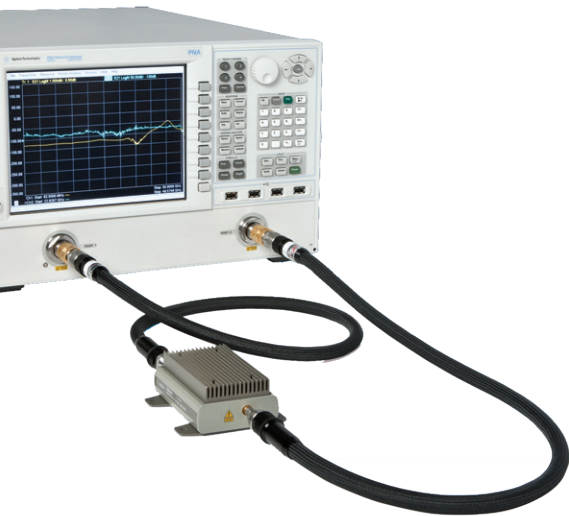


Improved VNA performance with precise measurements



Typical Applications

- Vector network analyzers
- Testing in lab environments
- Critical measurements

Benefits

- Extremely precise measurements with stable electrical performance up to 70 GHz
- Outstanding phase and amplitude stability with flexure
- Excellent reliability with extremely rugged cable construction and NMD-style connectors that withstand repetitive mating, flexure, crushing, twisting, and bending
- Reduced downtime because of increased intervals between calibrations

GORE® VNA Microwave/RF Test Assemblies set the industry standard for vector network analyzers (VNAs) through 70 GHz. Constant and/or highly repetitive movement of cables can compromise the measurement precision of high-performance VNAs. Leading manufacturers choose GORE® VNA Microwave/RF Test Assemblies because of the improved performance they see in their equipment.

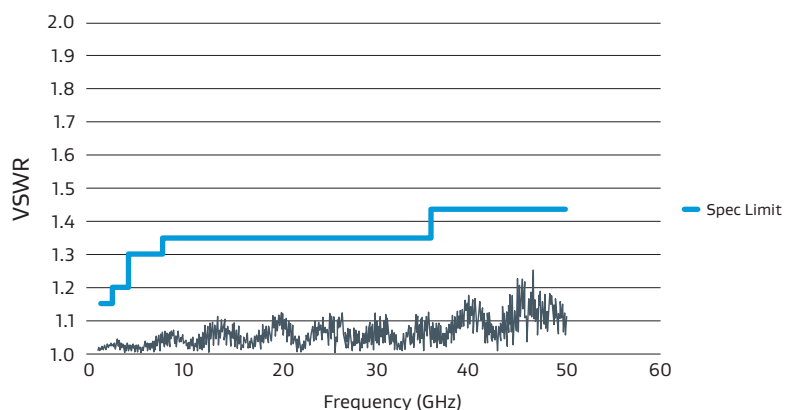
These test assemblies are specifically engineered to provide the most precise VNA measurements under laboratory conditions. They deliver the highest accuracy and the greatest time interval between recalibrations. GORE® VNA Microwave/RF Test Assemblies have a rugged, lightweight construction that enables longer service life, reduced downtime, and lower operating costs over the life of the equipment.

Guaranteed Stability for Precise & Repeatable Measurements

GORE® VNA Microwave/RF Test Assemblies maintain excellent insertion loss and VSWR (Figure 1). Unlike conventionally designed RF test assemblies, Gore's assemblies ensure accurate and repeatable measurements because of their excellent phase and amplitude stability with flexure (Figures 2 and 3). Additional testing is performed to guarantee this performance with flexure (Table 1).

Prior to shipment, all GORE® VNA Microwave/RF Test Assemblies are tested for return loss, insertion loss, phase stability, and loss stability up to their maximum operating frequency. Gore test methods simulate real-world environments to ensure that the assembly delivers precise and repeatable measurements in your application.

Figure 1: Typical VSWR Performance¹



1. Data is based on Gore's 50 GHz VNA assembly FE0BN0BM025.0.

GORE® VNA Microwave/RF Test Assemblies

Figure 2: Typical Phase Stability with Flexure¹

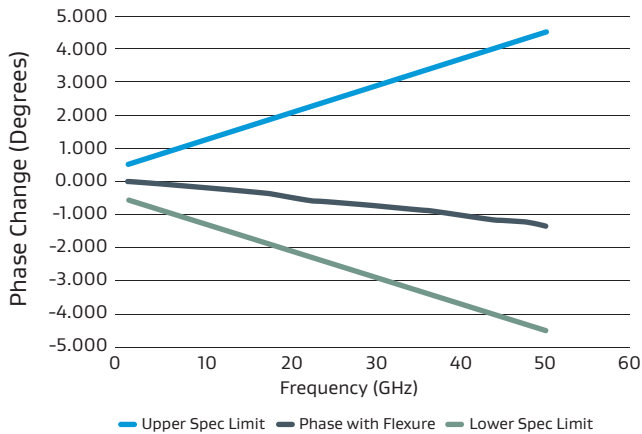
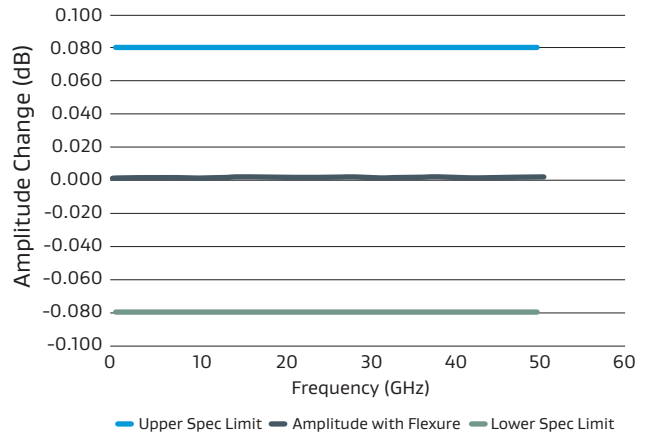


Figure 3: Typical Amplitude Stability with Flexure¹



1. Data is based on Gore's 50 GHz VNA assembly FE0BN0BM025.0. The assembly is terminated with a short circuit and tested on a calibrated system. A mandrel of 2.25 inch radius is placed midway down the assembly on either side. The assembly is bent 180 degrees around the mandrel, forming a "U" shape. The assembly is held in this position for one full sweep. Maximum deviation over the frequency range of analysis is noted. The assembly is then returned to its straight position, and the VNA is renormalized. The mandrel is placed on the opposite side of the assembly and the test is repeated.

Table 1: Product Specifications

Electrical Properties

Length (in)	Gore Cable Type											
	FB			FD			FE			FF		
	25	38	48	25	38	48	25	38	48	25	38	48
Maximum Frequency GHz	26.5	26.5	26.5	40	40	40	50	50	50	70	70	70
Typical VSWR	1.20:1	1.20:1	1.20:1	1.25:1	1.25:1	1.25:1	1.25:1	1.25:1	1.25:1	1.35:1	1.35:1	1.35:1
Maximum VSWR	1.29:1	1.29:1	1.29:1	1.35:1	1.35:1	1.35:1	1.43:1	1.43:1	1.43:1	1.50:1	1.50:1	1.50:1
Typical Insertion Loss dB	1.26	1.80	2.21	2.64	3.85	4.78	2.62	4.00	5.05	5.15	7.17	8.73
Maximum Insertion Loss dB	1.56	2.17	2.64	3.46	4.82	5.87	3.62	5.16	6.34	5.93	8.16	9.88
Nominal Impedance Ohms	50											
Typical Phase Stability degree	2.0	2.0	3.0	1.5	3.0	3.0	1.5	4.0	4.0	5.0	6.0	7.0
Maximum Phase Stability degree	3.9	7.4	10.0	3.7	7.3	7.3	4.5	9.0	9.0	8.54	10.55	10.55
Typical Amplitude Stability dB	0.01	0.02	0.03	0.02	0.02	0.03	0.01	0.03	0.03	0.02	0.02	0.04
Maximum Amplitude Stability dB	0.08	0.15	0.25	0.08	0.15	0.25	0.08	0.15	0.25	0.10	0.15	0.25
Nominal Dielectric Constant	1.4											
Nominal Velocity of Propagation %	85											
Shielding Effectiveness (dB through 18 GHz)	> 100											
Nominal Time Delay ns/cm (ns/in)	0.04 (0.103)											

Mechanical/Environmental Properties

Length (in)	Gore Cable Type											
	FB			FD			FE			FF		
	25	38	48	25	38	48	25	38	48	25	38	48
Nominal Weight g/m (oz/ft)	295.3 (3.2)											
Typical Flex Cycles	100,000			50,000			50,000			50,000		
Minimum Bend Radius mm (in)	57.2 (2.25)											
Temperature Range °C	Laboratory conditions; analyzer-specific (23 ± 5)											
Crush Resistance kgf/cm (lbf/in)	143 (800)											

Durable & Rugged Construction

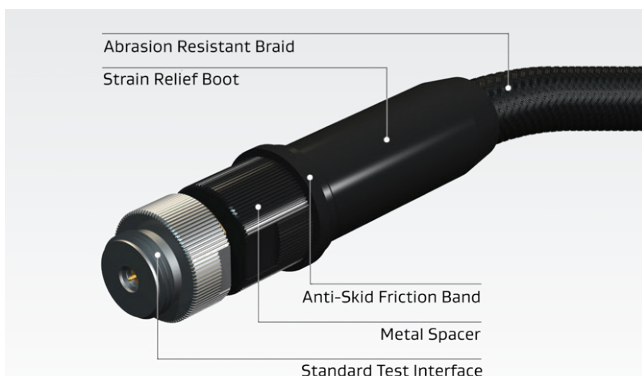
GORE® VNA Microwave/RF Test Assemblies offer outstanding electrical and mechanical performance for extremely precise and repeatable measurements (Table 1).

Constructed with an abrasion-resistant polymer braid around a flexible armor casing, these assemblies are extremely durable (Figure 4). They withstand crush forces of more than 800 pounds force/inch and have an auto-limiting bend radius of 2.25 in (57.2 mm). Even with this armored and rugged construction, GORE® VNA Microwave/RF Test Assemblies maintain excellent flexibility, which increases the cable's life. For example, when you drape the assembly over your finger, it will assume a 180-degree arc near the restricted bend radius.

Features of these assemblies include:

- NMD-style ruggedized connectors
- Crush resistance greater than 800 lbf/in
- Over 50,000 flexures at minimum bend radius
- Torque resistance
- Virtually zero cable springback

Figure 4: Assembly Cross-Section



GORE® VNA Microwave/RF Test Assemblies include NMD-style ruggedized connectors for direct attachment to VNA test ports and allow the use of test port-compatible adapters for best durability and stability (Figure 5). The combination of the assembly's ruggedized construction and NMD-style connector ensures longer flex life with consistent performance and reduced frequency of recalibration. In addition, these NMD-style ruggedized connectors include:

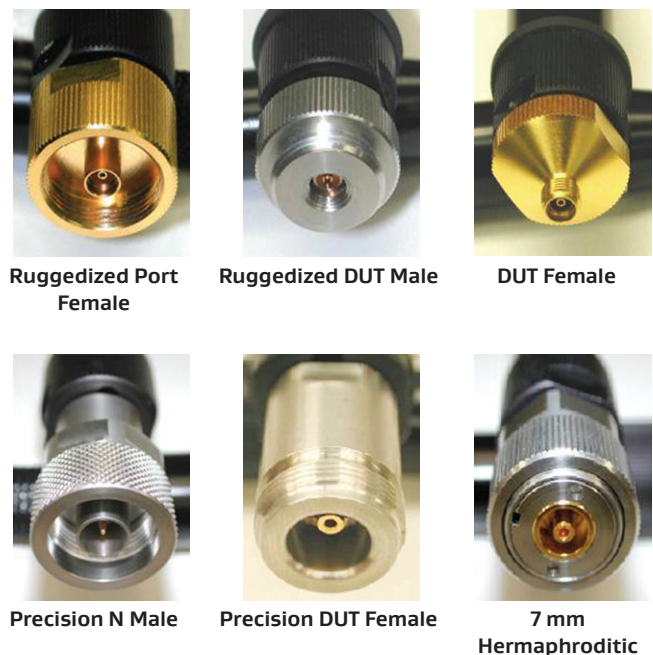
- A large gripping area with knurled metal spacer for easier connection
- An anti-skid friction band that helps prevent accidental movement when testing on a smooth surface
- A strain-relief boot that protects the cable-to-connector termination from external forces that can compromise measurement repeatability and assembly longevity

To verify the durability of GORE® VNA Microwave/RF Test Assemblies, Gore performed flex testing of more than 100,000 cycles (200,000 bends). For each cycle, the assembly was flexed 90 degrees to its auto-limiting bend radius and then bent 180 degrees in the opposite direction. Then, the same assembly was torqued 50,000 times (25,000 clockwise and 25,000 counter-clockwise). After these tests, the assemblies still met the same specifications as new assemblies.

Connector Options

NMD connectors available for GORE® VNA Microwave/RF Test Assemblies are specifically engineered to optimize performance of the assembly (Tables 2 and 3). These connectors mate with standard VNA systems, allowing mode-free broadband coaxial measurements from DC to maximum frequency of the assembly. They have an auxiliary, large thread and bearing surface for mating with conventional connectors of the same type and for attaching either male or female adapters.

Figure 5: Connector Options



Ordering Information

GORE® VNA Microwave/RF Test Assemblies are identified by a 12-character part number that designates the cable type, connector types, and assembly length.

1 2	3 4 5	6 7 8	9 10 11 12
Cable Type	Connector A	Connector B	Assembly Length

Positions 1–2: See Table 1 for the two-letter codes representing each cable type.

Positions 3–5: Connector that will attach to the VNA; see Table 2 for the list of connectors available for each cable type.

Positions 6–8: Connector that will attach to the device under test (DUT); see Table 3 for the list of connectors available for each cable type.

Positions 9–12: The length of the assembly expressed in inches to the nearest tenth, including zeroes to fill positions if the length is less than three digits. For example, the length of a 38-inch test assembly is specified as 038.0 in the last four digits of the part number. Cables are available in standard lengths of 25 in (0.64 m), 38 in (0.97 m) and 48 in (1.22 m).

The **GORE® Microwave/RF Assembly Builder** is a step-by-step tool that allows you to configure and request a quote for a test assembly with different connector options, assembly lengths, and frequencies. For more information, visit www.gore.com/rfcablebuilder.

The **GORE® Microwave/RF Assembly Calculator** is an online tool that calculates and compares the insertion loss, VSWR, and other parameters for various cable types. For more information, visit tools.gore.com/gmcalcalc.

Table 2: Connector Options for End A (VNA)¹

Connector Type	Max. Freq. (GHz)	Gore Cable Type			
		FB	FD	FE	FF
		26.5	40	50	70
Precision N Male	18	OAH	OAH	OAH	
7 mm Hermaphroditic	18	OHD	OHD	OHD	
3.5 mm Ruggedized Port Female	26.5	OHA			
2.92 mm Ruggedized Port Female	40		OBS		
2.4 mm Ruggedized Port Female	50			OBN	
1.85 mm Ruggedized Port Female	70				OCN

Table 3: Connector Options for End B (DUT)¹

Connector Type	Max. Freq. (GHz)	Gore Cable Type			
		FB	FD	FE	FF
		26.5	40	50	70
Precision N Male	18	OAH	OAH	OAH	
Precision N Female	18	OAL	OAL	OAL	
7 mm Hermaphroditic	18	OHD	OHD	OHD	
3.5 mm Ruggedized DUT Male	26.5	OHB	OHB	OHB	
3.5 mm Female	26.5	OHC	OHC	OHC	
2.92 mm Ruggedized DUT Male	40		OHR	OHR	
2.92 mm Female	40		OHQ	OHQ	
2.4 mm Ruggedized DUT Male	50			OBM	
2.4 mm Female	50			OBL	
1.85 mm Ruggedized DUT Female	70				OCM
1.85 mm Female	70				OCL

¹ The maximum operating frequency of a test assembly is determined as the lowest frequency of either the connector or the cable.

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