



Section V

**Phase
Stable
Assemblies**

INTRODUCTION: Vector network analyzers require electrically stable cable assemblies for measurement in very critical areas, such as Phase, Amplitude and VSWR. Cables have to maintain calibration data, even when subjected to bending and twisting which can introduce distorting parameters. The cable assembly needs to be flexible without being flaccid.

THE SOLUTION: Spectrum's automatic network analyzer test cable assemblies do meet all the requirements. These reliable test cables offer significant advantages when compared with standard test cables.

The Cables of Types 18 and 22 are very similar. The only difference is that Type 22 is armored, using a silicone jacketed fabric interwoven stainless steel spring. The flexibility of the cable can be compared with regular test cable assemblies. The operating frequency is recommended to 26.5 GHz.

The cable of Type 16 works to 50.0 GHz. It is a semi rigid type cable, armored with a silicone jacketed fabric interwoven stainless steel spring. The cable is a little bit on the stiffer side. But this is highly appreciated for several applications, especially when series of components have to be tested and when it is welcome that the connectors of the cable assembly remain closely in the connecting position.

The cable assemblies of Types 16 and 22 will withstand a pull of 22 pounds and are crush resistant to 880 pounds/square inch without degradation.

CABLE ASSEMBLY CONNECTORS: One end of the Assembly will usually be terminated with an NMD 2.4mm, 3.5mm, or K* connector, as needed for connecting directly with the RF output of the network analyzer. These NMD Connectors are designed with a larger than standard coupling nut for greater stability.

The other end of the ANA - Assembly may be terminated with any of the connectors, as needed in the customers test application, mating in direct connection with the device under test, such as 2.4mm, 3.5mm, 7mm, N, SMA, SPM, TNC, etc. As a large variety of connectors are available, adapters are not necessary and the test setup becomes simple and trustworthy. Sensitive tests can be performed, most accurate testing accomplished.

CABLE ASSEMBLY LENGTHS: The cable assemblies can be manufactured in almost any length, up to 6 meters (20ft.).

PREFERRED ASSEMBLIES: All necessary materials and piece parts will be carried in stock, helping to facilitate fast delivery. Cable assemblies of the most popular lengths, e.g. 45 cm. (17.7") and 60 cm. (2.36"), terminated with preferred connector styles, such as 2.4mm and 3.5mm for the Hewlett-Packard 8510 and K* for Wiltron 360, will be available, in most cases, within a few days of order placement.

THE CABLE ASSEMBLY KIT: ANA Cable Assemblies can be supplied in an instrument case. It normally contains beside the assemblies a torque wrench, or torque wrenches, as needed for the different connector styles, hex, and torques required.

CUSTOM PRODUCTS: Spectrum Elektrotechnik GmbH is a very innovative company. Our engineers are constantly designing new products, or modifying existing products to customers' requests. Therefore catalogs never will be complete. If you do not find exactly what you need in our catalogs, please contact our sales or engineering department.



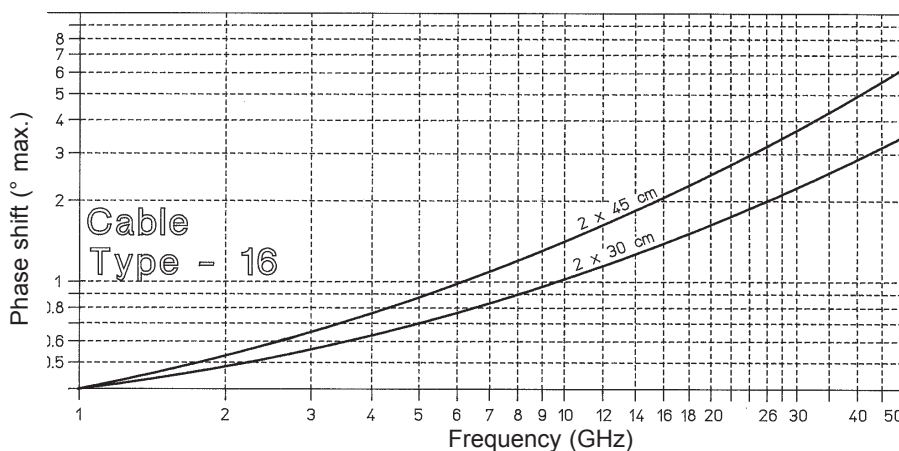
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Phase Stable Cable Assemblies

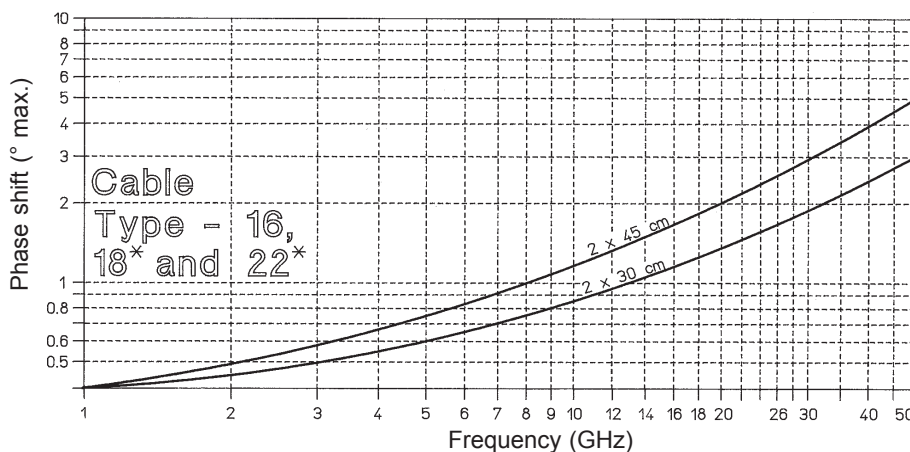


Cable Code	16	18	22
Frequency Range	50.0 GHz	26.5 GHz	26.5 GHz
Cable Outer diameter	9.2 mm. (.36")	6.0 mm. (.24")	9.2 mm. (.36")
Mechanical length	custom-made up to 6m	custom made up to 6m	custom made up to 6m
Electrical length	~ 1.44 x mechan. length	~1.36 x mechan. length	~1.36 x mechan. length
Bend radius min.	6 cm. (2.36")	6 cm. (2.36")	6 cm. (2.36")
Pull resistance	10 kg. (22 pounds)	2 Kg. (4.4 pounds)	10 kg. (22 pounds)
Crush resistance	62 kg./cm ² (880 psi)	16 kg./cm ² (225 psi)	62 kg./cm ² (880 psi)
Return loss, min. /Assembly	17 dB up to 50.0 GHz	20 dB up to 26.5 GHz	20 dB up to 26.5 GHz
2.4mm connectors	20 dB up to 26.5 GHz		
3.5mm connectors	20 dB up to 26.5 GHz		
7mm connectors	20 dB up to 18.0 GHz	20 dB up to 18.0 GHz	20 dB up to 18.0 GHz
K* connectors	20 dB up to 40.0 GHz	20 dB up to 26.5 GHz	20 dB up to 26.5 GHz
N connectors	20 dB up to 18.0 GHz	20 dB up to 18.0 GHz	20 dB up to 18.0 GHz
SMA connectors			
TNC connectors			
Return loss stability	40 dB min.	40 dB min.	40 dB min.
Phase stab., 2 x 45 cm. assies manual flexing/torque	Please see also Diagrams on page 177. 5.0° max. @ 40.0 GHz	Please see also Diagrams on page 177. 4.0° max. @ 26.5 GHz	Please see also Diagrams on page 177. 4.0° max. @ 26.5 GHz
Straight vs. 90° bend	4.0° max. @ 40.0 GHz	2.5° max. @ 26.5 GHz	2.5° max. @ 26.5 GHz
Straight after 3 x 90° bends	3.0° max. @ 40.0 GHz	2.0° max. @ 26.5 GHz	2.0° max. @ 26.5 GHz
Amplitude stab., 2 x 45 cm. assies manual flexing/torque	<0.05dB @ 40.0 GHz	-	-
Straight vs. 90° bend	<0.05dB @ 40.0 GHz	<0.05dB @ 26.5 GHz	<0.05dB @ 26.5 GHz
Straight after 3 x 90° bends	<0.05dB @ 40.0 GHz	<0.05dB @ 26.5 GHz	<0.05dB @ 26.5 GHz
Insertion Loss / m (39.37")	1.0 GHz	0.65	0.40
	10.0 GHz	2.50	1.34
	18.0 GHz	3.60	1.80
	26.5 GHz	4.50	2.20
	40.0 GHz	5.70	-
	50.0 GHz	6.60	-

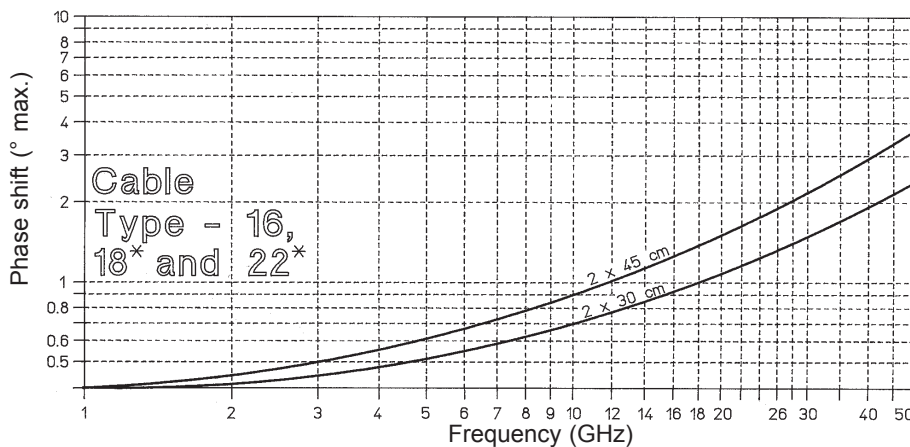
Phase Stability, with manual flexing/ torque



Phase Stability, measured when flexed from straight position to a 90° bend



Phase Stability measured in straight position after three 90° bends



Diagrams: Three different criteria were determined to demonstrate the max. phase shift of the cables at ambient temperature. Tests were performed on pairs of cables, so that the total lengths of the assemblies under test were always 60 cm and 90 cm respectively.

* Cable Types 18 and 22: max. operating Frequency: 26.5 GHz.

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Phase Stable Cable Assemblies

Connector Selection Chart



Type	Frequency	Sex	Description	Remarks	Connector Code	Finish
2.4 mm	DC - 50.0 GHz ¹⁾	Male	straight		HM	passivated Stainless Steel
				Maxi Nut	M2	
				The H2M and H2 developed at Spectrum, have larger than standard coupling threads for greater stability. The connectors are used on test ports, test port adapters, and test port cables.	H2M	
		Female		H2		
				HF		
3.5 mm	DC - 26.5 GHz	Male	straight		91	passivated Stainless Steel
				Maxi-Nut	M3	
				The H3M and H3 developed at Spectrum, have larger than standard coupling threads for greater stability. The connectors are used on test ports, test port adapters, and test port cables.	H3M	
		Female		H3		
				92		
7 mm	DC - 18.0 GHz	--	straight, 4 equally spaced Contact slots	90	passivated Stainless Steel	
			straight, 6 equally spaced Contact slots	96		
K*	DC - 40.0 GHz ¹⁾	Male	straight		KM	passivated Stainless Steel
				Maxi-Nut	MK	
				The WIM and WI developed at Spectrum, have larger than standard coupling threads for greater stability. The connectors are used on test ports, test port adapters, and test port cables.	WIM	
		Female		WI		
				KF		
N	DC - 18.0 GHz	Male	straight		51	passivated Stainless Steel
				PUSH-ON, NON-locking	NN	
		Female		PUSH-ON, locking	NDS	
					NS	
SMA	DC - 18.0 GHz	Male	straight		11	passivated Stainless Steel
				Maxi-Nut	MA	
				PUSH-ON, NON-locking	SM	
		Female		PUSH-ON, locking	SML	
					21	
TNC	DC - 18.0 GHz	Male	straight		31	passivated Stainless Steel
				PUSH-ON, NON-locking	TN	
		Female		PUSH-ON, locking	TS	
					41	

1) DC - 26.5 GHz for Cable Type 18 and 22.

INFORMATION ON HOW TO ORDER PHASE STABLE CABLE ASSEMBLIES:

Spectrum Elektrotechnik GmbH has set up an easy to use part number system. The customer can compose his part number, describing completely the component he is ordering. The table below explains the system and describes the possible alternatives.

THE CABLE: The two letters **AB** are used to identify the cable by its code. Three different cables are available, recognized by their cable codes 16, 18 and 22. For the specifications of the different cables, please refer to page 187 f.f. and the data sheets in section VII.3 "Standard Product Specifications", starting on page 203.

THE LENGTH: The letters **EFGH** are describing the length of the cable in millimeters, from reference plane to reference plane of the connectors.

THE ARMORING: Cable assemblies of Types 16 and 22 are armored as standard. They will withstand a pull of 22 pounds and are crush resistant to 880 pounds per inch square without any degradation.

THE CONNECTORS: A large variety of connectors are available for these Phase Stable Cable Assemblies. The letters **JKL** and **MNO** are to be replaced with the two or three digit codes, identifying the desired connector configuration. For the description of the connectors and their codes, please refer to pages 203 - 206.

A	B	-	E	F	G	H	-	J	K	L	-	M	N	O
<p>AB: to be replaced with the following two or three digit numbers respectively, for the Cable required.</p> <p>Cable Code 16 = Cable Type 16 18 = Cable Type 18 22 = Cable Type 22</p> <p>For details on the cables, please refer to Section VII.1, pages 187 - 198.</p>			<p>EFGH: to be replaced with the length of the cable. Measurements are taken from the reference plane of one connector to the opposite one.</p>				<p>JKL: to be replaced with the two or three digit number/letter Code, describing the Connectors as listed on the left.</p>			<p>MNO: to be replaced with the two or three digit number/letter Code, describing the Connectors as listed on the left.</p> <p>If Push-On Connector is required here as well, please use Code on pages 166 to 167.</p>				

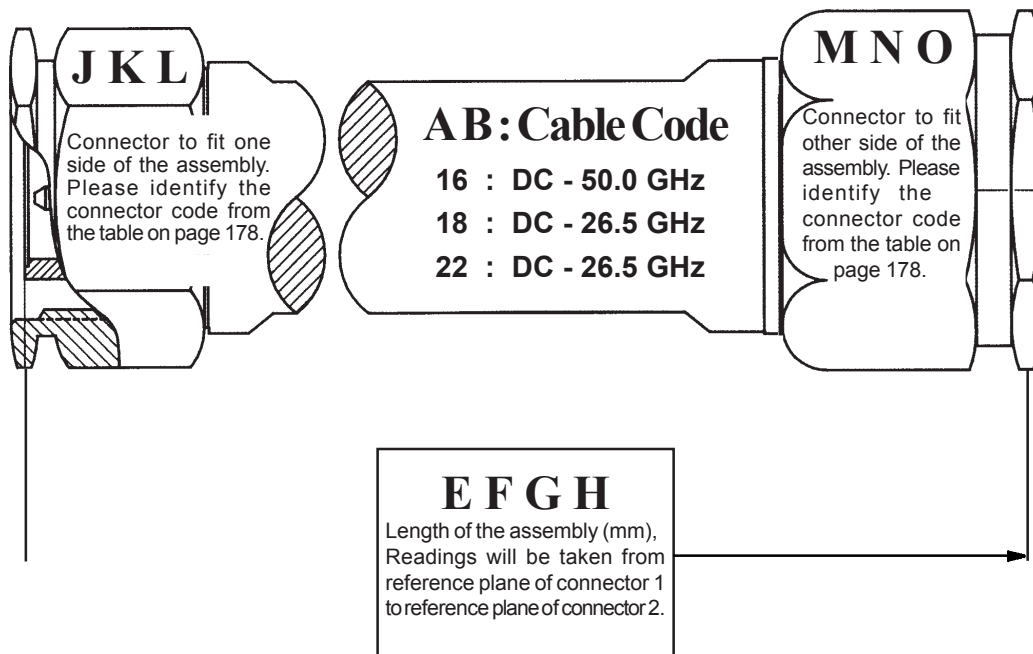
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Purchasing Information on Phase Stable Assemblies

Ordering Details:

The Part Number Sequence is:

AB - EFGH - JKL -MNO



For cable assemblies, made to customer specification, or complying to special requirements, the company will issue a special part number.

Ordering Example: The cable assembly of Type '16' shall have the length of 65 cm. It shall be terminated with '3.5mm' - female and 'K*' - male connectors (length is from interface to interface).
AB = cable code = 16 - EFGH = length in mm = 0650 - JKL and MNO are the connectors = 92 and KM.

Part Number for the cable assembly in this example: 16 - 0650 - KM - 92.