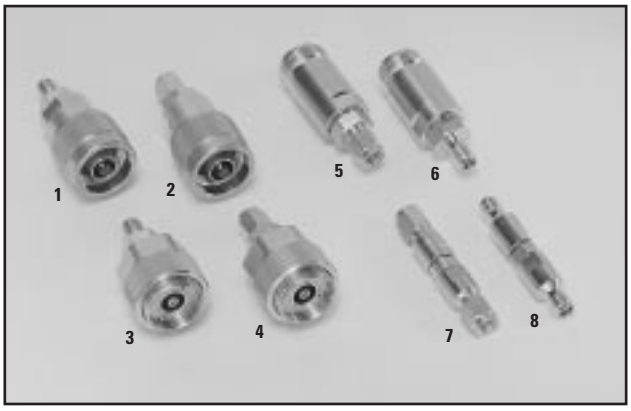
Adapters

1 HP 1250-1200 Adapter, BNC (f) to SMA (m)
2 HP 1250-1899 Adapter, BNC (f) to SMB (m)
3 HP 1250-0556 Adapter, BNC (f) to WECO Video (m)
4 HP 1250-0591 Adapter, BNC (f) to WECO Video (m)
5 HP 1250-1477 Standard, N (f) to BNC (m), Precision 50 Ohm
6 HP 1250-1473 Standard, N (f) to (m) to BNC (m), Precision 50 Ohm Adapter
7 HP 1250-0595 Adapter, BNC (f) to Triaxial (m)
8 HP 1250-1930
9 HP 1250-1830 Adapter, BNC (f) to Triaxial (f)
10 HP 1250-1857 Adapter, SMB (f) to BNC (m)
11 HP 1250-0562
12 HP 1250-1236 Adapter, SMB (f) to BNC (f)

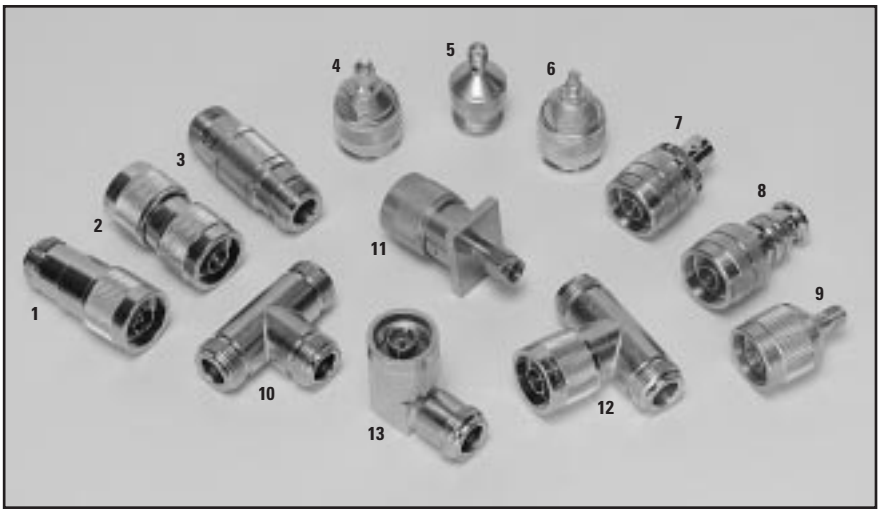


1 HP 1250-1391 Adapter, SMB Tee (f-m-m)
2 HP 1250-1741 SMA (f) to SMA (m) Right Angle Adapter
3 HP 1250-1698 Adapter, SMA Tee (m) (f) (f)
4 HP 1250-1249 Adapter, SMA Right Angle (m) (f)
5 HP 1250-1462 Adapter, SMA (m) to SMA (f)
6 HP 2020-5353 short 50 Ohm load
7 HP 2021-1314 short 50 Ohm load
8 HP 1250-0674 Adapter, SMB (m) to SMA (f)
9 HP 1250-1694 SMA (m) to SMA (f) Adapter
10 HP 1250-1158 SMA (f) to SMA (f) Adapter

Adapters



1 HP 1250-1744 Adapter, 3.5 mm (f) to Type-N (m), dc-18
2 HP 1250-1743 Adapter, 3.5 mm (m) to Type-N (m), DC to 18 GHz
3 HP 1250-1747 SMA (f) to APC-7 Adapter
4 HP 1250-1746 SMA (m) to APC-7 Adapter
5 HP 1250-1750 3.5 mm (m) to Type-N (f)
6 HP 1250-1745 3.5 mm (f) to Type-N (f)
7 HP 1250-1748 3.5 mm (f) to 3.5 mm (m) Instrument-Grade Adapter
8 HP 1250-1749 3.5 mm (f) to 3.5 mm (f)



1 HP 1250-0597 Adapter, Type-N (m) 50 Ohm to Type-N (f) 75 Ohm
2 HP 1250-1778 Standard N (m) to Standard N (m) Adapter, 50 Ohm
3 HP 1250-1529 Standard N (f) to Standard N (f) Adapter, 75 Ohm
4 HP 1250-1152 Adapter, SMC (f) to Type-N (m)
5 HP 1250-1404 Adapter, SMA (f) to Type-N (f)
6 HP 1250-1023 Adapter, SMC (m) to Type-N (m)
7 HP 2021-1535 Standard N (m) to BNC (f) Adapter, 75 Ohm
8 HP 1250-1533 Standard N (m) to BNC (m) Adapter, 75 Ohm
9 HP 1250-1250 Adapter, Type-N (m) to SMA (f), 50 Ohm
10 HP 1250-0846 Tee Adapter, Standard N (f) (f) (f)
11 HP 1250-1636 Adapter, Type-N (m) to SMA (m) 50 Ohm
12 HP 1250-0559 Tee Adapter, Standard N (m) (f) (f)
13 HP 1250-0176 Right Angle Standard N (m) to Standard N (f)

Adapters

Metrology/Instrument Grade Selection Guide [1]

Connector Type	1.85 mm	2.4 mm	2.92 mm	3.5 mm	7 mm	50 Ω Type-N	75 Ω Type-N
1.85 mm [2]	85058-60007 85058-60008 85058-60009						
2.4 mm		11900A,B,C	11904A,B,C,D	11901A,B,C,D	11902A,B	11903A,B,C,D	
3.5 mm				83059A,B,C 1250-1748 1250-1749	1250-1746 1250-1747	1250-1743 1250-1744 1250-1745 1250-1750	
7 mm						11524A, 11525A	
50 Ω Type-N							11852B

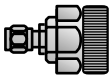
[1] See page 16 for general purpose grade adapters. See Network Analyzer/Waveguide Accessories chapters for additional adapter products.
[2] 1.85 mm is compatible with 2.4 mm. To adapt 1.85 mm to other connector types, use HP 1190X series adapters.

Typical Configuration


HP 11900A
HP 11901A
HP 11904A
HP 83059A
HP 1250-1159
HP 1250-1748
85058-60007


HP 11900B
HP 11901B
HP 11904B
HP 83059B
HP 1250-1158
HP 1250-1749
85058-60008


HP 11900C
HP 11901C
HP 11901D
HP 11904C
HP 11904D
HP 83059C
HP 1250-1462
85058-60009


HP 11533A
HP 11902A
HP 1250-1746

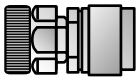

HP 11534A
HP 11902B
HP 1250-1747

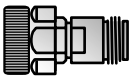

HP 11903A
HP 1250-1636
HP 1250-1743

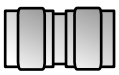

HP 11903D
HP 1250-1250
HP 1250-1744

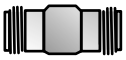

HP 11903C
HP 1250-1562
HP 1250-1750


HP 11903B
HP 1250-1745
HP 1250-1772


HP 11525A

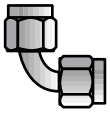

HP 11524A

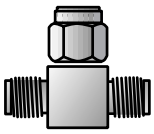

HP 1250-0778
HP 1250-1475
HP 1250-1528

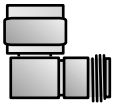

HP 1250-0777
HP 1250-1472
HP 1250-1529

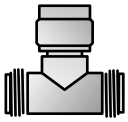

HP 11852B
HP 11852B Opt. 004
HP 1250-0597


HP 1250-1249


HP 1250-1397


HP 1250-1698


HP 1250-0176


HP 1250-0559


HP 1250-0846

Adapters

Metrology Grade [1]

HP Model	Type [2]	Frequency Range	Return Loss	Repeatability [3] (min)	Overall Length (nom) mm (in)	Ref. Plane to Ref. Plane Length (nom) mm (in)	Diameter (nom) mm (in)
11900A	2.4 mm (m), 2.4 mm (m)	dc to 50 GHz	>26 dB	–44 dB	16.2 (0.64)	12.4 (0.49)	9 (0.35)
11900B	2.4 mm (f), 2.4 mm (f)	dc to 50 GHz	>26 dB	–44 dB	18.5 (0.73)	12.4 (0.49)	8 (0.31)
11900C	2.4 mm (m), 2.4 mm (f)	dc to 50 GHz	>26 dB	–44 dB	17.4 (0.69)	12.4 (0.49)	9 (0.35)
11901A	2.4 mm (m), 3.5 mm (m)	dc to 26.5 GHz	>26 dB	–54 dB	20.9 (0.82)	16.1 (0.63)	9 (0.35)
11901B	2.4 mm (f), 3.5 mm (f)	dc to 26.5 GHz	>32 dB	–54 dB	21.1 (0.83)	16.1 (0.63)	8 (0.31)
11901C	2.4 mm (m), 3.5 mm (f)	dc to 26.5 GHz	>32 dB	–54 dB	20.2 (0.80)	16.1 (0.63)	9 (0.35)
11901D	2.4 mm (f), 3.5 mm (m)	dc to 26.5 GHz	>32 dB	–54 dB	21.8 (0.86)	16.1 (0.63)	9 (0.35)
11902A	2.4 mm (m), APC-7	dc to 18 GHz	>32 dB	–56 dB	43.8 (1.73)	38.5 (1.51)	22 (0.86)
11902B	2.4 mm (f), APC-7	dc to 18 GHz	>32 dB	–56 dB	44.8 (1.76)	38.5 (1.51)	22 (0.86)
11903A	2.4 mm (m), Type-N (m)	dc to 18 GHz	>28 dB	–48 dB	49.1 (1.93)	46.1 (1.82)	22 (0.86)
11903B	2.4 mm (f), Type-N (f)	dc to 18 GHz	>28 dB	–48 dB	58.3 (2.30)	46.1 (1.82)	15.7 (0.62)
11903C	2.4 mm (m), Type-N (f)	dc to 18 GHz	>28 dB	–48 dB	57.4 (2.26)	46.1 (1.82)	15.7 (0.62)
11903D	2.4 mm (f), Type-N (m)	dc to 18 GHz	>28 dB	–48 dB	50.0 (1.97)	46.1 (1.82)	22 (0.86)
11904A	2.4 mm (m), 2.92 mm (m) [4]	dc to 40 GHz	>24 dB	–40 dB	16.4 (0.64)	11.3 (0.45)	9 (0.35)
11904B	2.4 mm (f), 2.92 mm (f)	dc to 40 GHz	>24 dB	–40 dB	16.3 (0.64)	11.3 (0.45)	8 (0.31)
11904C	2.4 mm (m), 2.92 mm (f)	dc to 40 GHz	>24 dB	–40 dB	13.3 (0.52)	11.3 (0.45)	9 (0.35)
11904D	2.4 mm (f), 2.92 mm (m)	dc to 40 GHz	>24 dB	–40 dB	17.0 (0.67)	11.3 (0.45)	9 (0.35)
11904S	2.4 mm to 2.92 mm matched set						

Indicates QuickShip availability. Contact HP Direct or your local HP sales representative to confirm QuickShip.

[1] HP 1190X adapters are phase matched within each family.
[2] f = jack, m = plug.
[3] Repeatability = –20 Log $|\Delta\Gamma|$,where $|\Delta\Gamma| = |\Gamma m_1 - \Gamma m_2|$.
[4] 2.92 mm is compatible with 3.5 mm.

Adapters

Instrument Grade

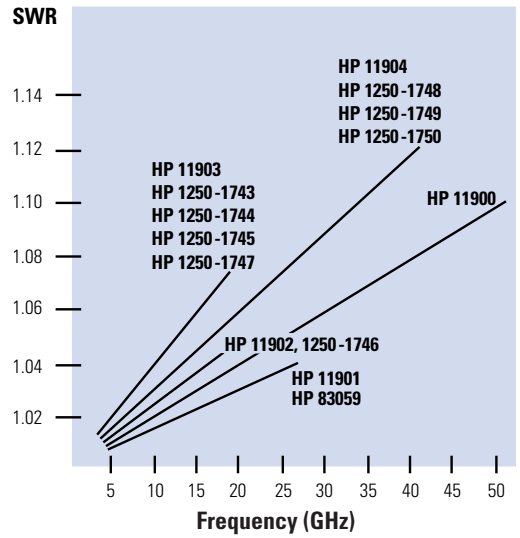
HP Model	Type[1]	Frequency Range	Return Loss (typ)	Overall Length (nom) mm (in)	Ref. Plane to Ref. Plane Length (nom) mm (in)	Diameter (nom) mm (in)
83059A	3.5 mm (m), 3.5 mm (m)	dc to 26.5 GHz	32 dB	28.4 (1.12)	23.1 (0.91)	10 (0.39)
83059B	3.5 mm (f), 3.5 mm (f)	dc to 26.5 GHz	32 dB	26.9 (1.06)	23.1 (0.91)	10 (0.39)
83059C	3.5 mm (m), 3.5 mm (f)	dc to 26.5 GHz	32 dB	25.7 (1.01)	23.1 (0.91)	10 (0.39)
83059K	Set of HP 83059A,B,C in wood case					
1250-1743	3.5 mm (m), Type-N (m)	dc to 18 GHz	28 dB	44.2 (1.74)	40.8 (1.61)	20.8 (0.82)
1250-1744	3.5 mm (f), Type-N (m)	dc to 18 GHz	28 dB	43.6 (1.72)	40.8 (1.61)	20.8 (0.82)
1250-1745	3.5 mm (f), Type-N (f)	dc to 18 GHz	28 dB	42.7 (1.68)	31.6 (1.24)	15.8 (0.62)
1250-1746	3.5 mm (m), APC-7	dc to 18 GHz	34 dB	37.9 (1.49)[2]	33.1 (1.30)	22.0 (0.87)
1250-1747	3.5 mm (f), APC-7	dc to 18 GHz	28 dB	37.0 (1.46)[2]	33.1 (1.30)	22.0 (0.87)
1250-1748	3.5 mm (m), 3.5 mm (m)	dc to 26.5 GHz	25 dB	45.1 (1.78)	39.6 (1.56)	9.2 (0.36)
1250-1749	3.5 mm (f), 3.5 mm (f)	dc to 34 GHz	23 dB	43.5 (1.71)	39.6 (1.56)	9.2 (0.36)
1250-1750	3.5 mm (m), Type-N (f)	dc to 18 GHz	24 dB	43.4 (1.71)	31.6 (1.24)	15.8 (0.62)
85058-60007	1.85 mm (m), 1.85 mm (m)[3]	dc to 65 GHz	22 dB	29.5 (1.16)	25.2 (0.99)	9.1 (0.36)
85058-60008	1.85 mm (f), 1.85 mm (f)[3]	dc to 65 GHz	22 dB	31.3 (1.23)	25.2 (0.99)	9.1 (0.36)
85058-60009	1.85 mm (m), 1.85 mm (f)[3]	dc to 65 GHz	22 dB	30.4 (1.20)	25.2 (0.99)	9.1 (0.36)
11852B[4]	50 ohm Type-N (f), 75 ohm Type-N (m)	dc to 3 GHz	30 dB	60.1 (2.37)	50.2 (1.98)	22 (0.87)
11852B Opt. 004[4]	50 ohm Type-N (m), 75 ohm Type-N (f)	dc to 3 GHz	30 dB	60.1 (2.37)	50.2 (1.98)	22 (0.87)

Indicates QuickShip availability. Standard model only. Contact HP Direct or your local HP sales representative to confirm QuickShip.

[1] f = jack, m = plug.
[2] Overall length with threaded coupling sleeve extended.
[3] 1.85 mm is compatible with 2.4 mm. To adapt 1.85 mm to other connector types, use HP1190X series adapters.
[4] Insertion loss is 5.7 dB typical.

Adapters

Typical Precision Adapter Performance



General Purpose Grade

Adapters APC-7 [1]	
11524A	APC-7 to Type-N (f)
11525A	APC-7 to Type-N (m)
11533A	APC-7 to SMA (m)
11534A	APC-7 to SMA (f)
Adapters Type-N, 50 Ω, SWR <1.03 to 1.3 GHz	
1250-1472	Type-N (f) to Type-N (f)
1250-1473	Type-N (m) to BNC (m)
1250-1474	Type-N (f) to BNC (f)
1250-1475	Type-N (m) to Type-N (m)
1250-1476	Type-N (m) to BNC (f)
1250-1477	Type-N (f) to BNC (m)
Adapters SMA	
1250-1158	SMA (f) to SMA (f)
1250-1159	SMA (m) to SMA (m)
1250-1249	SMA right angle (m) (f)
1250-1397	SMA right angle (m) (m)
1250-1462	SMA (m) to SMA (f)
1250-1698	SMA tee (m) (f) (f)
E9633A	SMA (m) to BNC (m)
E9634A	SMA (f) to BNC (m)

Indicates QuickShip availability. Contact HP Direct or your local HP sales representative to confirm QuickShip.

[1] APC-7 is a registered trademark of the Bunker Ramo Corporation.
[2] Type-N outer conductor; center pin sized for 75 Ω characteristic.
[3] BNC outer conductor; center pin sized for 75 Ω characteristic.
[4] SMB and SMC are often used inside HP instruments for inter-module RF connections. SMB is snap-on configuration. SMC is screw-on configuration.

General Purpose Grade (continued)

Adapters Type-N, Standard 50 Ω	
1250-0077	Type-N (f) to BNC (m)
1250-0082	Type-N (m) to BNC (m)
1250-0176	Type-N (m) to Type-N (f) right angle (use below 12 GHz)
1250-0559	Type-N tee, (m) (f) (f)
1250-0777	Type-N (f) to Type-N (f)
1250-0778	Type-N (m) to Type-N (m)
1250-0780	Type-N (m) to BNC (f)
1250-0846	Type-N tee (f) (f) (f)
1250-1250	Type-N (m) to SMA (f)
1250-1562	Type-N (f) to SMA (m)
1250-1636	Type-N (m) to SMA (m)
1250-1772	Type-N (f) to SMA (f)
Adapters Type-N, Standard 75 Ω [2]	
1250-0597	Type-N (m) (50 Ω) to Type-N (f) (75 Ω)
1250-1528	Type-N (m) to Type-N (m)
1250-1529	Type-N (f) to Type-N (f)
1250-1533	Type-N (m) to BNC (m)
1250-1534	Type-N (f) to BNC (m)
1250-1535	Type-N (m) to BNC (f)
1250-1536	Type-N (f) to BNC (f)
Adapters Type BNC, Standard 50 Ω	
1250-0076	Right angle BNC (UG-306/D)
1250-0080	BNC (f) to BNC (f) (UG-914/U)
1250-0216	BNC (m) to BNC (m)
1250-0591	BNC (f) to WECO Video (m)
1250-0595	BNC (f) to BNC Triaxial (m)
1250-0781	BNC tee (m) (f) (f)
1250-1830	BNC (f) to BNC Triaxial (f)
Adapters BNC, Standard 75 Ω [3]	
1250-1286	Right angle BNC (m) (f)
1250-1287	BNC (f) to BNC (f)
1250-1288	BNC (m) to BNC (m)
Adapters SMB, SMC [4]	
1250-0670	SMC tee (m) (m) (m)
1250-0671	SMB (m) to Type-N (m)
1250-0672	SMB (f) to SMB (f)
1250-0674	SMB (m) to SMA (f)
1250-0675	SMC (m) to SMA (f)
1250-0813	SMB (m) to SMB (m)
1250-0827	SMC (m) to SMC (m)
1250-0831	SMC (m) to BNC (m)
1250-0832	SMC (f) to BNC (f)
1250-0837	SMC tee (m) (m) (m)
1250-0838	SMC tee (f) (m) (m)
1250-1023	SMC (m) to Type-N (m)
1250-1113	SMC (f) to SMC (f)
1250-1152	SMC (f) to Type-N (m)
1250-1153	SMC (f) to Type-N (f)
1250-1236	SMB (f) to BNC (f)
1250-1237	SMB (m) to BNC (f)
1250-1391	SMB tee (f) (m) (m)
1250-1857	SMB (f) to BNC (m)

Adapters

- **Increased Measurement Versatility**
- **Ease-of-use for On Wafer and Coaxial measurements**

Increased Measurement Versatility

For Microwave and RF engineers making coax measurements at 50, 65 or 110 GHz, the HP 11920/1/2 series 1.0 mm adapters provide an easy way of measuring coaxial devices at high frequencies. The HP 11920 A/B/C 1.0 mm to 1.0 mm are designed for the measurement of components with 50 ohm 1.0 mm connectors. The HP 11921 A/B/C/D, 1.0 mm to 1.85 mm and the HP 11922 A/B/C/D, 1.0 mm to 2.4 mm are intended to be used as general purpose adapters that are versatile and interchangeable. These adapters increase the capability needed to use test systems, such as the HP 8510XF.

Ease of use for On Wafer and Coaxial measurements

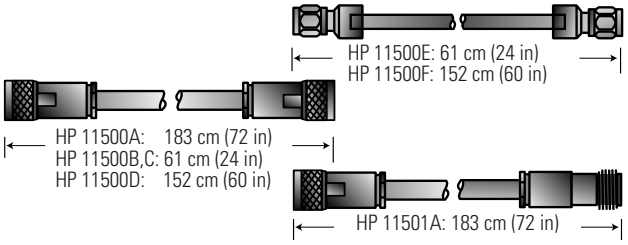
Each connector has an air dielectric interface and a center conductor that is supported by a low-loss plastic bead. Available with male and female connectors, these HP 1.0 mm adapters provide ease-of-use for microwave engineers who need to connect their test systems. The HP 1.0 mm adapters allow engineers to make fewer connections directly to their test port while maintaining the accuracy of their test system.

1.0 mm Adapters

HP Model	11920A 11920B 11920C	11921A 11921B 11921C 11921D	11922A 11922B 11922C 11922D	11923A
Features	← Excellent accuracy and Measurement versatility →			
Frequency Range	dc-20 GHz 20-50 GHz 50-75 GHz 75-110 GHz	dc - 65 GHz	dc - 50 GHz	dc - 110 GHz
Frequency Response				
Insertion Loss:	-0.5 dB	-0.5 dB	-0.7 dB	-1.0 dB
Return Loss:	-24 dB dc-20 GHz -20 dB 20-50 GHz -18 dB 50-75 GHz -14 dB 75-110 GHz	-20 dB	-20 dB	-16 dB
Input Power				
Max CW Power	← 10 W →			6W
Repeatability[1]	-35 dB	-35 dB 1.0 mm -40 dB 1.85 mm	-35 dB 1.0 mm -44 dB 2.4 mm	
RF Connectors				
A:	1mm(m) to 1mm(m)	1mm(m) to 1.85mm(m)	1mm(m) to 2.4mm(m)	1mm(f) to circuit card launch
B:	1mm(f) to 1mm(f)	1mm(f) to 1.85mm(f)	1mm(f) to 2.4mm(f)	
C:	1mm(m) to 1mm(f)	1mm(m) to 1.85mm(f)	1mm(m) to 2.4mm(f)	
D:		1mm(f) to 1.85mm(m)	1mm(f) to 2.4mm(m)	

1 Measured at 25° C

Cable Assemblies



HP Model	Frequency Range (GHz)	Length (nom) cm (in)	Connectors	SWR (max)	Ins. Loss (nom) (dB)
11500A	dc to 12.4	183 (72)	Type-N (m) (2)	—	—
11500B	dc to 12.4	61 (24)	Type-N (m) (2)	—	—
11501A	dc to 12.4	183 (72)	Type-N (m) to Type-N (f)	—	—
11500C	dc to 18	61 (24)	Precision N (m) (2)	1.4	1.5
11500D	dc to 18	152 (60)	Precision N (m) (2)	1.4	3.0
11500E	dc to 26.5	61 (24)	3.5 mm (m) (2)	1.4	2.0
11500F	dc to 26.5	152 (60)	3.5 mm (m) (2)	1.4	4.0

Indicates QuickShip availability. Contact HP Direct or your local HP sales representative to confirm QuickShip.

Precision 7-mm Connector Bead

HP 33391C Microwave Insulator (Bead) Assembly
The HP 33391C insulator bead assemblies are designed for use in 7-mm connectors such as type-N and APC-7. These are temperature stable devices, giving low signal loss due to their excellent reflection characteristics. They operate up to 18 GHz. The HP 33391C assemblies are packaged in convenient quantities of 50 per container.

HP 33391C Specifications
SWR (typ): 1.004, dc to 2 GHz; 1.004 + 0.0009/GHz, 2 to 18 GHz
Inner/Outer Ring Coplanarity: ±0.0005 inch typ., ± 0.0007 inch maximum.

Connectors

General

Many coaxial connector types are available in the RF and microwave industry, each designed for a specific purpose and application. For measurement applications, it is important to consider the number of connects/disconnects which impact the connector's useful life.

The frequency range of any connector is limited by the excitation of the first circular waveguide propagation mode in the coaxial structure. Decreasing the diameter of the outer conductor increases the highest usable frequency; filling the air space with dielectric lowers the highest usable frequency and increases system loss.

Performance of all connectors is affected by the quality of the interface for the mated pair. If the diameters of the inner and outer conductors vary from the nominal design, if plating quality is poor, or if contact separation at the junction is excessive, then the reflection coefficient and resistive loss at the interface will be degraded.

A few connectors (such as the APC-7) are designed to be sexless. Most are female connectors that have slotted fingers which introduce a small inductance at the interface. The fingers accommodate tolerance variations, but reduce repeatability and may ultimately break after 1000 connections. Hewlett-Packard offers slotless versions of connectors in certain measuring products which decrease inductance and increase repeatability.

The following is a brief review of common connectors used in test and measurement applications:

APC-7 (7 mm) Connector

The APC-7 (Amphenol Precision Connector-7 mm) offers the lowest reflection coefficient and most repeatable measurement of all 18 GHz connectors. Development of the connector was a joint effort between HP and Amphenol which began in the 1960s. This is a sexless design and is the preferred connector for the most demanding applications, notably metrology and calibration.

Type-N Connector

The type-N (Navy) 50-ohm connector was designed in the 1940s for military systems operating below 4 GHz. In the 1960s, improvements pushed performance to 12 GHz and later, mode-free, to 18 GHz. HP offers some products with slotless type-N center conductors for improved performance to 18 GHz. HP type-N connectors are completely compatible with MIL-C-39012. Certain 75-ohm products use a type-N design with smaller center conductor diameters, and thus are not compatible with 50-ohm connectors.

SMA Connector

The SMA (Subminiature A) connector was designed by Bendix Scintilla Corporation and is one of the most commonly used RF/microwave connectors. It is intended for use on semi-rigid cables and in components which are connected infrequently. Most SMA connectors have higher reflection coefficients than other connectors available for use to 24 GHz because of the difficulty to anchor the dielectric support.

3.5-mm Connector

The 3.5-mm connector was primarily developed at Hewlett-Packard, with early manufacturing at Amphenol. Its design strategy focused on highly-rugged physical interfaces that would mate with popular SMA dimensions, allowing thousands of repeatable connections. It is mode-free to 34 GHz.

1.0-mm Launch

The Launch adaptor has a 1.0-mm female connector on one end and a glass to metal seal interface on the other end. This is for transition of ultra-high frequency (up to 110 GHz) signals from coax into a microstrip package or onto a circuit board.

2.92-mm Connector

The 2.92-mm connector mates with SMA and 3.5-mm connectors, and offers mode-free performance to 40 GHz.

2.4-mm Connector

The 2.4-mm connector was developed by HP, Amphenol, and M/A-COM for use to 50 GHz. This design eliminates the fragility of the SMA and 2.92-mm connectors by increasing the outer wall thickness and strengthening the female fingers. It can mate with SMA, 3.5-mm and 2.92-mm with the use of precision adapters. The 2.4-mm product is offered in three quality grades; general purpose, instrument and metrology. General purpose grade is intended for economy use on components, cables and microstrip, where limited connections and low repeatability is acceptable. Instrument grade is best suited for measurement applications where repeatability and long life are primary considerations. Metrology grade is best suited for calibration applications where the highest performance and repeatability are required.

1.85-mm Connector

The 1.85-mm connector was developed in the mid-1980s by HP for mode-free performance to 65 GHz. Hewlett-Packard offered their design as public domain in 1988 to encourage standardization of connector types; a few devices are available from various manufacturers for research work. The 1.85-mm connector mates with the 2.4-mm connector and has the same ruggedness. Many experts have considered this connector to be the smallest possible coaxial connector for common usage up to 65 GHz.

1.0-mm Connector

Designed to support transmission all the way to 110 GHz, this 1.0-mm connector is a significant achievement in precision manufacturing resulting in a reliable and flexible interconnect.

BNC Connector

The BNC (Bayonet Navy Connector) was designed for military use and has gained wide acceptance in video and RF applications to 2 GHz. Above 4 GHz, the slots may radiate signals. Both 50-ohm and 75-ohm versions are available. A threaded version (TNC) helps resolve leakage for common applications up to 12 GHz.

SMC Connector

The SMC (Subminiature C) is much smaller than an SMA connector, making it suitable for some applications with size constraints. It is often used up to 7 GHz where low leakage and few connections are required.

Connector Care and Signal Performance

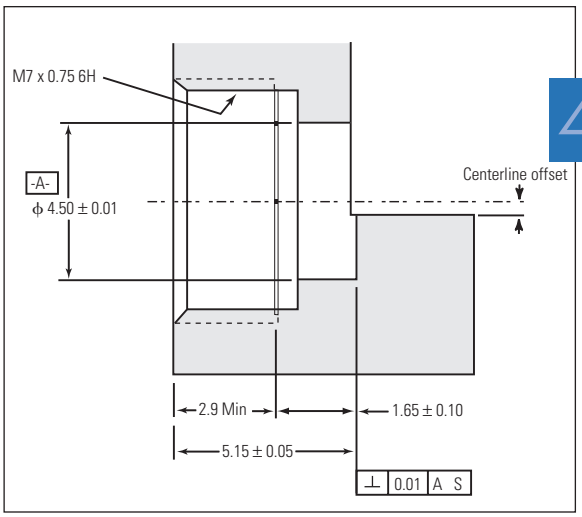
While many HP RF/microwave connectors have been designed for rugged mechanical interfaces, the user must be aware that cleanliness of the surfaces and care in applying torque to the connector nut are crucial to long life and full signal performance. Table 1 shows the recommended torque for various connector types. For additional information on RF/microwave connector care, request publication 08510-90360, "*Quick Reference – Connector Care.*"

* Note: For more infromation on connector care, visit the website **http://www.hp.com/go/mta/support/faq**

Table 1. Recommended Torque Values for Connectors

Connector Type	Torque lb-inch (N-cm)
Precision 7 mm	12 (136)
Precision 3.5 mm	8 (90)
SMA	5 (56) Use the SMA torque value to connect male SMA connectors to female precision 3.5-mm connectors. Use the 3.5-mm torque value to connect male 3.5-mm connectors to the female SMA (8 lb-inch).
Precision 2.4 mm	8 (90)
Precision 1.85 mm	8 (90)
Type-N	Type-N connectors may be connected finger tight. If a torque wrench is used, 12 lb-inch (136 N-cm) is recommended.

Connectors



Flexible micro-circuit packaging

The HP 11923A 1.0 mm female-connector launch threads into a package or fixture housing to transition a microwave circuit from microstrip to coaxial connector. The HP 11923A connector launch is intended for use with 8510XF and other test systems up to 110 GHz. The HP 11923A 1.0 mm female connector has an air dielectric interface and center conductor that is supported by a low-loss plastic bead on one end, and a glass-to-metal seal interface on the other end. This interface consists of a 0.162 mm diameter pin that extends inside the package or fixture for connection onto a microwave circuit.

The HP 11923A is pre-assembled and supplied with a machining detail for mounting the launch and assembly instructions (see figure 1). The user is responsible for making the connection onto the circuit card, machining the package, and installing the connector. If a quasi-hermetic seal is desired, epoxy may be applied to threads of the launch prior to installation. The procedure describing the necessary dimensions for the package and installation is provided with the launch assembly.

Specifications

Specifications describe the instrument's warranted performance over the temperature range 0 to 55° C (except where noted). Supplemental characteristics are intended to provide information for applying the instrument by giving typical but nonwarranted performance parameters. These are noted as "typical", "nominal" or "approximate".

1.0mm (f) Connector Launch

Model Number	Coax Connector Type	Frequency (GHz)	Insertion Loss
11923A	(f) to circuit card launch	dc- 110	better than: -1.0 dB

Supplemental characteristics

Model number	Return loss	Max CW Power
11923A	-16 dB	better than: 6W

Environmental Specifications

	Operating	Non-operating
Temperature	0° to 55°C	-40° to 75° C
Altitude	<15.000 meters (< 50.000 feet)	<15.000 meters (<50.000 feet)

Note: The operating temperature is a critical factor in the performance during measurements and between calibrations. Storage or operation within an environment other than that specified above may cause damage to the product and void the warranty.

Non-operating environmental specifications apply to storage and shipment. Products should be stored in a clean, dry environment. Operating environmental specifications apply when the product is in use. Products should not be operated in a condensing environment.

Key literature

HP 11923A Operating and Service Guide 11923-90001
1999/2000 MTA Catalog 5968-4314E

Slotless Connectors

Precision Slotless sockets (female connectors) were developed by HP to provide the most accurate traceable calibration possible. Connectors that use precision slotless sockets are metrology grade connectors. The outside diameter of the socket does not change when mated with pins of varying diameters, within the tolerance requirements of a metrology grade connector.

Conventional slotted sockets are flared by the inserted pin. Because physical dimensions determine connector impedance, electrical characteristics of the connector pair are dependent upon the mechanical dimensions of the pin. While connectors are used in pairs, their pin and socket halves are always specified separately as part of a standard, instrument, or device under test. Because the slotted socket's outer diameter changes with different pin diameters, it is very difficult to make precision measurements with the conventional slotted socket connector. The measurement of the device is a function of its connector.

Slotless sockets are used in the following calibration kits:

HP 85052B/C/D
HP 85054B/D
HP 85056A/D

Coaxial mechanical calibrations kits

Connector	Frequency Range	Type	VNA Calibration Accuracy	HP Model	Available Options	Page
Type-F(75 ohm)	DC to 3	Economy	5%-1%	**85039B**	1BP, 1BN, UK6, 00M, 00F	86
Type-F(75 ohm)	DC to 3	Economy	5%-1%	**85036E**	1BP, 1BP, UK6, 910	87
Type-F(75 ohm)	DC to 3	Standard	5%-1%	**85036B**	1BP, 1BP, UK6, 910	87
Type-F(50 ohm)	DC to 6	Economy	5%-1%	**85032E**	1BP, 1BP, UK6, 910	88
Type-F(50 ohm)	DC to 6	Standard	5%-1%	**85032B**	1BP, 1BP, UK6, 910, 001	88, 89
Type-F(50 ohm)	0.045 to 18	Economy	5%-1%	**85054D**	1BP, 1BP, 002	91
Type-F(50 ohm)	0.045 to 18	Standard	2%-0.3%	**85054B**	1BP, 1BP, 002	90
7-16	DC to 7.5	Standard	2%	**85038A**	none	92
7-16	DC to 7.5	Standard	2%	**85038F**	none	92
7-16	DC to 7.5	Standard	2%	**85038M**	none	92
7 mm	DC to 6	Economy	2%-0.3%	**85031B**	1BP, 1BP, UK6, 910	93
7 mm	0.045 to 18	Economy	5%-1%	**85050D**	1BP, 1BP, 910, 002	93
7 mm	0.045 to 18	Standard	2%-0.05%	**85050B**	1BP, 1BP, 910, 002	94
7 mm	0.045 to 18	Precision	0.3%-0.05%	**85050C**	1BP, 1BP, 910, 002	95
3.5 mm	DC to 6	Economy	5%-1%	**85033D**	1BP, 1BP, UK6, 910, 001, 002	96
3.5 mm	0.045 to 26.5	Economy	5%-1%	**85052D**	1BP, 1BP, 910, 002	97
3.5 mm	0.045 to 26.5	Standard	3%-0.5%	**85052B**	1BP, 1BP, 910, 002	98
3.5 mm	0.045 to 26.5	Precision	2%-0.5%	**85052C**	1BP, 1BP, 910, 002	99
2.92 mm	0.045 to 50	Economy	11%-4% (Option 001 65%-3%)	**85056K**	1BP, 1BP, 001*, 002	100, 101
2.4 mm	0.045 to 50	Economy	5%-1%	**85056D**	1BP, 1BP, 910, 002	102
2.4 mm	0.045 to 50	Standard	4%-0.5%	**85056A**	1BP, 1BP, 910, 002	103
1 mm	0.045 to 110	Precision	5%-1%	**85059A**	none	104, 105

Option description

002: Add calibration/verification data on magnetic tape in addition to 3.5" floppy
1BN: MIL standard 45662A calibration certification
1BP: MIL standard 45662A calibration certification with test data
UK6: Commercial calibration certificate with test data
00M: Includes male standards & male-male adapter
00F: Includes female standards and female-female adapter
001: Deletes 7 mm to 3.5 mm adapters
001*: Adds 2.4 mm sliding load an 2.4 mm gauges
001:** Adds data for HP 8702 ligthwave component analyzer
910: Adds extra manual

Note: For more information on connector care, visit the website *http://www.hp.com/go/mta/support/faq*

Slotless Connectors

Waveguide mechanical calibrations kits

Connector	Frequency Range	Type	VNA Calibration Accuracy	HP Model	Available Options	Page
WR-90	8.2 to 12.4	Precision	0.3%-0.05%	X11644A	002	106
WR-62	12.4 to 18	Precision	0.3%-0.05%	P11644A	002	107
WR-42	18 to 16.5	Precision	0.3%-0.05%	K11644A	002	108
WR-28	26.5 to 40	Precision	0.3%-0.05%	R11644A	002	109
WR-22	33 to 50	Precision	0.3%-0.05%	Q11644A	002	110
WR-19	40 to 60	Precision	0.3%-0.05%	U11644A	002	111
WR-15	50 to 75	Precision	0.3%-0.05%	V11644A	002	112
WR-10	75 to 110	Precision	0.3%-0.05%	W11644A	002	113

Coaxial electronic calibrations kits (Ecal)

Connector	Frequency Range	Type	VNA Calibration Accuracy	HP Model	Available Options	Page
7 mm	30kHz to 6GHz	Standard	1%-0.1%	85091A		115, 116
Type-N(50ohm)	30kHz to 6GHz	Standard	1%-0.1%	85092A		114, 115, 116, 117
3.5 mm	30kHz to 6GHz	Standard	2%-0.2%	85093A		114, 115, 116, 117
7 mm	1GHz to 18GHz	Standard	2%-0.05%	85060B		115, 116
3.5 mm	1GHz to 26.5GHz	Standard	3%-0.5%	85062B		114, 115, 116, 117
Type-N(50ohm)	1GHz to 18GHz	Standard	2%-0.1%	85064B		114, 115, 116, 117
PC Interface kit	n/a	n/a	n/a	85097A		115

Mechanical verification kits

Connector	Frequency Range	Type	VNA Calibration Accuracy	HP Model	Available Options	Page
Type-N	0.045 to 18GHz	Precision	n/a	85055A	1BP,002,910	118
7 mm	DC to 6GHz	Precision	n/a	85029B	1BP,001**,910	118
7 mm	0.045 to 18GHz	Precision	n/a	85051B	1BP,002,910	119
3.5 mm	0.045 to 26.5GHz	Precision	n/a	85053B	1BP,002	119
2.4 mm	0.045 to 50GHz	Precision	n/a	85057B	1BP,002	120
WR-28	26.5 to 40	Precision	n/a	R11645A	1BP,002	120
WR-22	33 to 50	Precision	n/a	Q11645A	1BP,002	121
WR-19	40 to 60	Precision	n/a	U11645A	1BP,002	121
WR-15	50 to 75	Precision	n/a	V11645A	1BP,002	122
WR-10	75 to 110	Precision	n/a	W11645A	1BP,002	122

Option description

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1BN: MIL standard 45662A calibration certification
1BP: MIL standard 45662A calibration certification with test data
UK6: Commercial calibration certificate with test data
00M: Includes male standards & male-male adapter
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001: Deletes 7 mm to 3.5 mm adapters
001*: Adds 2.4 mm sliding load an 2.4 mm gauges
001:** Adds data for HP 8702 ligthwave component analyzer
910: Adds extra manual