
Spectrum Elektrotechnik GmbH is a leading manufacturer of RF and Microwave Components in the Frequency Range of DC to 50 GHz. The products are published in eight individual catalogs, showing detailed information and comprehensive data.

Adapters, DC - 50 GHz, 50 Ohms

Coaxial Adapters (In Series and Between Series)
High Power Adapters
Push-On Adapters
Waveguide to Coax Adapters

Connectors, DC - 50 GHz, 50 Ohms

Blind Mate Connectors
Coaxial Connectors
High Power Connectors
Multi Pin Connectors
Push-On Connectors

Cable Assemblies, DC - 50 GHz, 50 Ohms

ANA Test Cables
Flexible Cable Assemblies
Low Loss Cable Assemblies
Phase Stable Cable Assemblies
Semi Rigid Cable Assemblies (Dia. 0.34" to 1")

Test Necessities and Accessories, DC - 50 GHz, 50 Ohms

LRL, TRL Calibration and Verification Kits
ANA Cable Assemblies
Torque Wrenches
Interface Gauges
Calibration Kits
Terminations

Components, DC - 50 GHz, 50 Ohms

Antennas
Attenuators
Circulators
CDM-Components
Couplers
Custom Components
DC-Blocks
Gain-Equalizers
Isolators
Limiters
Mismatches
Phase Shifters
Switches
Terminations
Waveguide Components

Quick Connections, 50 Ohms

Blind Mate Connectors
Push - On Adapters
Push - On Connectors
Push - On Cable Assemblies

Components, 75 Ohms

Adapters
Attenuators
Connectors
Switches
Transformers

Machines and Tools

Coax Cable Cutting/Stripping Machines
Flex Cable Cutting/Stripping Machines
Semi-Rigid Cable Bending Machines

This Handbook shows a most extensive line of Cables and Cable Assemblies in the frequency range of DC to 50.0 GHz.

In various chapters, the different Flexible Cable Assembly categories, the Handy-Form cables and the Semi-Rigid cables are shown. On the newer generation connectors such as PUSH-ONs and Field Replaceable Connectors or Interchangeable Connectors you will find detailed information in two separate sections. The chapter Special Products and Services gives a general overview about speciality products and the company's capabilities. Towards the end of the Handbook you will find detailed mechanical specifications on connectors used.

A **Quick Reference Guide** on Pages 6 and 7 gives details on the subjects that are covered in the individual chapters.

The last pages of this Handbook show a general Index, an Index on Connectors and on Cable Codes as well. This information helps to immediately identify data and knowledge about a certain product or it will give reference to pages where additional information can be derived from.

But just in case you still do not find exactly the product you require, please contact the factory or your nearest Spectrum Area Representative. Due to continuous development we may have solved a similar problem for someone else, or did develop already the product you require.

As it is our main goal to improve specification and performance of the products, Spectrum Elektrotechnik GmbH has to reserve the right to change specifications, design and any other information shown in this Handbook at any time without previous notice.

Because of the comprehensive information gathered in this volume, we call it a Handbook, hopefully the Handbook you like to work with best. If you find the time, we would appreciate your personal opinion about this Handbook.

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The Com- pany



Spectrum Elektrotechnik GmbH was founded in 1981 and has become a leading supplier of state-of-the-art components used in the RF and Microwave Technology, such as Connectors, Adapters, Cable Assemblies, Phase Shifters, Couplers, Gain Amplitude Equalizers, Terminations, Calibration Kits, etc., etc. In Addition, a number of complex and integrated components have been engineered and manufactured for certain programs and to the customer needs.

Throughout the world, Spectrum Elektrotechnik GmbH has established a reputation as a design, development and manufacturing center. The Company has been recognized as setting standards, introducing new ideas and leading into new technologies.

The Products

The products are used in commercial systems such as Cellular Applications, Radios, SatCom/VSAT, Satellites and Space Applications, Test Centers and Wireless Communication. The Products are used in defence applications as well, like Airborne Radars, Electronic Intelligence, Electronic Warfare, Jamming Systems, Missile Guidance, etc. Whenever RF or Microwave Expertise and Advanced Manufacturing Technologies are needed you will find SpectrumElektrotechnikGmbH.

Capabilities and Facilities

The departments within the Company have been set up as an intelligent Network, guaranteeing complete in-house control of every operation and procedure, from design, development, manufacturing, assembly and testing. Spectrum Elektrotechnik GmbH is small enough to react quickly and large enough to handle extensive orders of important programs successfully. This capability enables to develop, manufacture and test the extensive range of Products meeting the highest standards of quality and performance. Spectrum Elektrotechnik GmbH introduced CAD design centers already in 1984 as well as CAD/CAM work stations to provide data to computer controlled machines. The Company operates the most advanced machines and uses Test Centers to 50 GHz from HP and to 40 GHz from Wiltron. Manufacturing and Quality Control comply to DIN-ISO 9000, permitting to meet strict requirements in Commercial, Avionics, Military and Hi-Rel applications. A Final Inspection to 100% is standard, Tests on electrical and physical performance, their tolerances, the workmanship, and the compliance to applicable specifications.

Support

An adequate and knowledgeable staff is always available to support the Customers in respect to Applications, Engineering and Sales. The staff acts as a Team, understanding applications, specifications, needs, priorities and problems as well. A net of distributors assures immediate delivery of off the shelf products. Authorized technical knowledgeable Representatives will provide immediate assistance to the customers needs.

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Cancellation

Ordering

Please include both, Spectrum Elektrotechnik GmbH part number, and a description of the item(s) ordered. If special features are required, describe them as completely as possible and include an engineering sketch. Orders may be placed directly with the factory in Munich or with any authorized Spectrum Elektrotechnik GmbH Representative. Minimum Factory Order is DM 100.00.

Cancellation of, or changes to an order acknowledged by Spectrum Elektrotechnik GmbH are accepted only upon terms that protect Spectrum Elektrotechnik GmbH against loss.

Returns

Excess or unused material cannot be returned for credit without factory authorization. Such material is subject to a handling charge of not less than 15 % upon return and inspection of material at the factory. In no case will Spectrum Elektrotechnik GmbH authorize return of material beyond ninety (90) days after shipment from the factory. Credit for returned material is issued by Spectrum Elektrotechnik GmbH only to the original purchaser. Freight charges for returned material is the responsibility of the Buyer.

Acceptance of Orders

All orders are subject to acceptance at the discretion of the factory and with an Order Acknowledgment from Spectrum Elektrotechnik GmbH.

Defective Material

Claims for defective material or workmanship are subject to verification by Spectrum Elektrotechnik GmbH Quality Control, and must have prior factory authorization. Upon verification, Spectrum Elektrotechnik GmbH reserves the right to repair or replace, as deemed necessary.

Terms

Upon approval of credit, payment is due Net 30 days from date of invoice. Late payments are subject to a 1.5 % monthly charge on past due balances.

Prices / Specifications

Unless otherwise specified, prices quoted are F. O. B. Spectrum Elektrotechnik GmbH plant. Both prices and specifications are subject to modification without prior notice.

Shipments

Spectrum Elektrotechnik GmbH ships via the most expedient reliable carrier. Shipment F.O.B., Spectrum Elektrotechnik GmbH plant, will be sent freight prepaid and billed unless other prior arrangements are made. Spectrum Elektrotechnik GmbH will use any acceptable method of delivery specifically requested by customer.

Patent and Trademark Indemnity

Buyer agrees at Buyer's expense to protect and defend Seller against any and all claims of patent or trademark infringement arising from Seller's compliance with Buyer's designs or specifications or instruction and to hold Seller harmless from all losses, damages, costs and expenses attributable to any such claim or claims. Seller shall have the right to approve or disapprove counsel designated by Buyer to defend such claims.

Damaged Materials/Shortages

All orders should be inspected upon receipt for both completeness and to insure receipt of materials in proper condition. All claims for shortages must be made within thirty (30) days after date of shipment of material from Spectrum Elektrotechnik GmbH plant. Title to goods passes to the Buyer upon delivery to the carrier and risk of loss or damage shall thereafter rest with the Buyer. Claims for damage or loss while material is in transit must be made against the carrier by the Buyer.

Warranty

Spectrum Elektrotechnik GmbH warrants products of its manufacture to be free from defects in material and work-manship under conditions of normal use. If, within one year after delivery of the original owner and after prepaid return by the original owner, any Spectrum Elektrotechnik GmbH product is found to be defective, Spectrum Elektrotechnik GmbH shall, at its option, repair or replace said defective item. This warranty does not apply to products which have been disassembled, modified or subjected to conditions ex-ceeding the

Spectrum Elektrotechnik GmbH reserves the right to make design changes without notice on any of its products and without any obligation to make same or similar changes to items previously purchased. In no event does Spectrum Elektrotechnik GmbH assume liability for installation labor or for consequential damages. This warranty is the extent of the obligation or liability assumed by Spectrum Elektro- technik GmbH with respect to its products, and no other warranty or guarantee is either expressed or implied.

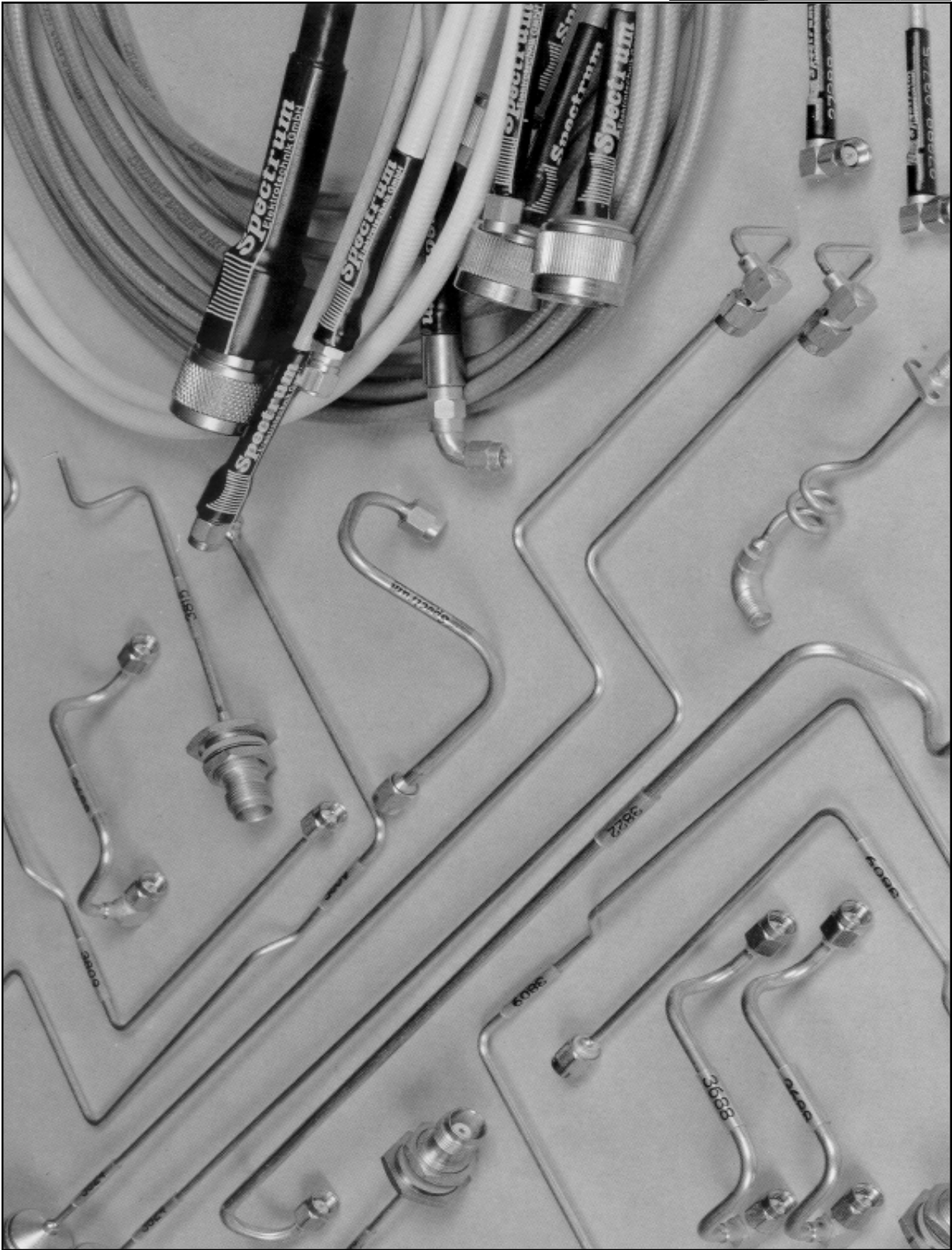
applicable specifications or ratings.

Quick Reference Guide by Sections



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General Information on Cable Assemblies and Connectors

- **Information on Cable Assemblies:**
 - **Quality** Page 10
 - **Basic Information** Page 11
 - **Insertion Loss Calculation** Page 12
 - **Power Limiting Factors** Page 13
 - **Lengths Tolerances** Page 14
 - **Armor & Ruggedizing Options** Page 15

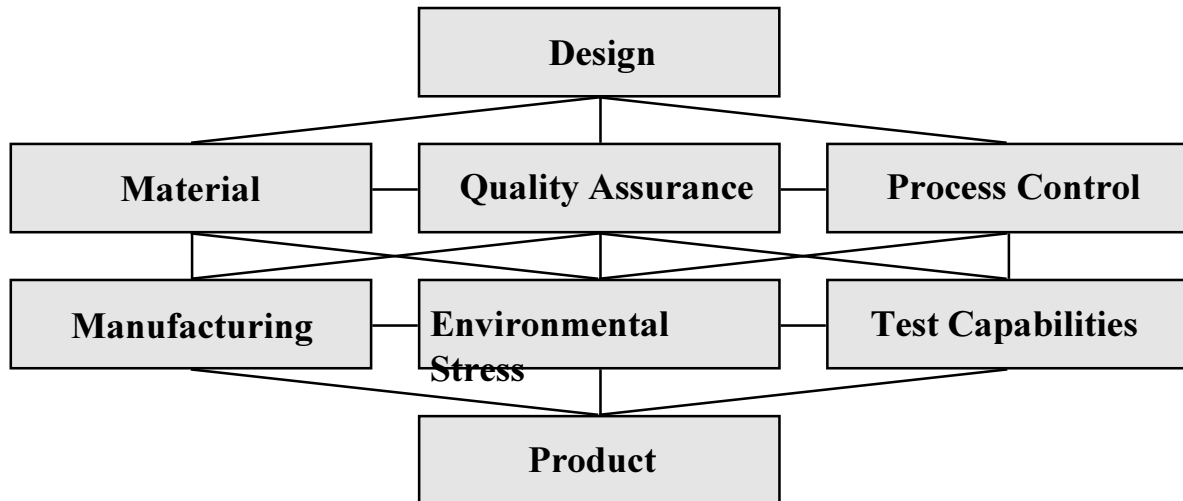
- **Information on Connectors:**
 - **Connector Specifications** Page 21
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- **Purchasing Information:** Page 27

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Quality is a high level of superiority, a degree of excellence, something that gives especial worth and value to the product. Quality Products conform to Specification. Quality Products work much longer without defect or the need for repair than other products. Spectrum Elektrotechnik GmbH manufactures Quality Products.



Quality Assurance: Although the Design is at the very beginning, Quality Assurance is involved already at that stage. Quality Assurance is always involved! Quality Assurance is always geared to defect prevention and is constantly working on process improvements. The modern structured Quality Assurance of Spectrum Elektrotechnik GmbH assures that a product will be designed and built, meeting the highest expectations.

Design: Only a good design can be the basis for reliable products of good quality. To design state-of-the-art products, most economically and most efficiently, new techniques are needed. Spectrum Elektrotechnik GmbH added CAD already in 1984, being one of the first companies, installing a CAD design center.

Material: The best material can be the basis for a dependable product of best quality. Spectrum Elektrotechnik GmbH only uses best materials. Only the best can be just good enough.

Manufacturing: An almost perfect manufacturing process can be an assurance for a product of outstanding performance and repeatability. The best machines, the best and effective tooling and highly trained personnel are also fundamentals for manufacturing a Quality Product. Spectrum Elektrotechnik GmbH uses the most modern CNC controlled machines and employs highly skilled and trained personnel.

Process Control: Controlling the process means controlling every step that is involved to make the product. A good Process Control assures repeatability. At Spectrum Elektrotechnik GmbH every process is completely documented. With every work order automatically a complete set of documentation is issued, describing the manufacturing process in detail, step by step. Manufacturing sequences are always followed by inspection steps, assuring that a mistake is caught right away. And: The Process Documentation is immediately updated, whenever a change is implemented in the process.

Environmental Stress: Cables and connectors are using a number of different materials with different behaviour, different thermal expansion. Cable and connectors are therefore being temperature cycled in a wide temperature range and up to 32 hours, depending on the product and the application. The thermal stress reduced the strain and makes the materials become predictable during normal operation.

Test Capabilities: Spectrum Elektrotechnik GmbH uses sophisticated test equipment. Having the Facilities also means: using them. At Spectrum Elektrotechnik GmbH every single cable assembly is tested, either in a 'go, no go test' for commercial assemblies, or by taking complete test reports for High Performance Cable Assemblies, hard copy data being supplied with the product, as standard, free of charge.


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Spectrum Elektrotechnik GmbH offers a wide variety of cables. They are shown in the following sections:

- **High Performance Cable Assemblies**
- **Commercial Cable Assemblies (RG - Type Cable Assemblies)**
- **Quick Connecting Cable Assemblies (with PUSH - ON Connectors)**
- **Phase Stable Assemblies (ANA - Cable Assemblies)**
- **Cable Assemblies with interchangeable connectors**
- **Handy - Form Cable Assemblies**
- **Semi - Rigid Cable Assemblies**

Spectrum's Flexible Microwave Cables are built to withstand mechanical abuse. However, for those extra rough applications, Spectrum Elektrotechnik GmbH offers additional protection of ruggedizing or armoring and soft armoring. Information on armoring is given on Pages 15 - 19.

Detailed Information on every Cable is shown on the Data Sheets or Tables in the individual sections, lining out the Characteristics, the mechanical, electrical and environmental specification. An example of a Data Sheet for Flexible Cable Assemblies is given below. The original Data Sheets are shown in larger scale.

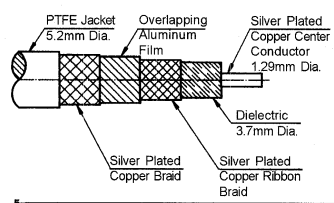
High Performance Flexible Cable Assemblies  **Spectrum**
Elektrotechnik GmbH

Cable - Type 100
Low Loss, Low Cost
High Performance
DC - 26.5 GHz

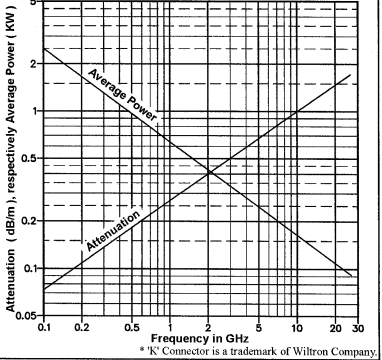
SPECIFICATION		Type 100
Cable Code	Standard	100
	Armored	100X
	X Please Find Armor & Ruggedizing Options on Pages 15 - 19.	
Frequency Range	Standard	DC-26.5 GHz
Outer Diameter in mm	Standard	5.2
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 1
Velocity in %, ± 2%		75
Capacitance in pF/m		87
Dielectric Strength (60 Hz) in KV rms		6.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.5
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.18
	2.0 GHz	0.40
	5.0 GHz	0.63
	10.0 GHz	0.97
	18.0 GHz	1.35
	26.5 GHz	1.70
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	950
	2.0 GHz	421
	5.0 GHz	244
	10.0 GHz	162
	18.0 GHz	114
	26.5 GHz	91
Peak-Power, 10% Duty Cycle		4 x CW-Power
RF - Leakage at 18.0 GHz		-100 dBc
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		Copper Ribbon Braid, Overlapping Aluminum Film, Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		3.7
Dielectric Material		Low Density PTFE
Dielectric Constant		1.8
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		1.29
Weight in Gramms/Meter		69
Minimum Bend Radius, Inside, Static (mm)		26
Minimum Bend Radius, Inside, Dynamic (mm)		60

Characteristics:

- Performance to 26.5 GHz, when terminated with K* or 3.5 mm connectors (mating with SMA).
- Rugged Construction.
- Short delivery; certain lengths with preferred connector styles may be in stock.
- The cable used most; significant price advantage over other similar products.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 1.4/4.4, 2.4mm, 3.5mm, 7mm, 7/16, HN, K*, N, SBX, SBY, SC, SMA, SPM and TNC.
- For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pgs. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



The diagram shows a cross-section of the cable with the following components labeled: PTFE Jacket (5.2mm Dia.), Overlapping Aluminum Film, Silver Plated Copper Center Conductor (1.29mm Dia.), Dielectric (3.7mm Dia.), Silver Plated Copper Braid, and Silver Plated Copper Ribbon Braid.



The graph plots Attenuation (dB/m) and Average Power (KW) against Frequency in GHz. The x-axis ranges from 0.1 to 30 GHz on a logarithmic scale. The y-axis ranges from 0.05 to 5 dB/m and 0.1 to 5 KW on a logarithmic scale. Two lines are shown: one for Average Power (increasing with frequency) and one for Attenuation (decreasing with frequency).

Diagram: Insertion Loss and Power vs. Frequency

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Electrical Specifications

Temperature Range

Mechanical Specifications

Characteristics

Cable Cross Section

Diagram: Insertion Loss and Power vs. Frequency

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Insertion Loss Calculation of Cable Assem-



plies

To calculate a cable assembly's insertion loss:

Use the Data Sheets provided for the cable and calculate the cable attenuation for the length of your assembly. The Data Sheets show the cable attenuation/m vs. frequency. (If you are more used to the length in ft., please multiply the attenuation/m by 0.305 and you will obtain the attenuation/ft.). Add the Connector Insertion Loss and the Mismatch Loss from the Tables below.

Example:

Cable Assembly Insertion Loss.

$$= \text{Attenuation (dB/m)} \times \text{Assembly Length (m)} + \text{Connector 1 loss} + \text{Connector 2 loss} + \text{Mismatch loss}$$

Where: **Attenuation** = value from the Data Sheet

Connector 1 loss and Connector 2 loss = value from chart below

Mismatch loss = value due to assembly VSWR, from chart below

Connector Insertion Loss (dB/Connector)

Frequency (GHz)	0.5	1.0	2.0	4.0	8.0	12.0	18.0	26.0	30.0	40.0	50.0
Fixed Straight	0.03	0.04	0.04	0.05	0.07	0.08	0.11	0.15	0.17	0.19	0.22
Replaceable Straight	0.05	0.06	0.06	0.07	0.11	0.12	0.16	N/A	N/A	N/A	N/A
Angle	0.07	0.08	0.08	0.10	0.12	0.14	0.20	N/A	N/A	N/A	N/A

Note: There will be variation in loss from one connector series to another. However, since the insertion loss of a connector increases with length, and decreases with diameter, these tend to balance, and the actual variation is relatively small. This table provides maximum values.

Mismatch Loss (dB)

VSWR	1.20:1	1.25:1	1.30:1	1.35:1	1.40:1
Insertion Loss (dB)	0.04	0.06	0.07	0.10	0.12

Assembly VSWR

VSWR figures listed below are maximum values.

Cable Length	Frequency Range (GHz)	Cable Assembly 2 straight connectors	Cable Assembly 1 straight 1 angled	Cable Assembly 2 angled connectors
< 5m	Up to DC - 18.0	1.25:1	1.30:1	1.35:1
> 5m	Up to DC - 18.0	1.30:1	1.30:1	1.35:1
</> 5m	Up to DC - 20.0	1.25:1 / 1.30:1	1.30:1 / 1.35:1	1.40:1
</> 5m	Up to DC - 40.0	1.35:1 / 1.40:1	N/A	N/A
</> 5m	Up to DC - 50.0	1.40:1 / 1.45:1	N/A	N/A

The Power Specifications, as listed on the Data Sheets, are based on Sea Level and an Ambient Temperature of 25 °C.

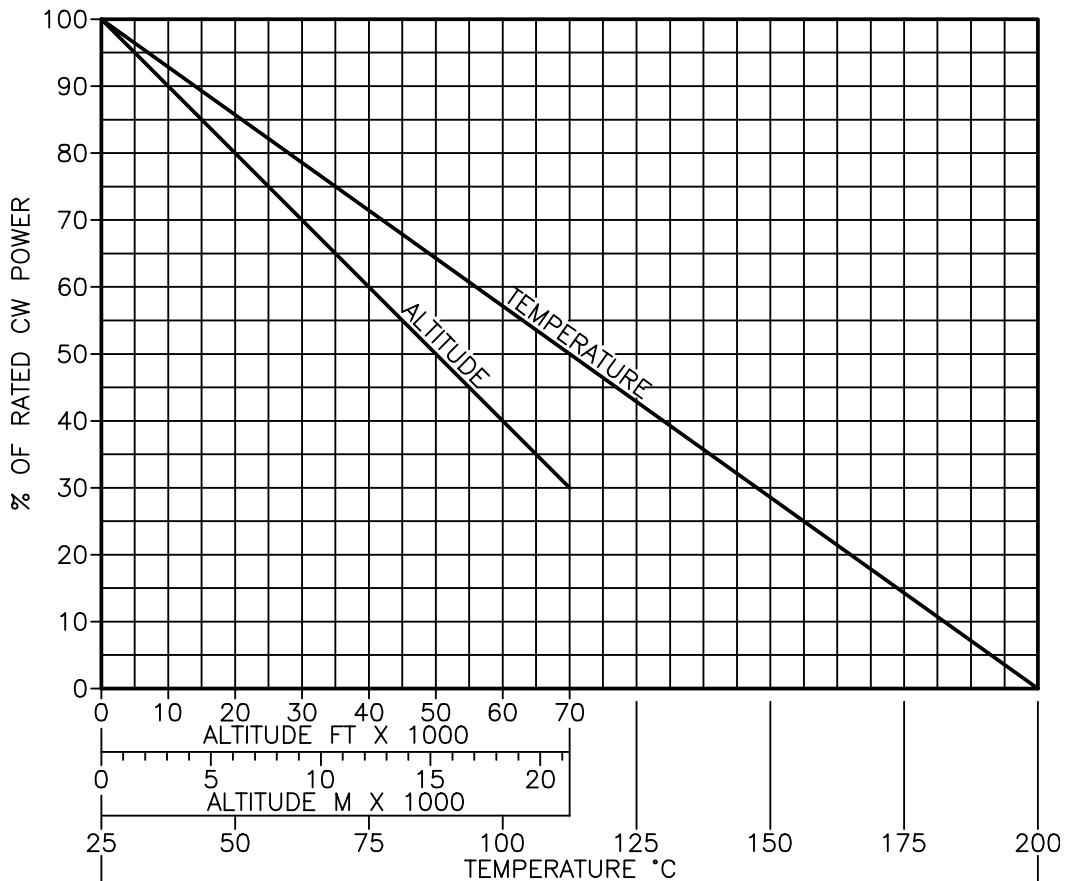
Other altitudes and/or higher temperatures will limit the power. The power derating diagrams below can be used to calculate the maximum power at certain altitudes and temperatures.

For information on Power Limits of complete Cable Assemblies, also power limiting information on the Connectors is needed. To obtain this information, please consult the factory.

Additional Power Limits can be borne in the application, or the shape of the cable assembly. Sharp bends or other mechanical stress can be limiting the power in addition.

A cable assembly with high VSWR will also take much less power stress than an electrical almost ideal assembly. An assembly with high loss will also not be a good candidate for high power.

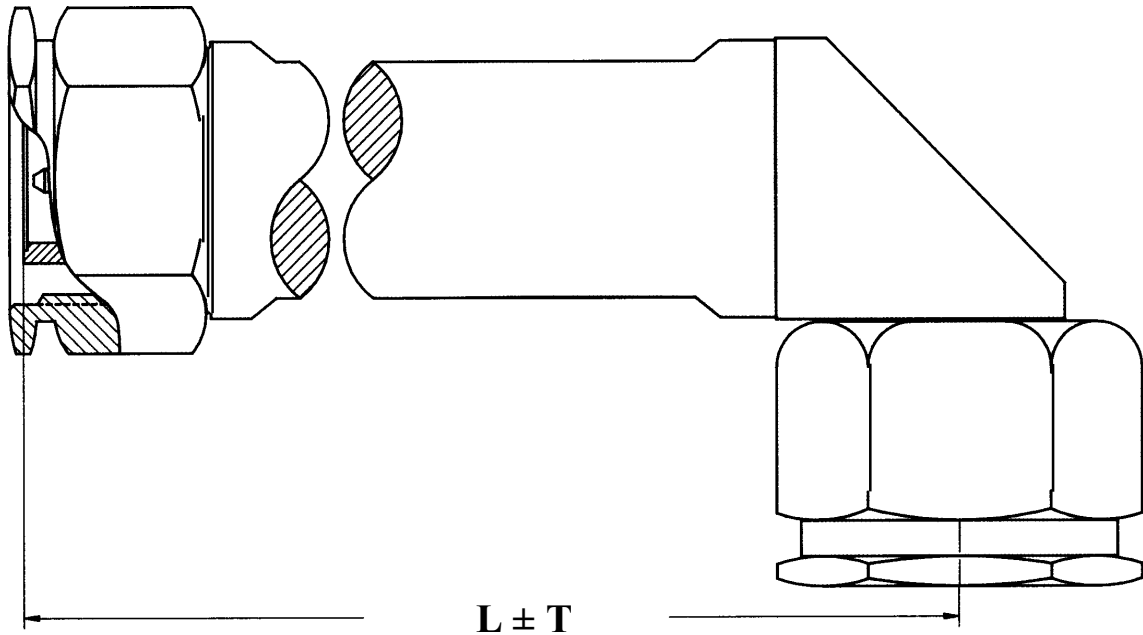
% DERATING FOR ALTITUDE AND TEMPERATURE



$$\text{CABLE POWER CAPABILITY} = (\text{RATED POWER}) \times (\text{TEMPERATURE DERATING}) \times (\text{ALTITUDE DERATING})$$

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The Length "L" of a Standard Cable Assembly is measured from the Reference Planes of the connectors, if not specified differently in the order. For angled connectors the center axis is used instead.



The Standard Tolerance "T" of the Length of the Cable Assembly depends on the actual length and the type of cable, flexible or semi rigid.

If not specified in the order, the standard tolerances below will be used. Upon request other tolerances can be offered. But it will depend on the type of cable, the style of the connectors and possibly also on other parameters of the customer specification. Smaller length tolerances may be subject to surcharge.

Semi - Rigid Cable Assemblies:		Flexible Cable Assemblies:	
Length "L"	Tolerance "T"	Length "L"	Tolerance "T"
20 cm max.	± 0.5 mm	100 cm max.	± 2.0 mm
20 cm to 50 cm	± 1.0 mm	100 cm to 200 cm	± 3.0 mm
50 cm to 100 cm	± 1.5 mm	> 200 cm	± 10.0 mm or 1% of the length, whichever is greater
100 cm to 310 cm	± 3.0 mm		
310 cm to 610 cm	± 5.0 mm		
> 610 cm	± 10.0 mm or 1% of the length, whichever is greater		

In some applications it will be of advantage, or it even might be a necessity, to add some kind of protection to the cable assembly, to withstand harsh environment or rough handling, or both.

Spectrum Elektrotechnik GmbH offers a number of standard armor and ruggedizing options. The customer may decide which of the options fit best his requirement.

But besides these standard options, in certain programs different armoring or ruggedizing need to be used. It can be offered on request, knowing the exact application and the specific environment, a special Part Number will then be assigned.

To have armor added to the cable, please proceed as follows:

*** For cable, using a 2 or 3 digit code, Types 01 - 999:**

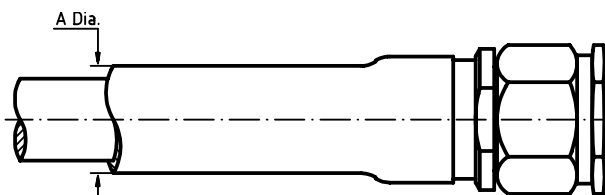
Add the code of the armor or ruggedizing option as described on Pages 16 - 19, to the cable code (e.g.: cable of type **10**, armored with type **C** armor, becomes **10C**).

*** For cable, using a 4 digit code, Types 101L - 999H:**

Use the conversion table below to identify the correct coding and add it to the cable type.

Armor & Ruggedizing Options	2 or 3 Digits	3 Digits + L	3 Digits + H
C	C	C	N
D	D	D	O
E	E	E	P
G	G	G	Q
H	H	H	R
K	K	K	T
L	L	L	U
M	M	M	W

Ruggedizing



Type C:
Protection against humidity. The jacket of the cable is completely covered with polyolefin shrink tubing per MIL-I-23053/16.

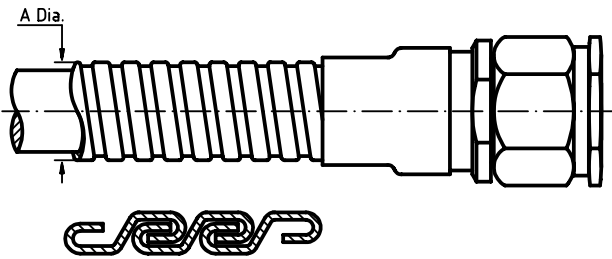
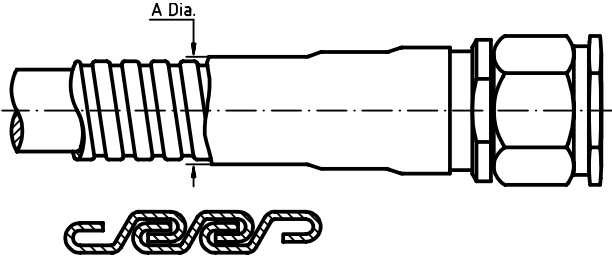
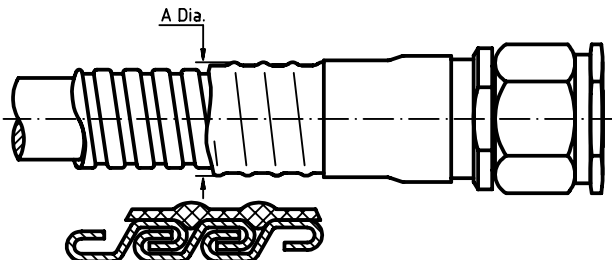
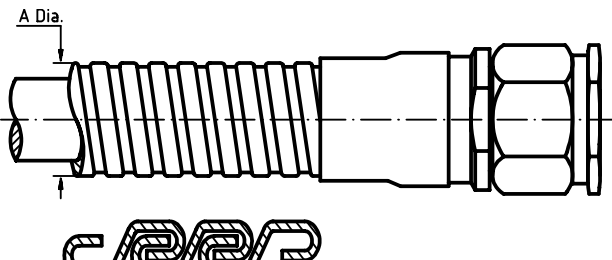
C

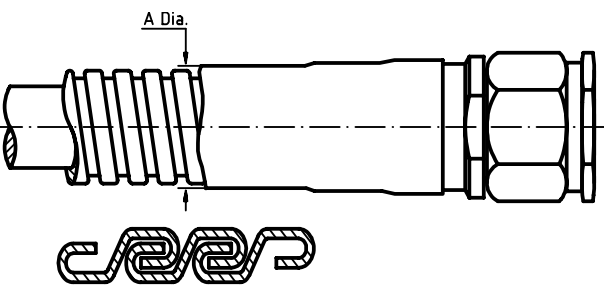
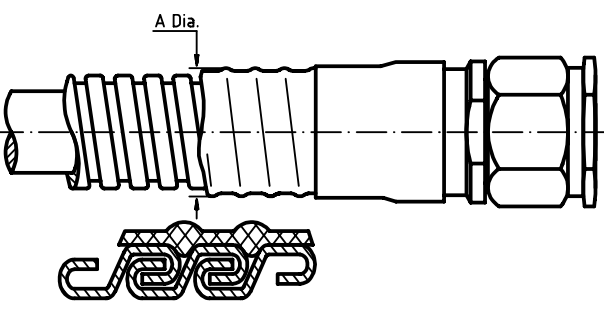
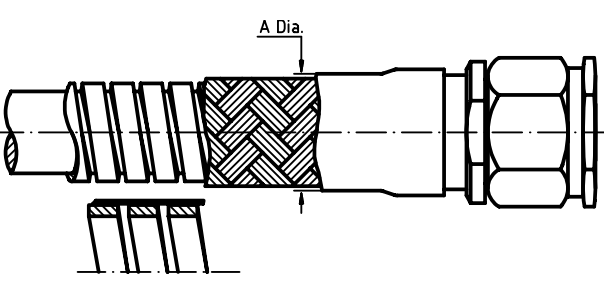
Suggested Armoring & Ruggedizing Options, please refer to Pages 18 - 19.

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tions

Hard armor is used where crush resistance is required and less flexibility and higher weight are acceptable. The armor is known for its strength and toughness. The edges of the metal strip of the armor are folded in so that the joints interlock and form a four-wall thickness. To protect the assembly from humidity, the armor can be covered with flexible tubing. For details, please refer to the following pictures and descriptions (figures D - L) as shown below and to the right.

<h1>D</h1>	<p>Type D: Good crush resistance.</p>	
<h1>E</h1>	<p>Type E: Good crush resistance, and excellent protection against humidity. The stainless steel armor of Type D is completely covered with polyolefin shrink tubing per MIL-I-23053/4.</p>	
<h1>G</h1>	<p>Type G: Good crush resistance and best protection against humidity. The jacket over the metal hose consists of gray silicone-silicone caoutchouc compound. The jacket is not only waterproof but also resistant to most chemicals over a wide temperature range.</p>	
<h1>H</h1>	<p>Type H: The ultimate crush resistance. This armor is even heavier than Type D.</p>	

	<p>Type K: The ultimate crush resistance and excellent protection against humidity. The stainless steel armor of Type H is completely covered with polyolefin shrink tubing per MIL- I-23053/4.</p>	<p>K</p>
	<p>Type L: The ultimate crush resistance and best protection against humidity. The jacket over the metal hose consists of gray silicone-silicone caoutchouc compound. The jacket is not only waterproof but also resistant to most chemicals over a wide temperature range. This armor is similar to Type G, but heavier.</p>	<p>L</p>
	<p>Type M: For hard armor but highest flexibility, pull relief and twist resistance this cable armoring can be recommended. It consists of a stainless steel spiral, interwoven by interlocking fiberglass yarn and jacketed by a silicone caoutchouc compound. The jacket is not only waterproof but also resistant to most chemicals over a wide temperature range.</p>	<p>M</p>
<p>Suggested Armoring & Ruggedizing Options, please refer to Pages 18 - 19.</p>		

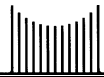
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Suggested Armoring & Ruggedizing Options



Cable Type Cable Type	Cable Dia. (mm) Cable Ø	Suggested Armor Suggested Armor Type								Armor Diameter (mm) Armor Diameter								Suggested Armor
		C	D	E	G	H	K	L	M	C	D	E	G	H	K	L	M	
		N	O	P	Q	R	T	U	W	N	O	P	Q	R	T	U	W	
03	13.5					X	X							23.3	27.3			03H 03K
10	7.2							X								11.6		10L
11	3.2							X								11.6		11L
12	11.2					X	X							19.3	21.1			12H 12K
14	7.4								X								16.2	14M
17	2.7							X								9.6		17L
21	10.8					X	X							17.3	19.0			21H 21K
37	4.6							X								9.6		37L
39	5.0							X								9.6		39L
43	4.3							X								11.6		43L
57	10.5								X								15.6	57M
65	8.7								X								13.6	65M
100	5.2							X								9.6		100L
120	11.2					X	X							19.3	21.1			120H 120K
140	7.4								X								16.2	140M
300	13.5					X	X							23.3	27.3			300H 300K
500L	14.0					X	X							23.3	27.3			500H/500K 500R/500T
500B	14.0					X	X							23.3	27.3			

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Suggested Armoring & Ruggedizing Options










Minimum Bend Radius (static) when suggested armor (mm) Suggested Armor Type								Weight of the armor (grams/meter) Armor Diameter								Cable Type Cable Type
C	D	E	G	H	K	L	M	C	D	E	G	H	K	L	M	
N	O	P	Q	R	T	U	W	N	O	P	Q	R	T	U	W	
				95	105							394	560			03
						50								146		10
						50								146		11
				80	90							321	433			12
							75								350	14
						40								115		17
				75	85							284	396			21
						40								115		37
						40								115		39
						50								146		43
							75								325	57
							65								241	65
						40								115		100
				80	90							321	433			120
							75								350	140
				95	105							394	560			300
				95	105							394	560			500L
				95	105							394	560			500B

Connector Specifications



A very important part of the cable assembly is the connector. The best cable without the best connectors is not worth much. Spectrum Elektrotechnik GmbH designs and manufactures its own connectors, each one especially engineered to the specific cable, to the application and even to customer's individual needs.

All the connectors manufactured and used by Spectrum Elektrotechnik GmbH, if not specified differently in the order, will meet the following standard specifications:

1.4/4.4	DIN 47298
1.8/5.6	DIN 47226
2/5.5	 Spectrum Specifications
2.4mm	 Spectrum Specifications
3.5mm	 Spectrum Specifications
7mm	IEC 457-2
7/16	DIN 47223
BMA	 Spectrum Specifications
BNC	MIL-C-39012 (IEC 169-2)
C	MIL-C-39012 (IEC 169-7)
HN	MIL-C-3643
K*	 Spectrum Specifications
N	MIL-C-39012
SBX	 Spectrum Specifications
SBY	 Spectrum Specifications
SC	MIL-C-39012
SMA	MIL-C-39012
SMB	MIL-C-39012
SMC	MIL-C-39012
SMP	DESC 94007 and DESC 94008
SPM	 Spectrum Specifications
TNC	MIL-C-39012 or MIL-C-87104/2
TNX	 Spectrum Specifications

The Specifications listed above are available on request. The Specifications are also shown in full detail in "The 97' Adapter Handbook", and "The 97' Connector Handbook". The Handbooks can be supplied free of charge. An example of a typical connector specification is shown on the following pages. Connectors that do not meet the appropriate specifications can ruin the mating connectors, test sets, etc.

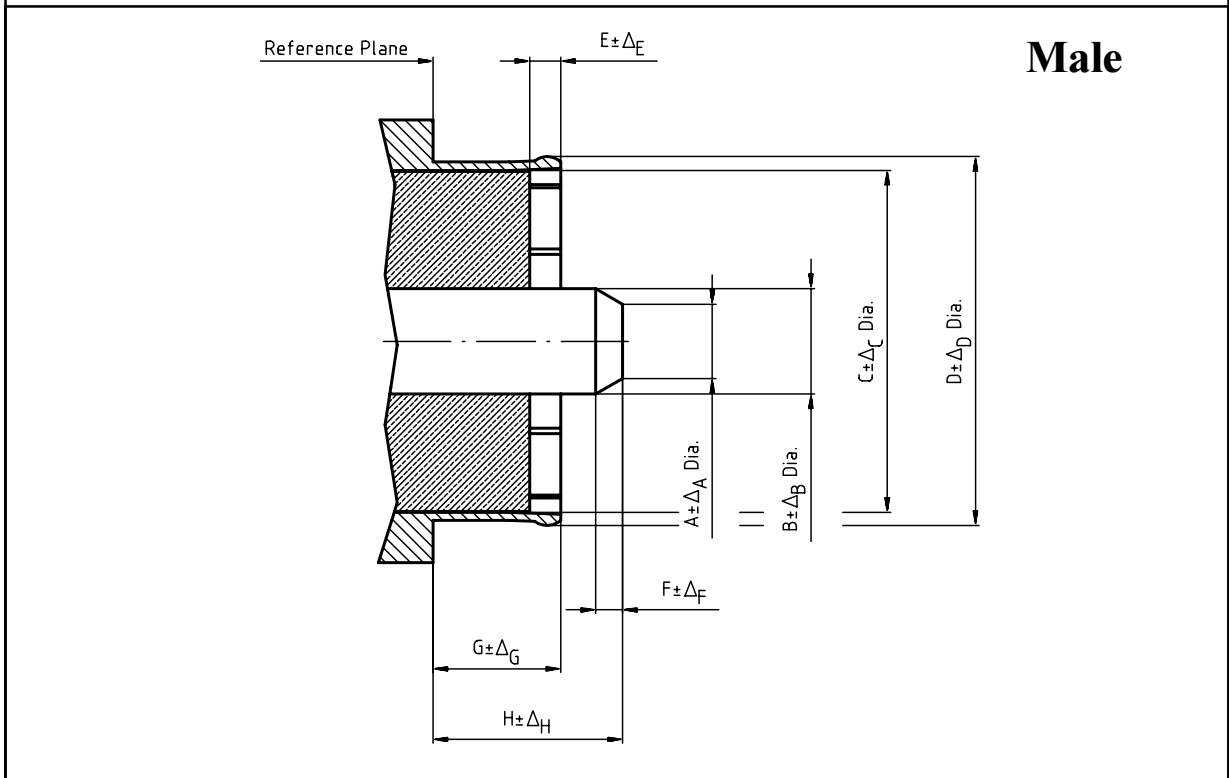
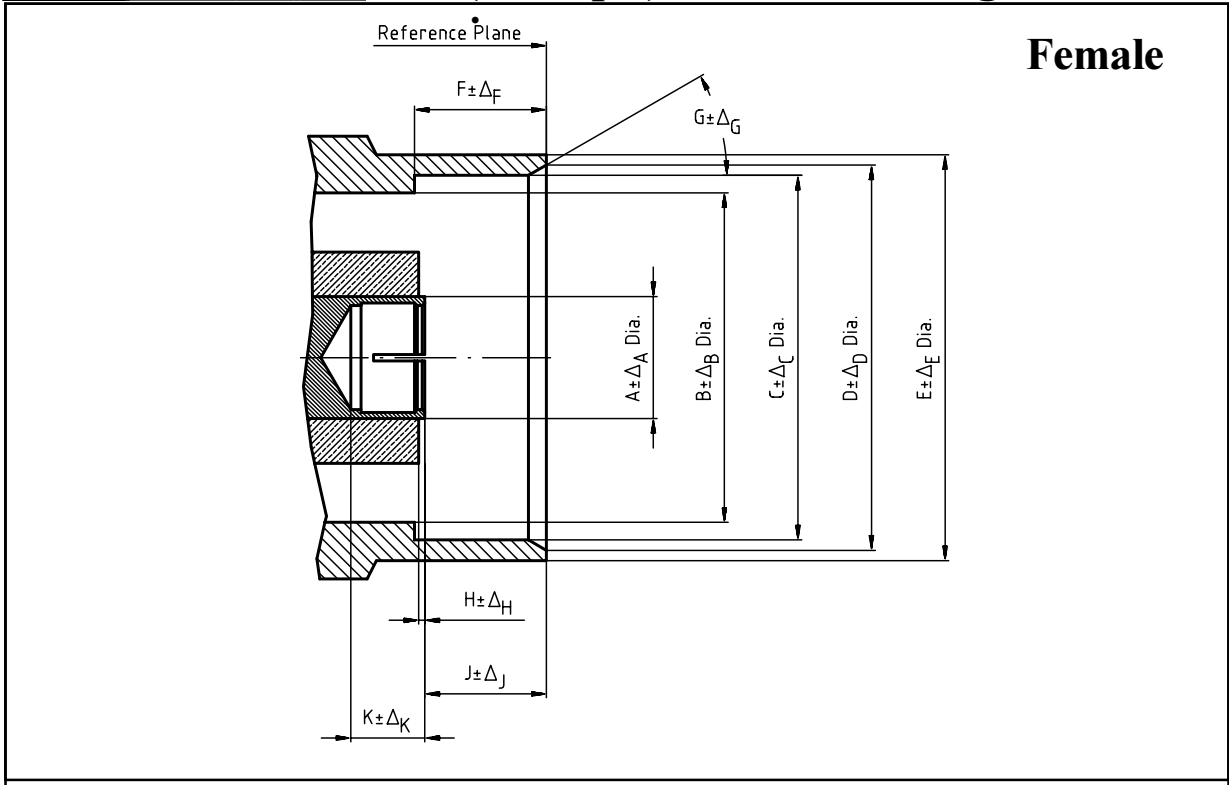
Connector Specifications (Example)



The specifications below are general specifications for connectors. Specific Data for VSWR, Insertion loss, R.F. leakage etc., are available from the factory upon request. Specifications in the following table are recommended for any procurement documents or drawings. In the event of any conflict between these specifications and other documentation, these specifications shall govern. These specifications are subject to change according to the latest revision.

REQUIREMENT	GENERAL SPECIFICATIONS
GENERAL	
Standard Materials	STEEL corrosion resistant 1.4305 per DIN 17440 (QQ-S-764, class 303 or ASTM-A-582-80). ALUMINUM AlMg4.5Mn per DIN 1725, AlMgSi0.5 per DIN 1725, AlMgSi1 per DIN 1725 (6061-T6 per QQ-A-225/8). BRASS CuZn39Pb3 per DIN 17660 (QQ-B-626, half hard). COPPER BERYLLIUM 33-25 CuBe2Pb H per DIN 17666 (QQ-C-530). TFE Fluorocarbon per DIN 52900 (MIL-P-19468 and L-P403). SILICONE RUBBER per DIN 3771 (MIL-R-5847 and ZZ-R-765, Class II B.) Grade 65 - 75.
Finish for COPPER BERYLLIUM STAINLESS STEEL ALUMINUM BRASS VARIOUS	BORRNIUM NITRIDE Dielectric for high power applications per inhouse specification. Center Contacts shall be gold plated to a minimum thickness of .00005 inch (1.27 µm) in accordance with MIL-G-45204, Type II, Grade C. shall be passivated per QQ-P-35. Conductive Parts shall have an iridited finish per MIL-C-5541. Other parts, such as Coupling Nuts and Back-Bodies shall be anodized per MIL-A-8625. .00003 inch (0.8 µm) min. gold plating per MIL-G-45204, or nicle plating per QQ-N-190, as specified.
Design	Imoloy .0001 inch (2.5 µm) min. plating, consisting of 55% Copper / 20% Zinc / 25% Tin (on special request).
ELECTRICAL	
Frequency Range Insulation Resistance Voltage Standing Wave Ratio (VSWR) Contact Resistance Dielectric Withstanding Voltage RF High Potential Withstanding Voltage RF Leakage Insertion Loss	Please refer to the appropriate connector data sheet.
MECHANICAL	
Connector Durability Cable Retention Force Coupling Nut Retention Force Force to Engage and Disengage Longitudinal Force max. Mating Characteristics Recommended Mating Torque	Please refer to the appropriate connector data sheet.
ENVIRONMENTAL	
Corrosion (Salt Spray) Vibration Shock Thermal Shock Moisture Resistance	Specification MIL-STD-202, Method 101, Test Condition B. The salt solution shall be 5%. Specification MIL-STD-202, Method 204, Test Condition B. Specification MIL-STD-202, Method 213, Test Condition 1. Specification MIL-STD-202, Method 107, Test Condition B, except high temperature shall be + 200°C. Specification MIL-STD-202, Method 106. Step 7b (vibration) shall be omitted. Insulation resistance shall be 200 megohms min. within 5 minutes of removal from humidity.

(Example) Interface Mating Dimen-



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Connector Selection Chart 50 Ω



Type	Sex	Description	Remarks	Code	Finish	
1.4/4.4	Connector	straight		03	silver plated Brass	
1.8/5.6	Male	straight		07	gold plated Brass	
		Right Angle		05		
	Female	straight		04		
		Right Angle		06		
2/5.5	Male	Right Angle		02	anodized aluminum	
2.4 mm	Male	straight	Maxi-Nut	HM	passivated Stainless Steel	
			NMD	M2		
		2-Hole Flange Mount		H2M		
		straight	HP-direct connection	HN		
	Female	Bulkhead Feedthrough	2-Hole Flange Mount			HF
			4-Hole Flange Mount			H2
		2-Hole Flange Mount		HB		
			4-Hole Flange Mount			HF2
			HF4			
3.5 mm	Male	straight	Maxi-Nut	91	passivated Stainless Steel	
			NMD	M3		
				H3M		
	Female	straight	direct Connection	HP-direct connection		92
			Bulkhead Feedthrough			H3
			2-Hole Flange Mount			92B
			4-Hole Flange Mount			922
						924
7 mm	Connector	straight, Contact 4 equally spaced slots	Interchangeable Connector	E90	passivated Stainless Steel	
				90		
		straight, Contact 6 equally spaced slots	Interchangeable Connector	E96		
				96		
7/16	Male	straight	PUSH-ON, Locking	7SB	silver plated Brass	
				7S	passivated Stainless Steel	
				75		
	Female	straight	Bulkhead Feedthrough			76
			4-Hole Flange Mount		753	
					754	
BMA	Male	Bulkhead Feedthrough		BM	passivated Stainless Steel	
			2-Hole Flange Mount			BF
	Female	Bulkhead Feedthrough		BB		
			straight			BW
BNC	Male	straight		71	nickel plated Brass	
	Female			81		
C	Male	straight		88	passivated	
	Female			89	Stainless Steel	
HN	Male	straight		69	passivated Stainless Steel	
		Right Angle		67		
	Female	straight		68		
K*	Male	straight	Regular length	KM	passivated Stainless Steel	
			Maxi-Nut	MK		
			Short	KMS		
			NMD	WIM		
	Female	straight	Wiltron direct connection			KF
						WI
			Bulkhead Feedthrough			KFB
			2-Hole Flange			KF2
		4-Hole Flange		KF4		
N	Male	straight	PUSH-ON, Locking	NSB	silver plated Brass	
			PUSH-ON, Locking, Double "D"	NDB	passivated Stainless Steel	
				ND		
			PUSH-ON, Locking, Hexagonal Knurl Nut	NS		
				510		
				51		
			Interchangeable Connector	E51		
			High Power	51H		
	Female	straight	High Power			55
						61
			Interchangeable Connector			E61
			High Power			61H
			straight			63
			Bulkhead Feedthrough	Right Angle		
4-Hole Flange Mount	straight			5B		
				65		
		Right Angle		5C		
SBX	Male	straight		XM	passivated	
	Female			XF	Stainless Steel	
SBY	Male	straight		YM	passivated	
	Female			YF	Stainless Steel	

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 *'K' Connector is a trademark of Wiltron

Type	Sex	Description	Remarks	Code	Finish			
SC	Male	straight	Chart	80	passivated Stainless Steel			
		Right Angle		77				
		straight		80H				
	Female	straight		79				
		Bulkhead Feedthrough		78				
		straight	High Power	79H				
SMA	Male	straight	Across Flats	1S	passivated Stainless Steel			
			Maxi-Nut	MA				
			PUSH-ON, Non Locking	SM				
			PUSH-ON, Locking	SML				
			Phase Adjustable	PH				
			Regular	11				
			Interchangeable Connector	E11				
			Short	11S				
			Short	10S				
			Regular	10				
			Low Cost	101				
							14	gold plated Stainless Steel
							15	
	Right Angle	DC-12.0 GHz	Regular (w/o wire holes)	151				
			Short (w/o wire holes)	152				
			Long (w/o wire holes)	153				
			Regular (with wire holes)	154				
			Short (with wire holes)	155				
			Long (with wire holes)	156				
			Long	17L				
	Radius Right Angle	DC - 25.0 GHz	17					
				16	gold plated Stainless Steel			
				20	passivated Stainless Steel			
				21				
			Interchangeable Connector	E21				
				23				
			Bulkhead Feedthrough	22				
				24				
			4-Hole Flange Mount	25				
				27				
			2-Hole Flange Mount	26				
				26				
			Right Angle	Regular				
			18R					
			Long					
			18L					
		Radius Right Angle	DC - 25.0 GHz					
			28					
			19					
				pass. Stainless Steel				
SMB	Male	straight	DC - 4.0 GHz	MB	gold plated Brass			
	Female			FB				
SMC	Male	straight	DC - 10.0 GHz	MC	gold plated Brass			
		Right Angle		CW				
	Female	straight		FC				
SMP Test	Male	straight	DC - 40.0 GHz	TMJ	passivated Stainless Steel			
	Female			TMP				
Connector SMP	Male	straight	DC - 40.0 GHz	MJ	passivated Stainless Steel			
	Female			Right Angle		MP		
			DC - 18.0 GHz	MPR				
SPM	Male	straight		PM	passivated Stainless Steel			
	Female	straight		PJ				
		Bulkhead Feedthrough		PGF				
		2-Hole Flange Mount		PG2				
		4-Hole Flange Mount		PG4				
SSMA	Male	straight		SSM	passivated Stainless Steel			
	Female			SSF				
TNC	Male	straight	PUSH-ON, locking	TS	passivated Stainless Steel			
				31				
			Interchangeable Connector	E31				
			High Power	31H				
				35				
		Right Angle		40	gold plated Stainless Steel			
	Female	straight		41	passivated Stainless Steel			
			Interchangeable Connector	E41				
			High Power	41H				
			Bulkhead Feedthrough	43				
				45				
			44					
	4-Hole Flange Mount	straight		gold plated Stainless Steel				
	Radius Right Angle		46					
TNX	Male	straight		39	passivated Stainless Steel			
	Female			49				

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Frequency Range Chart of Connectors



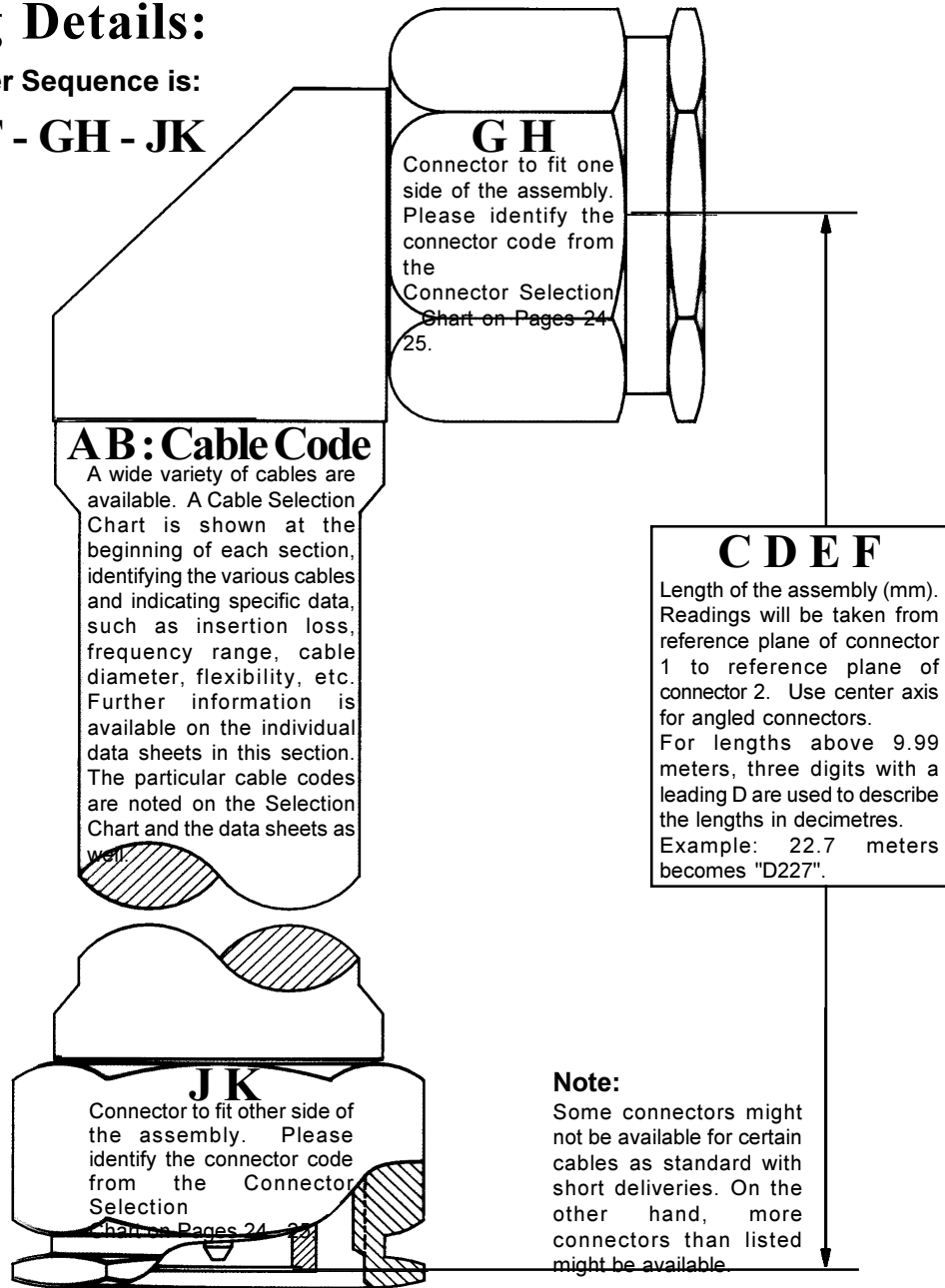
Coaxial Connector Frequency Range Chart												
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18	26.5	30	40	50
Band	L	S	C	X	KU	K	KA					
Connector Type	Operational Range →				Applicable MIL, DIN or IEC Spec							
1.4/4.4	DC - 20.0 GHz							DIN 47298				
1.8/5.6	DC - 10.0 GHz					DIN 47226						
2/5.5	DC - 14.0 GHz											
2.4 mm	DC - 50.0 GHz											
3.5 mm	DC - 35.0 GHz											
7 mm	DC - 18.0 GHz							IEC 457-2				
7/16	DC - 7.5 GHz				DIN 47223							
BMA	DC - 22.0 GHz											
BNC	DC - 4.0 GHz			MIL-C-39012 (IEC 169-2)								
C	DC - 10.0 GHz					MIL-C-39012 (IEC169-7)						
HN	DC - 8.0 GHz				MIL-C-3643							
K*	DC - 40.0 GHz											
N	DC - 18.0 GHz min., optional DC - 20.0 GHz							MIL-C-39012				
SBX	DC - 8.0 GHz											
SBY	DC - 12.0 GHz											
SC	DC - 10.0 GHz					MIL-C-39012						
SMA	DC - 18.0 GHz							MIL-C-39012				
SMB	DC - 4.0 GHz			MIL-C-39012/67/72								
SMC	DC - 10.0 GHz					MIL-C-39012/73/78						
SMP	DC - 40.0 GHz											
SPM	DC - 18.0 GHz											
SSMA	DC - 34.0 GHz										No MIL Designation	
TNC	DC - 11.0 GHz					MIL-C-39012						
TNC	DC - 18.0 GHz							MIL-C-87104/2				
TNX	DC - 18.0 GHz											

* 'K' Connector is a trademark of Wiltron Company.

Purchasing Information on Flexible Cable Assemblies

Ordering Details:

The Part Number Sequence is:
AB - CDEF - GH - JK



Ordering Example:

The cable assembly of Type 10 shall have the length of 210 cm. It shall be terminated with a TNC straight male and a N right angle male (interface of connector 1 to center axis of the angled connector).

AB = cable code = 10 * CDEF = length in mm = 2100 * GH and JK are the connectors = 31 and 55.

Part Number for the cable assembly in this example: 10 - 2100 - 31 - 55.

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Flexible Cable Assemblies

- | Description: | Cable Types: | | | | | |
|--|--------------|-----|-----|-----|-----|-----|
| High Performance Cable Assemblies | 03 | 10 | 11 | 12 | 14 | 17 |
| | 37 | 39 | 43 | 51 | 57 | 60 |
| | 65 | 100 | 120 | 140 | 300 | 500 |

Page 31 f.f.
- | Description: | Cable Types: | | | |
|------------------------------------|--------------|----------|----|-----------|
| Commercial Cable Assemblies | 21 | RG-214/U | 40 | RG-400 /U |
| | 23 | RG-223/U | 42 | RG-142B/U |
| | 31 | RG-316/U | 58 | RG-58C /U |
| | 32 | RD-316/U | | |

Page 53 f.f.
- | Description: | Cable Types: | | | |
|---|--------------|----|-----|-----|
| Quick Connections
(Cable Assemblies with
PUSH-ON Connectors) | 10 | 14 | 18 | 22 |
| | 40 | 42 | 100 | 140 |

Page 63 f.f.
- | Description: | Cable Types: | | |
|---|--------------|----|----|
| Phase Stable Assemblies
(ANA - Cable | 16 | 18 | 22 |

Page 69 f.f.
- | Description: | Cable Types: | |
|---|--------------|-----|
| Cable Assemblies
with Interchangeable
Connectors | 22 | 100 |

Page 75 f.f.
- Connector Outline Drawings:**

Page 105 f.f.

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High Performance Flexible Cable Assem-



blies



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High Performance Flexible Cable Assemblies

Cables, covered in this section					
03	10	11	12	14	17
37	39	43	51	57	60
65	100	120	140	300	500

- **High Performance Cable Selection Chart** Page 32
- **High Power Cable Selection Chart** Page 33
- **High Performance Cable Specifications** Page 35 f.f.

Although this section offers a wide range of products, it does not show all the flexible cables Spectrum Elektrotechnik GmbH is manufacturing and offering. But this section lists cables which are used in approximately 90% of the applications.

Should you require something different, please do not hesitate to contact the factory. The product you need in your program may have been developed already.

Note: Towards the end of this Handbook, starting at Page 105, you will find useful information on connectors used most frequently.

Cable specification may change without notice (for equal or superior electrical performance).

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High Performance Cable Selection Chart													
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18	26.5	30	40	50	
Band	L		S		C	X		KU		K	KA		
Cable Type	Operational Range →												
Increasing Insertion Loss ↓	03	(Dia. 13.5mm). Military Application.					9.5 GHz						
	500	(Dia. 14.0mm).					11.0 GHz						
	300	(Dia. 13.5mm).					9.5 GHz						
	51	(Dia. 17.0mm). Armored.							18.0 GHz				
	12	(Dia. 11.2mm). Military Application.					12.4 GHz						
	60A 60B	(Dia. 12.0mm). High Power, armored.							18.0 GHz				
	57	(Dia. 10.5mm).							18.0 GHz				
	120	(Dia. 11.2mm).					12.4 GHz						
	14	(Dia. 7.4mm). Military Application.							20.0 GHz				
	65	(Dia. 8.7mm).								26.5 GHz			
	140	(Dia. 7.4mm).							20.0 GHz				
	10	(Dia. 7.0mm). Military Application. Ruggedized.								26.5 GHz			
	100	(Dia. 5.2mm).								26.5 GHz			
	39	(Dia. 5.0mm).									40.0 GHz		
	43	(Dia. 4.3mm).								26.5 GHz			
	37	(Dia. 4.6mm).										50.0 GHz	
	11	(Dia. 3.2mm).										40.0 GHz	
17	(Dia. 2.7mm).							18.0 GHz					

High Power Cable Selection Chart												
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18	26.5	30	40	50
Band	L		S		C	X	KU		K	KA		
Cable Type	Operational Range →											
Increasing Power ↑	500	(Dia. 14.0mm).					11.0 GHz					
	03	(Dia. 13.5mm). Military Application.					9.5 GHz					
	300	(Dia. 13.5mm).					9.5 GHz					
	60A 60B	(Dia. 12.0mm). High Power, armored.							18.0 GHz			
	12	(Dia. 11.2mm). Military Application.					12.4 GHz					
	120	(Dia. 11.2mm).					12.4 GHz					

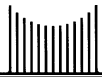
For High Power Applications a variety of High Power Connectors in different Connector styles were developed, using special dielectric for good heat dissipation.

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High Performance Flexible Cable Assemblies



34 Spectrum Elektrotechnik GmbH P.O. Box 45 05 33, 80905 Munich, Germany Tel. (89) 354 804-0, Fax (89) 354 804-90 (Country Code: 49)

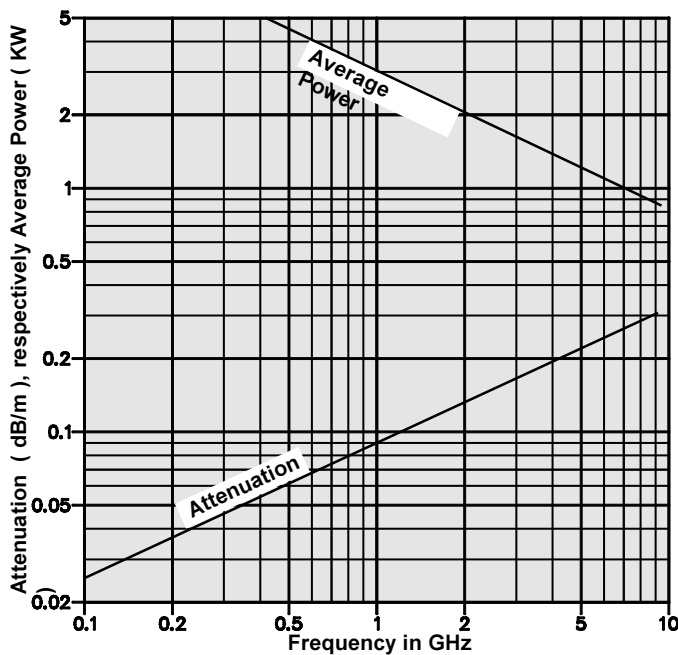
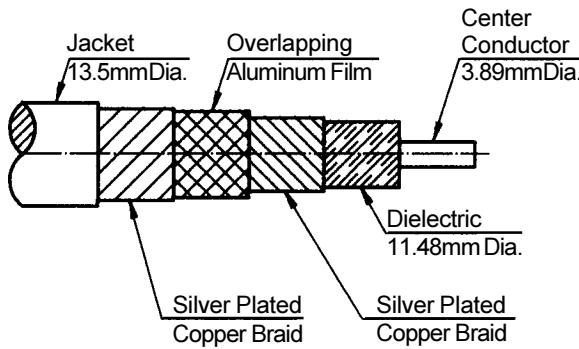


- Characteristics:**
- Ultra low loss to 9.5 GHz.
 - Very Rugged Construction.
 - The Ideal Receive/Transmit Cable.
 - Meeting the very highest Quality Standard, as needed in military applications.
 - Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
 - Available connectors: 3.5mm, 7mm, 7/16, C, HN, N, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
 - For Connector Code details please refer to Pp. 24 - 25.
 - For information on armor please refer to Pages 15 - 19.
 - For ordering information please refer to Page 27.

Cable - Type 03

Low Loss, High Power

DC - 9.5 GHz



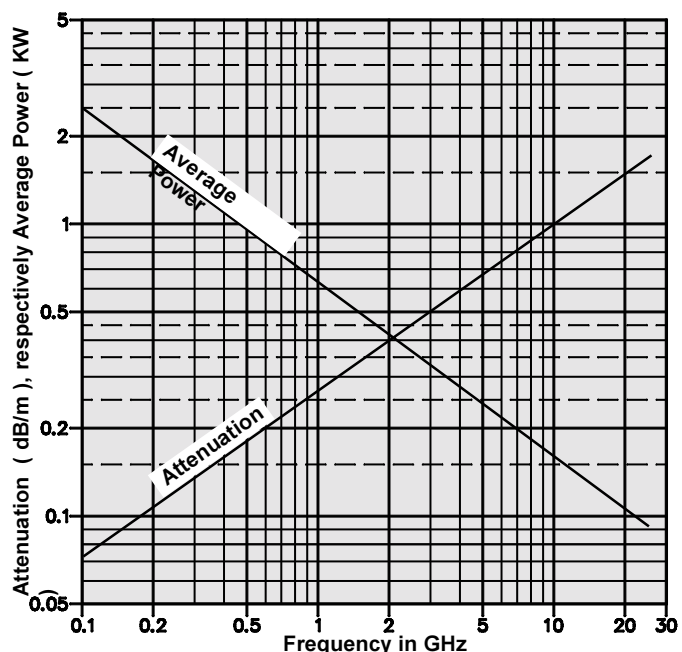
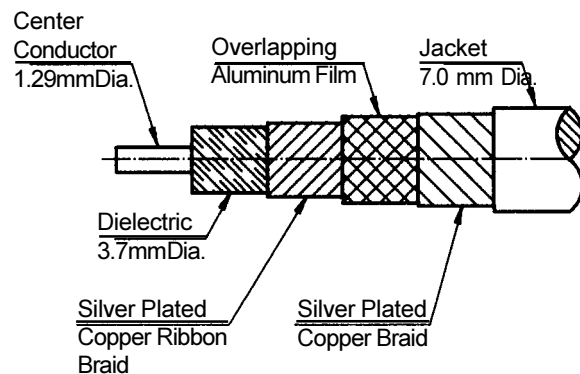
SPECIFICATION		Type 03
Cable Code	Standard	03
	Armored	03x <small>X Please find Armor & Ruggedizing Options on Pages 15 - 19.</small>
Frequency Range	DC 9.5 GHz	
Outer Diameter in mm	Standard	13.5
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C	50 ± 2	
Velocity in %, ± 2%	77	
Capacitance in pF/m	87	
Dielectric Strength (60 Hz) in KV rms	8.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	2.0	
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.06
	2.0 GHz	0.14
	4.0 GHz	0.20
	6.0 GHz	0.25
	8.0 GHz	0.29
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	4500
	2.0 GHz	1960
	4.0 GHz	1380
	6.0 GHz	1070
	8.0 GHz	900
9.0 GHz	850	
RF - Leakage at 9.5 GHz	- 90 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	Silver Plated Copper Braid, Aluminum Film, Silver Plated Copper Braid	
Outer Jacket	PTFE	
Dielectric Diameter in mm	11.48	
Dielectric Material	Low Density PTFE	
Dielectric Constant	1.7	
Center Conductor Material	Copper, Silver Plated	
Center Conductor Dia. in mm	3.89	
Weight in Gramms/Meter	350	
Minimum Bend Radius, Inside, Static (mm)	90	
Minimum Bend Radius, Inside,		

Cable - Type 10 DC - 26.5 GHz

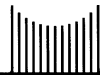
SPECIFICATION		Type 10
Cable Code	Standard	10
	Armored	10x X Please find Armor & Ruggedizing Options on Pages 15 - 19.
Frequency Range	DC 26.5 GHz	
Outer Diameter in mm	Standard	7.0*
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C	50 ± 1	
Velocity in %, ± 2%	75	
Capacitance in pF/m	87	
Dielectric Strength (60 Hz) in KV rms	5.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	1.0	
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.18
	2.0 GHz	0.40
	5.0 GHz	0.63
	10.0 GHz	0.97
	26.5 GHz	1.70
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	950
	2.0 GHz	421
	5.0 GHz	244
	10.0 GHz	162
	26.5 GHz	91
RF - Leakage at 18.0 GHz	- 100 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	Silver Plated Copper Braid, Overlapping Aluminum Film, Silver Plated Copper Braid	
Outer Jacket	PTFE with add. Polyolefin Jacket*	
Dielectric Dia. in mm	3.7	
Dielectric Material	Low Density PTFE	
Dielectric Constant	1.8	
Center Conductor Material	Copper, Silver Plated	
Center Conductor Dia. in mm	1.29	
Weight in Gramms/Meter	69	
Minimum Bend Radius, Inside, Static (mm)	26	
Minimum Bend Radius, Inside, Dynamic (mm)	60	

Characteristics:

- Performance to 26.5 GHz, when terminated with K* or 3.5mm connectors (mating with SMA).
- Meeting the very highest Quality Standard, as needed in military applications.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 1.4/4.4, 2.4mm, 3.5mm, 7mm, 7/16, HN, K*, N, SBX, SBY, SC, SMA, SPM and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



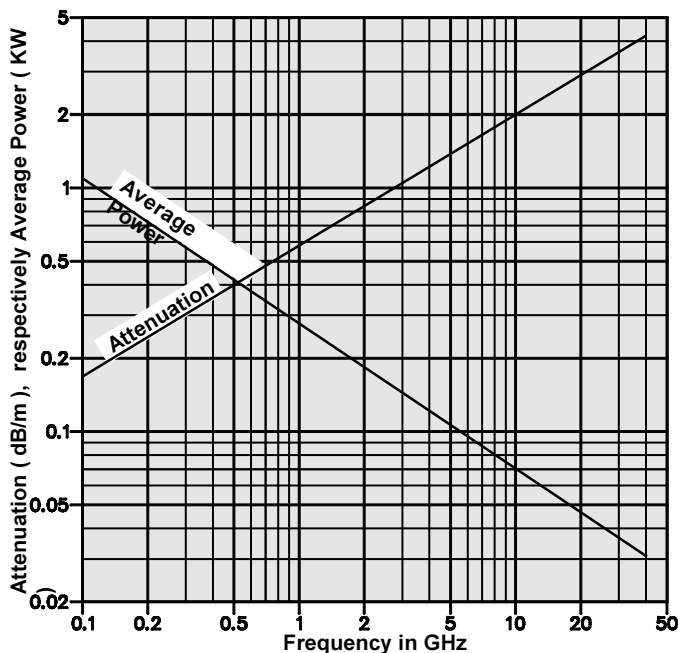
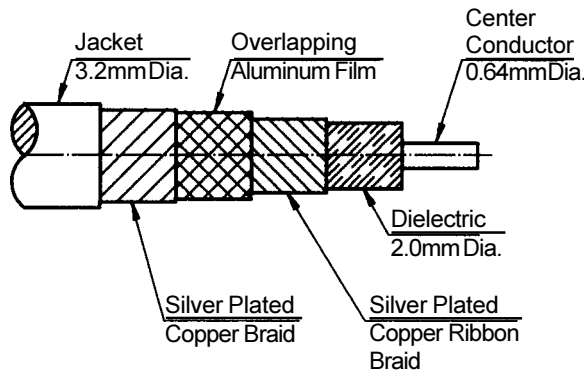
* 'K' Connector is a trademark of Wiltron



- Characteristics:**
- Low Loss Performance to 40.0 GHz.
 - Small Diameter.
 - Rugged Construction.
 - Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
 - Available connectors: 1.4/4.4, 2.4mm, 3.5mm, BMA, K*, N, SMA, and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
 - For Connector Code details please refer to Pp. 24 - 25.
 - For information on armor please refer to Pages 15 - 19.
 - For ordering information please refer to Page 27.

Cable - Type 11

DC - 40.0 GHz



SPECIFICATION		Type 11
Cable Code	Standard	11
	Armored	11X X Please find Armor & Ruggedizing Options on Pages 15 - 19.
Frequency Range	DC 40.0 GHz	
Outer Diameter in mm	Standard	3.2
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C	50 ± 2	
Velocity in %, ± 2%	74	
Capacitance in pF/m	90	
Dielectric Strength (60 Hz) in KV rms	5.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	0.5	
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.40
	2.0 GHz	0.85
	5.0 GHz	1.40
	10.0 GHz	2.00
	18.0 GHz	2.60
	40.0 GHz	4.20
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	405
	2.0 GHz	180
	5.0 GHz	105
	10.0 GHz	70
	18.0 GHz	48
	26.5 GHz	38
40.0 GHz	28	
RF - Leakage at 18.0 GHz	- 100 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	Silver Plated Copper Braid, Overlapping Aluminum Film, Silver Plated Copper Braid	
Outer Jacket	PTFE	
Dielectric Diameter in mm	2.0	
Dielectric Material	Low Density PTFE	
Dielectric Constant	1.8	
Center Conductor Material	Copper, Silver Plated	
Center Conductor Dia. in mm	0.64	
Weight in Gramms/Meter	26	
Minimum Bend Radius, Inside, Static (mm)	13	
Minimum Bend Radius, Inside,		

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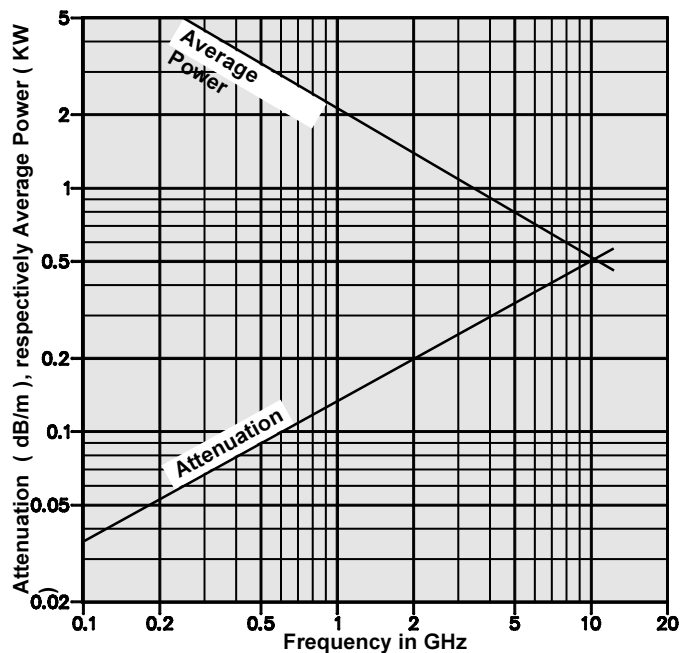
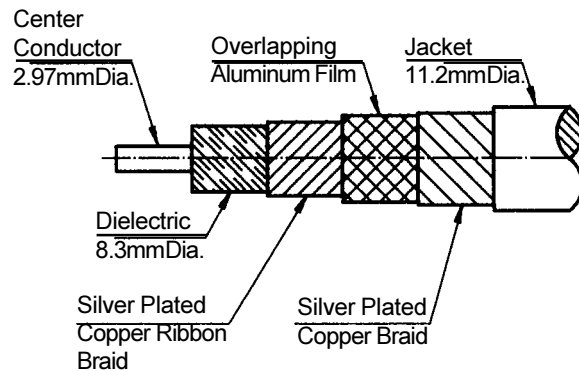
Cable - Type 12

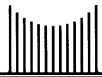
DC - 12.4 GHz

SPECIFICATION		Type 12
Cable Code	Standard	12
	Armored	12x X Please find Armor & Ruggedizing Options on Pages 15 - 19.
Frequency Range	DC 12.4 GHz	
Outer Diameter in mm	Standard	11.2
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C	50 ± 1	
Velocity in %, ± 2%	77	
Capacitance in pF/m	87	
Dielectric Strength (60 Hz) in KV rms	8.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	2.0	
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.09
	1.0 GHz	0.14
	2.0 GHz	0.20
	5.0 GHz	0.34
	10.0 GHz	0.50
	12.4 GHz	0.55
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	3100
	1.0 GHz	2100
	2.0 GHz	1349
	5.0 GHz	780
	10.0 GHz	515
	12.4 GHz	470
RF - Leakage at 12.4 GHz	-100 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	Silver Plated Copper Braid, Overlapping Aluminum Film, Silver Plated Copper Braid	
Outer Jacket	PTFE	
Dielectric Diameter in mm	8.3	
Dielectric Material	Low Density PTFE	
Dielectric Constant	1.7	
Center Conductor Material	Copper, Silver Plated	
Center Conductor Dia. in mm	2.97	
Weight in Grams/Meter	280	
Minimum Bend Radius, Inside, Static (mm)	64	
Minimum Bend Radius, Inside,		

Characteristics:

- Excellent Performance to 12.4 GHz.
- Very Rugged Construction.
- Meeting the very highest Quality Standard, as needed in military applications.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 7/16, HN, N, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



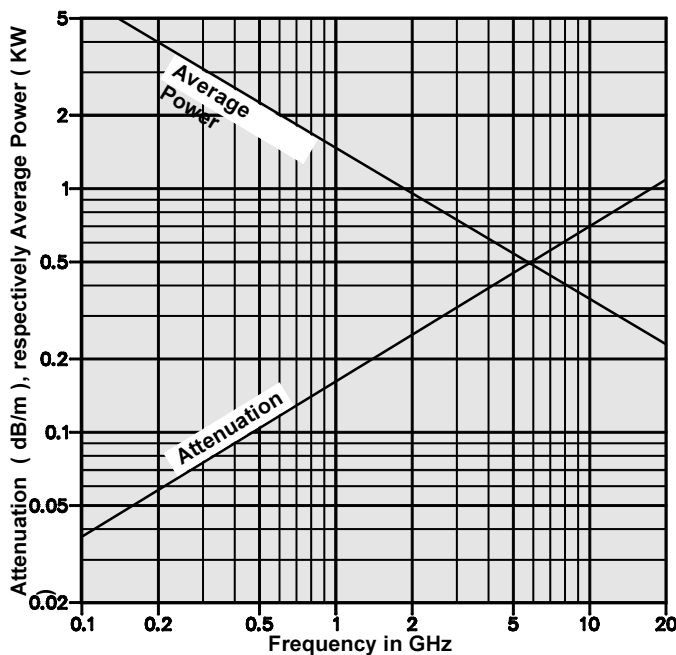
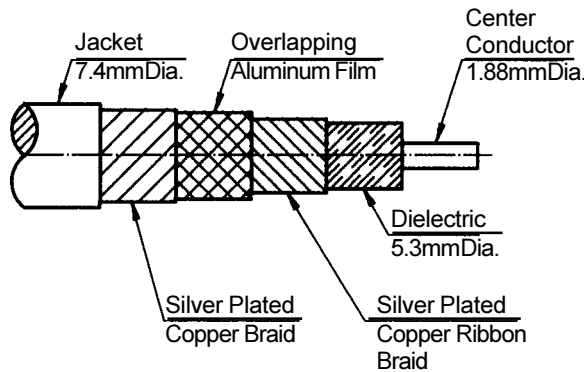


Characteristics:

- Excellent Performance to 20.0 GHz
- Very Rugged Construction.
- Meeting the very highest Quality Standard, as needed in military applications.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 3.5mm, 7mm, 7/16, HN, N, SC, SMA, and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.

Cable - Type 14

DC - 20.0 GHz



SPECIFICATION		Type 14
Cable Code	Standard	14
	Armored	14X X Please find Armor & Ruggedizing Options on Pages 15 - 19.
Frequency Range		DC 20.0 GHz
Outer Diameter in mm	Standard	7.4
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 1
Velocity in %, ± 2%		76
Capacitance in pF/m		87
Dielectric Strength (60 Hz) in KV rms		6.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.5
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.13
	2.0 GHz	0.29
	5.0 GHz	0.49
	10.0 GHz	0.72
	20.0 GHz	1.08
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	2200
	2.0 GHz	967
	5.0 GHz	561
	10.0 GHz	372
	20.0 GHz	230
RF - Leakage at 18.0 GHz		-100 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		Silver Plated Copper Braid, Overlapping Aluminum Film, Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		5.3
Dielectric Material		Low Density PTFE
Dielectric Constant		1.7
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		1.88
Weight in Grams/Meter		118
Minimum Bend Radius, Inside, Static (mm)		38
Minimum Bend Radius, Inside,		80

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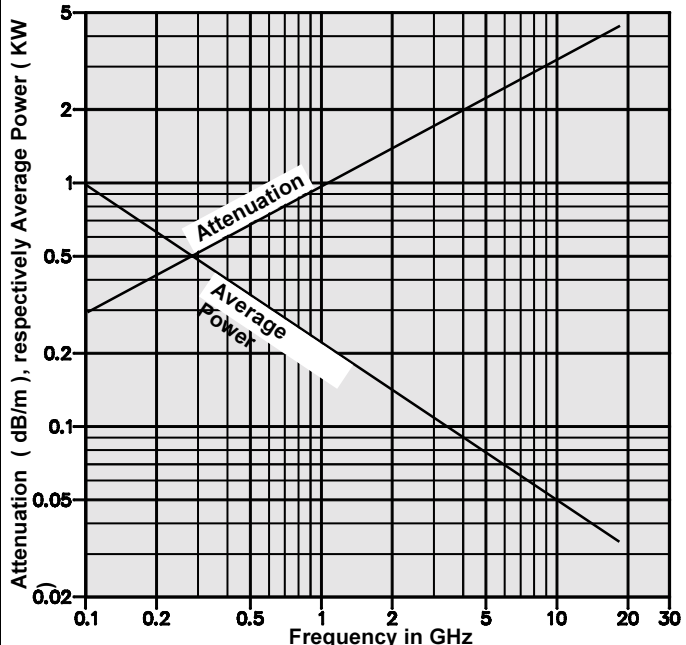
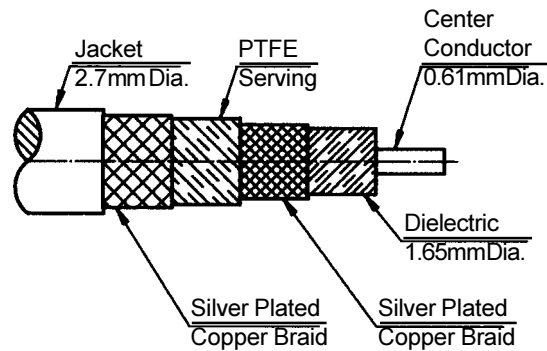
Flexible as Woolen Yarn

DC to 18.0 GHz

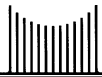
Characteristics:

- Performance to 18.0 GHz.
- Small Diameter.
- Almost no Spring Back; the cable is like Woolen Yarn.
- Better System Performance because of nearly no mechanical interference.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 1.4/4.4, 3.5mm, BMA, K*, N, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.

SPECIFICATION		Type 17
Cable Code	Standard	17
	Armored	17X <small>X Please find Armor & Ruggedizing Options on Pages 15 - 19.</small>
Frequency Range		DC 18.0 GHz
Outer Diameter in mm	Standard	2.7
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		76
Capacitance in pF/m		85
Dielectric Strength (60 Hz) in KV rms		2.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		0.6
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.64
	2.0 GHz	1.30
	4.0 GHz	1.90
	8.0 GHz	2.67
	12.4 GHz	3.40
	18.0 GHz	4.20
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	320
	2.0 GHz	140
	4.0 GHz	90
	8.0 GHz	58
	12.4 GHz	46
	18.0 GHz	36
26.5 GHz	28	
RF - Leakage at 18.0 GHz		-90 dBC
Operating Temperature Range		-54°C to +90°C
Outer Conductor Construction		2x Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		1.65
Dielectric Material		Low Density PTFE
Dielectric Constant		1.7
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		0.61
Weight in Gramms (Meter)		20
Minimum Bend Radius, Inside, Static (mm)		6.0
Minimum Bend Radius, Inside,		



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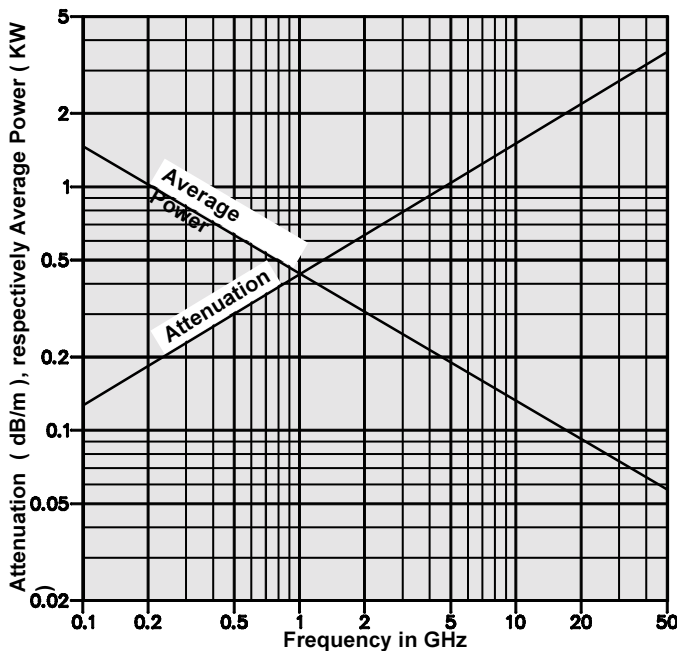
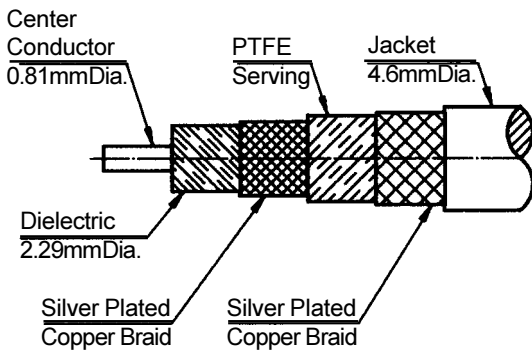


Characteristics:

- Performance to 50.0 GHz
- Small Diameter.
- Excellent Flexibility.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 2.4mm, 3.5mm, 7mm, K*, N and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.

Cable - Type 37

Ultimate Performance to 50.0 GHz



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SPECIFICATION		Type 37
Cable Code	Standard	37
	Armored	37X
X Please find Armor & Ruggedizing Options on Pages 15 - 19.		
Frequency Range	DC 50.0 GHz	
Outer Diameter in mm	Standard	4.6
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C	50 ± 2	
Velocity in %, ± 2%	81	
Capacitance in pF/m	79	
Dielectric Strength (60 Hz) in KV rms	2.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	1.3	
Nominal Insertion Loss in dB/m vs. Frequency	4.0 GHz	0.94
	8.0 GHz	1.37
	12.4 GHz	1.75
	18.0 GHz	2.18
	26.5 GHz	2.65
	40.0 GHz	3.10
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	4.0 GHz	215
	8.0 GHz	145
	12.4 GHz	120
	18.0 GHz	97
	26.5 GHz	80
	40.0 GHz	62
50.0 GHz	58	
RF - Leakage at 18.0 GHz	-90 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	2x Silver Plated Copper Braid	
Outer Jacket	PTFE	
Dielectric Diameter in mm	2.29	
Dielectric Material	Low Density PTFE	
Dielectric Constant	1.5	
Center Conductor Material	Copper, Silver Plated	
Center Conductor Dia. in mm	0.81	
Weight in Grams/Meter	49	
Minimum Bend Radius, Inside, Static (mm)	25	

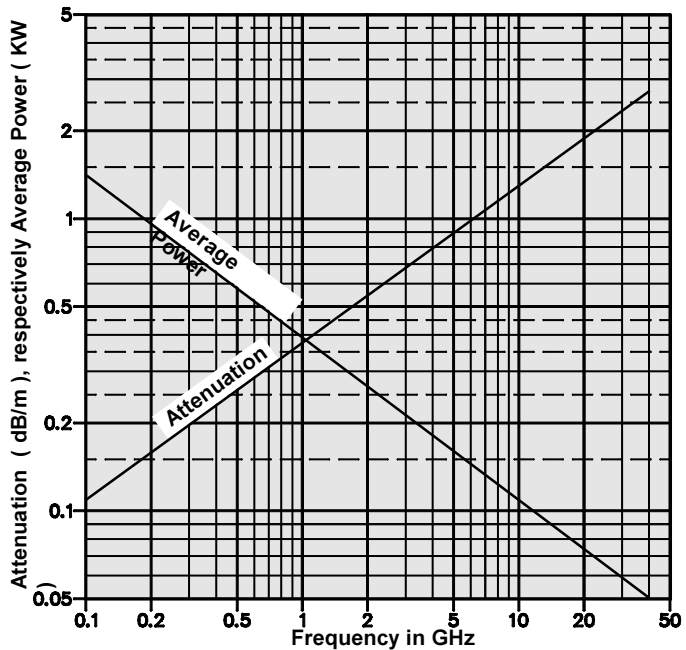
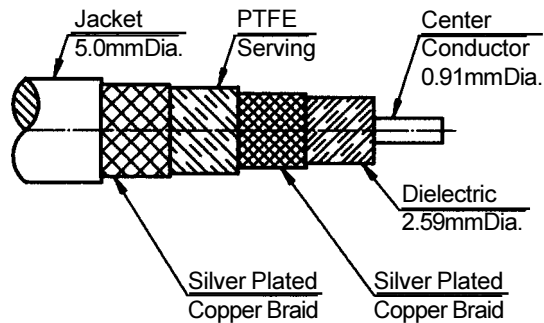
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Cable - Type 39 Ultimate Performance to DC - 40.0 GHz

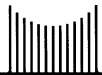
SPECIFICATION		Type 39
Cable Code	Standard	39
	Armored	39x
	X Please find Armor & Ruggedizing Options on Pages 15 - 19.	
Frequency Range		DC 40.0 GHz
Outer Diameter in mm	Standard	5.0
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		84
Capacitance in pF/m		79
Dielectric Strength (60 Hz) in KV rms		2.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.3
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.26
	4.0 GHz	0.79
	8.0 GHz	1.15
	12.4 GHz	1.43
	18.0 GHz	1.80
	40.0 GHz	2.70
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	570
	4.0 GHz	180
	8.0 GHz	120
	12.4 GHz	95
	18.0 GHz	77
	40.0 GHz	50
RF - Leakage at 18.0 GHz		- 100 dB
Operating Temperature Range		-54°C to +135°C
Outer Conductor Construction		2x Silver Plated Copper Ribbon Braid
Outer Jacket		cross linked Polyolefin
Dielectric Diameter in mm		2.59
Dielectric Material		Low Density PTFE
Dielectric Constant		1.4
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		0.91
Weight in Grams/Meter		67
Minimum Bend Radius, Inside, Static (mm)		25
Minimum Bend Radius, Inside,		

Characteristics:

- Low Loss Performance to 40.0 GHz.
- Small Diameter.
- Excellent Flexibility.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 2.4mm, 3.5mm, K*, N, and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



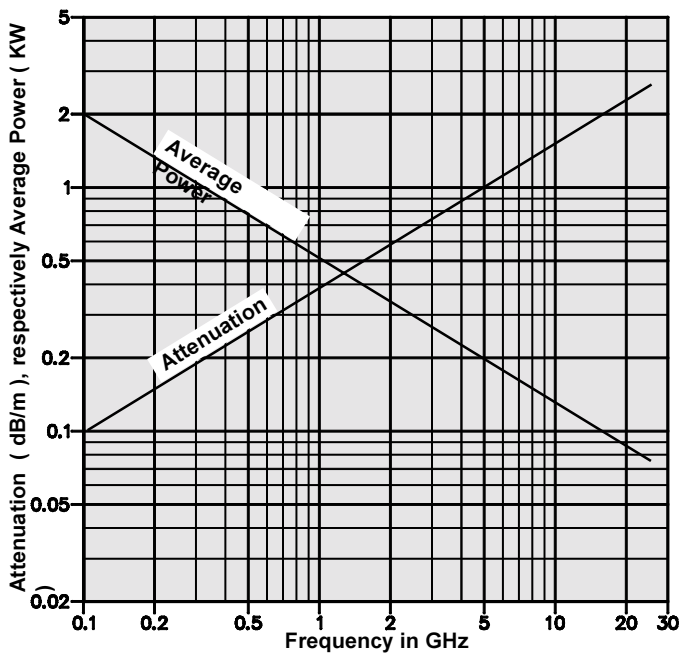
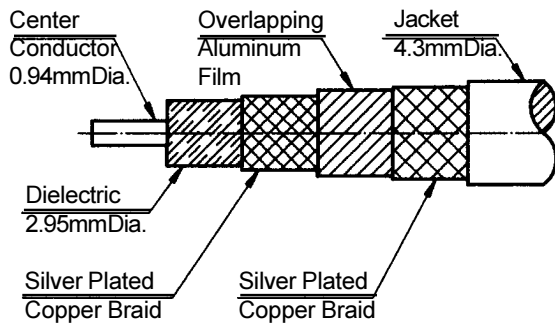
* 'K' Connector is a trademark of Wiltron



Characteristics:

- Performance to 26.5 GHz, when terminated with K* or 3.5mm connectors (mating with SMA).
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 1.4/4.4, 2.4mm, 3.5mm, 7mm, 7/16, HN, K*, N, SBX, SBY, SC, SQ8, SMA, SPM and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.

Cable - Type 43
DC - 26.5 GHz



* 'K' Connector is a trademark of Wiltron

SPECIFICATION		Type 43
Cable Code	Standard	43
	Armored	43X
	X Please find Armor & Ruggedizing Options on Pages 15 - 19.	
Frequency Range		DC 26.5 GHz
Outer Diameter in mm	Standard	4.3
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		72
Capacitance in pF/m		79
Dielectric Strength (60 Hz) in KV rms		5.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		0.7
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.28
	2.0 GHz	0.61
	4.0 GHz	0.85
	8.0 GHz	1.28
	12.4 GHz	1.70
	18.0 GHz	2.10
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	800
	2.0 GHz	340
	4.0 GHz	220
	8.0 GHz	150
	12.4 GHz	120
	18.0 GHz	90
26.5 GHz		75
RF - Leakage at 18.0 GHz		-90 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		Silver Plated Copper, Aluminium Film, Silver Plated Copper
Outer Jacket		PTFE
Dielectric Diameter in mm		2.95
Dielectric Material		Low Density PTFE
Dielectric Constant		1.9
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		0.94
Weight in Gramms/Meter		45
Minimum Bend Radius, Inside, Static (mm)		40
Minimum Bend Radius, Inside,		

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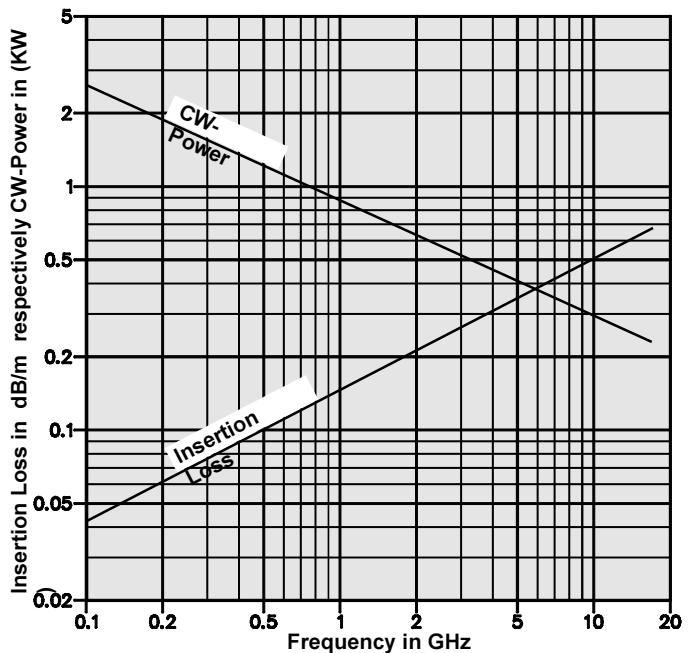
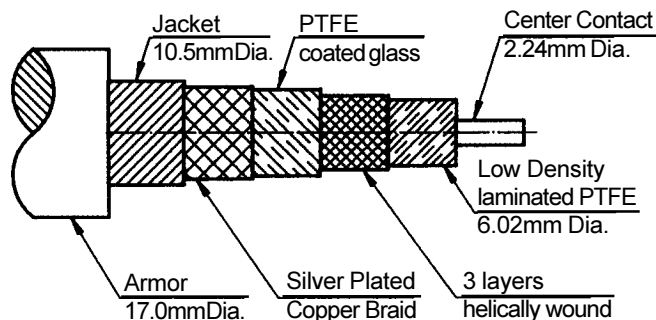
Cable - Type 51

0.68 dB/m Insertion Loss at 18.0 GHz

Characteristics:

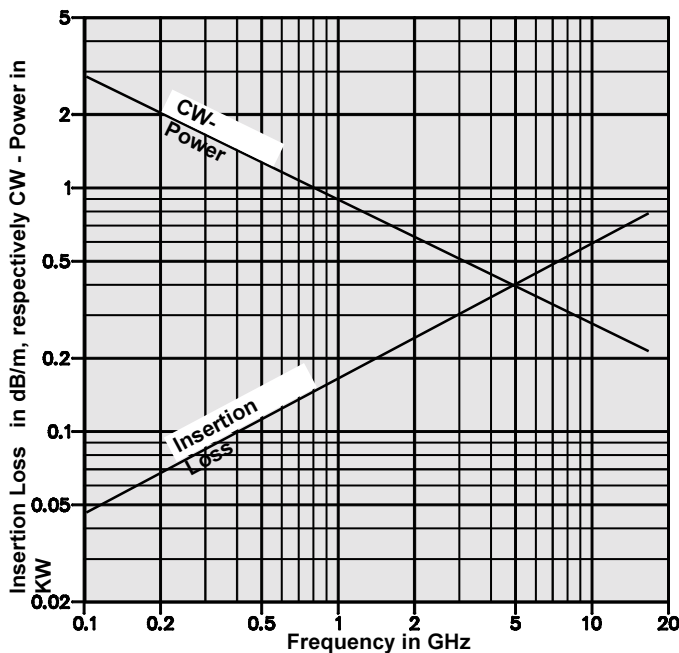
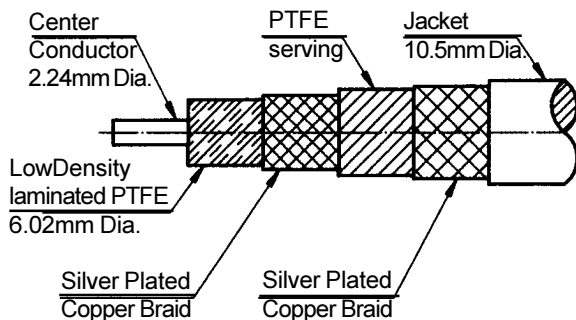
- Ultra Low Loss to 18.0 GHz.
- The ideal receiver cable.
- Meeting the very highest Quality Standard, as needed in military applications.
- Cable always will be ruggedized by armor:
 - For assemblies to a length of 10 m: Cotton woven stainless steel spring, silicone jacketed.
 - For longer assemblies: Interlaced stainless steel spiral, polyolefin jacketed.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 3.5mm, 7mm, 7/16, HN, N, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- Specify power level when ordering:
 - 51** : Power less than 10 Watts.
 - 51H**: High Power.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.

SPECIFICATION		Type 51
Cable Code	Low Power Assembly <10W	51
	High Power Assembly >10W	51H
Frequency Range	DC 18.0 GHz	
Outer Diameter in mm	17.0	
Impedance in Ohms at Sea Level and +25°C	50 ± 2	
Velocity in %, ± 2%	84	
Capacitance in pF/m	79	
Dielectric Strength (60 Hz) in KV rms	6.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	1.5	
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.10
	2.0 GHz	0.21
	4.0 GHz	0.30
	8.0 GHz	0.43
	12.4 GHz	0.55
	18.0 GHz	0.68
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	1250
	2.0 GHz	640
	4.0 GHz	450
	8.0 GHz	320
	12.4 GHz	260
	18.0 GHz	220
RF - Leakage at 18.0 GHz	-90 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	2x Copper Braid, Silver Plated	
Outer Jacket	Stainless steel Armor, silicone jacketed	
Dielectric Diameter in mm	6.02	
Dielectric Material	Low Density PTFE	
Dielectric Constant	1.4	
Center Conductor Material	Copper, Silver Plated	
Center Conductor Dia. in mm	2.24	
Weight in Gramms/Meter	640	
Minimum Bend Radius, Inside, Static (mm)	70	
Minimum Bend Radius, Inside, Dynamic (mm)	350	



Characteristics:

- Performance to 18.0 GHz.
- Low Loss at Low Price.
- Ideal as a Test Cable and a System Cable as well.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 3.5mm, 7mm, 7/16, HN, N, SBX, SBY, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- Specify power level when ordering:
57: Power less than 10 Watts.
57H: High Power Assembly.
- For armoring please use the following codes:
57X: Armored Low Power Assembly.
57HX: Armored High Power Assembly.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



Cable - Type 57
0.80 dB/m Insertion
Loss at 18.0 GHz

SPECIFICATION		Type 57
Cable Code	Low Power Assembly <10W	57
	High Power Assembly >10W	57H
	57 Armored	57X
	57H Armored <small>Please find Armor & Ruggedizing Options on Pages 15 - 19</small>	57HX
Frequency Range		DC 18.0 GHz
Outer Diameter in mm	Standard	10.5
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		84
Capacitance in pF/m		79
Dielectric Strength (60 Hz) in KV rms		6.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.5
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.12
	2.0 GHz	0.24
	4.0 GHz	0.35
	8.0 GHz	0.51
	18.0 GHz	0.80
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	1250
	2.0 GHz	640
	4.0 GHz	450
	8.0 GHz	320
	18.0 GHz	220
RF - Leakage at 18.0 GHz		-90 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		2x Copper Braid, Silver Plated
Outer Jacket		Cross linked Polyolefin
Dielectric Diameter in mm		6.02
Dielectric Material		Low Density PTFE
Dielectric Constant		1.4
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		2.24
Weight in Gramms/Meter		196
Minimum Bend Radius, Inside,		80

Cable - Type 60A 60B

High Power to 18.0 GHz
0.75 dB/m Insertion Loss

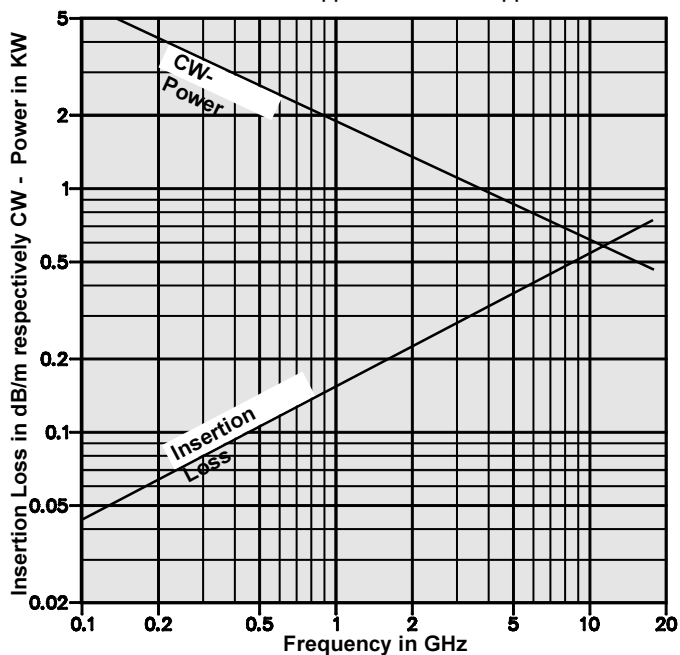
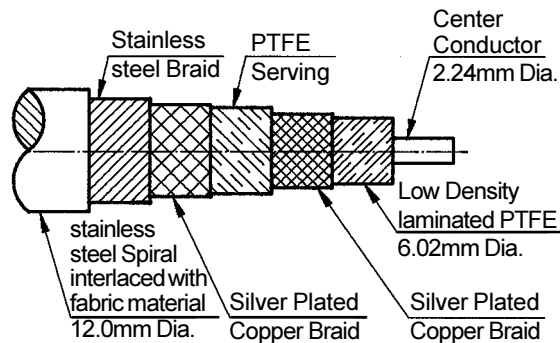
Characteristics:

- High Power applications to 18.0 GHz.
- Excellent heat dissipation at the connectors because of the Design and the special Dielectric.
- Ruggedized by a third braid made from stainless steel, and in addition a stainless steel spring, interlaced with fabric material.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 7/16, HN, N, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.
- Identify operating temperature when ordering:

Type 60A operates to 90°C.

Type 60B operates to 150°C.

SPECIFICATION		Type 60
Cable Code	Operating Temperature -54°C to + 90°C	60A
	Operating Temperature -54°C to +150°C	60B
Frequency Range		DC 18.0 GHz
Outer Diameter in mm		12.0
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		84
Capacitance in pF/m		79
Dielectric Strength (60 Hz) in KV rms		6.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.5
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.11
	2.0 GHz	0.23
	4.0 GHz	0.33
	8.0 GHz	0.47
	12.4 GHz	0.60
	18.0 GHz	0.75
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	2600
	2.0 GHz	1300
	4.0 GHz	950
	8.0 GHz	670
	12.4 GHz	550
	18.0 GHz	450
RF - Leakage at 18.0 GHz		-90 dBC
Outer Conductor Construction		2x Copper Braid Silver Plated
Outer Jacket		Stainless steel polyamide Spiral
Dielectric Diameter in mm		6.02
Dielectric Material		Low Density PTFE
Dielectric Constant		1.4
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		2.24
Weight in Gramms/Meter		332
Minimum Bend Radius, Inside,		



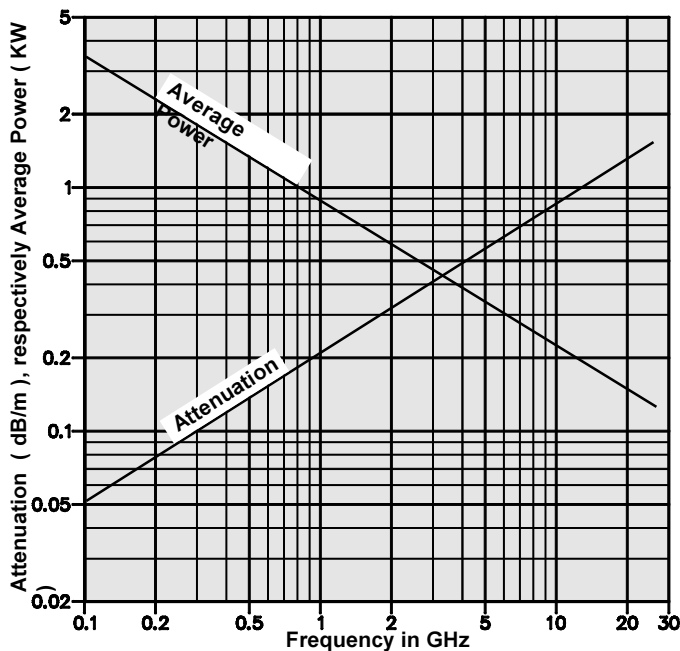
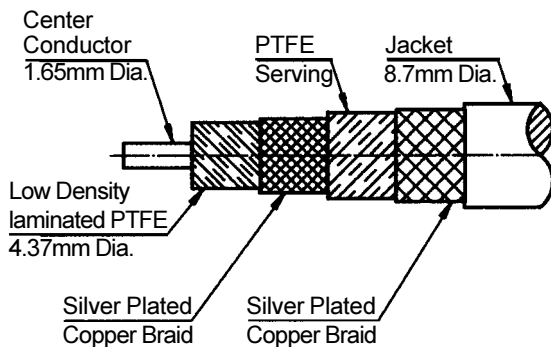
Characteristics:

- Low Loss Performance to 26.5 GHz.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 2.5/5.5, N, SC, SMA and TNC.
- For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.

Cable - Type 65

1.4 dB/m Insertion Loss

Loss



SPECIFICATION		Type 65
Cable Code	Standard	65
	Armored	65x X Please find Armor & Ruggedizing Options on Pages 15 - 19.
Frequency Range	DC 26.5 GHz	
Outer Diameter in mm	Standard	8.7
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C	50 ± 2	
Velocity in %, ± 2%	84	
Capacitance in pF/m	79	
Dielectric Strength (60 Hz) in KV rms	6.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	1.5	
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.16
	2.0 GHz	0.34
	4.0 GHz	0.50
	8.0 GHz	0.75
	18.0 GHz	1.15
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	1350
	2.0 GHz	590
	4.0 GHz	380
	8.0 GHz	260
	18.0 GHz	160
RF - Leakage at 18.0 GHz	-90 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	2x Copper Braid, Silver Plated	
Outer Jacket	Cross linked Polyolefin	
Dielectric Diameter in mm	4.37	
Dielectric Material	Low Density PTFE	
Dielectric Constant	1.4	
Center Conductor Material	Copper, Silver Plated	
Center Conductor Dia. in mm	1.65	
Weight in Grams/Meter	153	
Minimum Bend Radius, Inside, Static (mm)	65	
Minimum Bend Radius, Inside,		

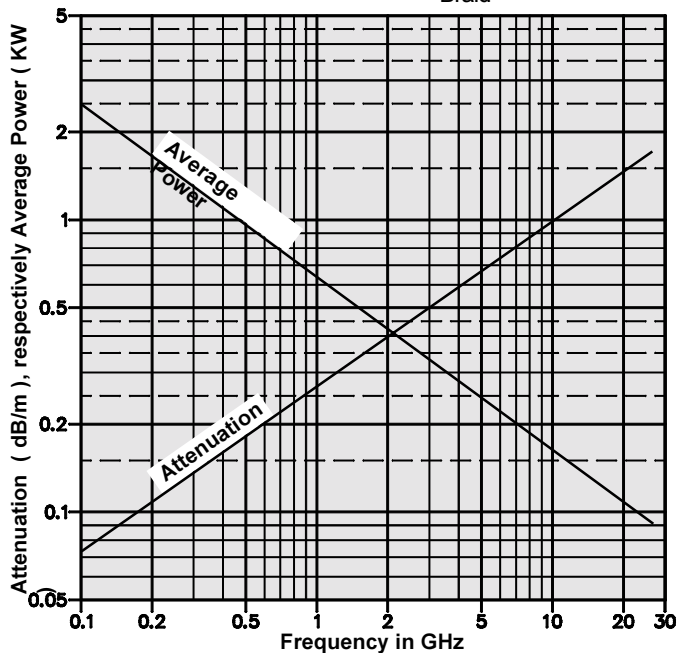
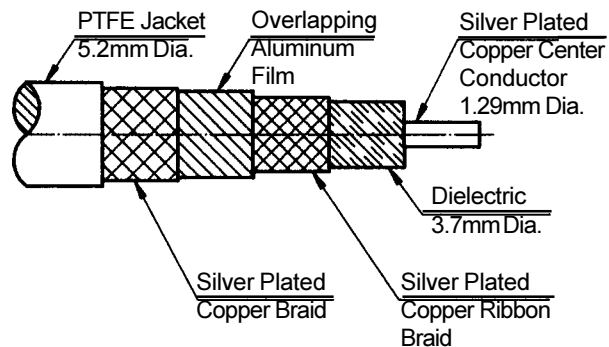
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Cable - Type 100 Low Loss, Low Cost High Performance DC - 26.5 GHz

SPECIFICATION		Type 100
Cable Code	Standard	100
	Armored	100x
	X Please find Armor & Ruggedizing Options on Pages 15 - 19.	
Frequency Range		DC 26.5 GHz
Outer Diameter in mm	Standard	5.2
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 1
Velocity in %, ± 2%		75
Capacitance in pF/m		87
Dielectric Strength (60 Hz) in KV rms		6.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.5
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.18
	2.0 GHz	0.40
	5.0 GHz	0.63
	10.0 GHz	0.97
	18.0 GHz	1.35
	26.5 GHz	1.70
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	950
	2.0 GHz	421
	5.0 GHz	244
	10.0 GHz	162
	18.0 GHz	114
	26.5 GHz	91
Peak-Power, 10% Duty Cycle		4 x CW-Power
RF - Leakage at 18.0 GHz		- 100 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		Copper Ribbon Braid, Overlapping Aluminum Film, Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		3.7
Dielectric Material		Low Density PTFE
Dielectric Constant		1.8
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		1.29
Weight in Grams/Meter		69
Minimum Bend Radius, Inside, Static (mm)		26
Minimum Bend Radius, Inside,		

Characteristics:

- Performance to 26.5 GHz, when terminated with K* or 3.5 mm connectors (mating with SMA).
- Rugged Construction.
- Short delivery; certain lengths with preferred connector styles may be in stock.
- The cable used most; significant price advantage over other similar products.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 1.4/4.4, 2.4mm, 3.5mm, 7mm, 7/16, HN, K*, N, SBX, SBY, SC, SMA, SPM and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



* 'K' Connector is a trademark of Wiltron



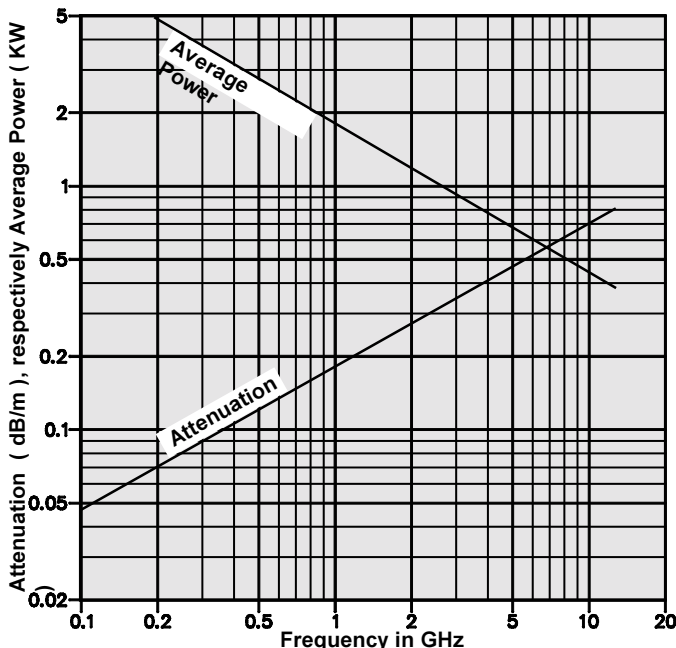
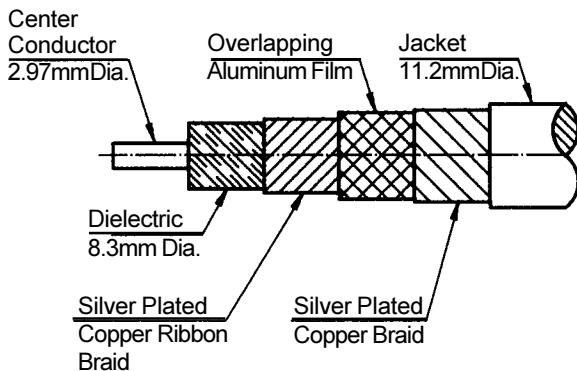
Characteristics:

- Excellent Performance to 12.4 GHz
- Rugged Construction.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 7/16, HN, N, SBX, SBY, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.

Cable - Type 120

DC - 12.4 GHz

SPECIFICATION		Type 120
Cable Code	Standard	120
	Armored	120x
	X Please find Armor & Ruggedizing Options on Pages 15 - 19.	
Frequency Range		DC 12.4 GHz
Outer Diameter in mm	Standard	11.2
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 1
Velocity in %, ± 2%		77
Capacitance in pF/m		87
Dielectric Strength (60 Hz) in KV rms		8.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		2.0
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.13
	1.0 GHz	0.17
	2.0 GHz	0.28
	5.0 GHz	0.48
	12.4 GHz	0.80
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	2710
	1.0 GHz	1900
	2.0 GHz	1183
	5.0 GHz	682
	12.4 GHz	395
RF - Leakage at 12.4 GHz		- 100dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		Silver Plated Copper Braid, Overlapping Aluminum Film, Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		8.3
Dielectric Material		Low Density PTFE
Dielectric Constant		1.7
Center Conductor Material		Copper, Silver Plated
Center Conductor, 1 Dia. in mm		2.97
Weight in Grams/Meter		280
Minimum Bend Radius, Inside, Static (mm)		64
Minimum Bend Radius, Inside,		



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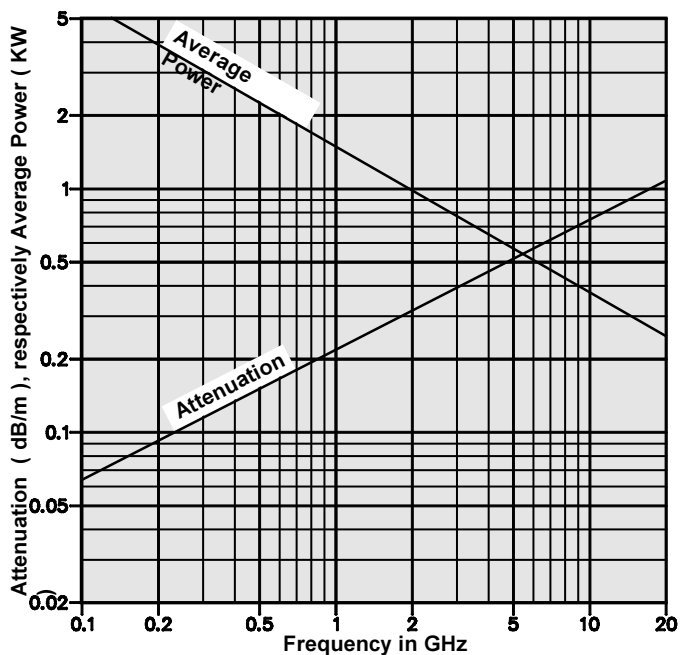
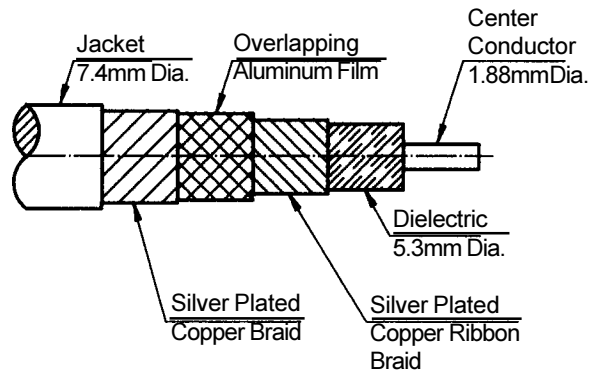
Cable - Type 140

DC - 20.0 GHz

SPECIFICATION		Type 140
Cable Code	Standard	140
	Armored	140X
	X Please find Armor & Ruggedizing Options on Pages 15 - 19.	
Frequency Range		DC 20.0 GHz
Outer Diameter in mm	Standard	7.4
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 1
Velocity in %, ± 2%		83
Capacitance in pF/m		87
Dielectric Strength (60 Hz) in KV rms		6.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.5
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.15
	2.0 GHz	0.32
	5.0 GHz	0.53
	10.0 GHz	0.75
	18.0 GHz	1.05
	20.0 GHz	1.14
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	2200
	2.0 GHz	967
	5.0 GHz	561
	10.0 GHz	372
	18.0 GHz	263
	20.0 GHz	245
RF - Leakage at 18.0 GHz		-100 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		Silver Plated Copper Braid, Overlapping Aluminum Film, Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		5.3
Dielectric Material		Low Density PTFE
Dielectric Constant		1.4
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		1.88
Weight in Grams/Meter		118
Minimum Bend Radius, Inside, Static (mm)		38
Minimum Bend Radius, Inside,		

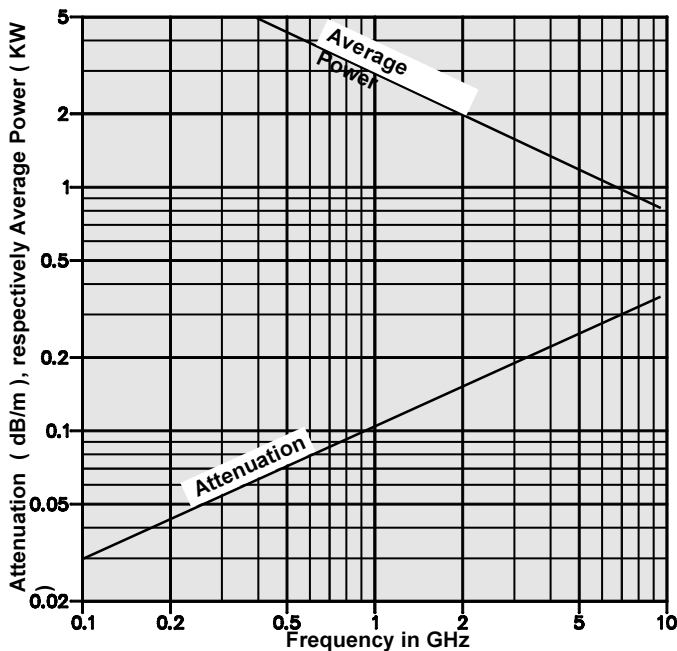
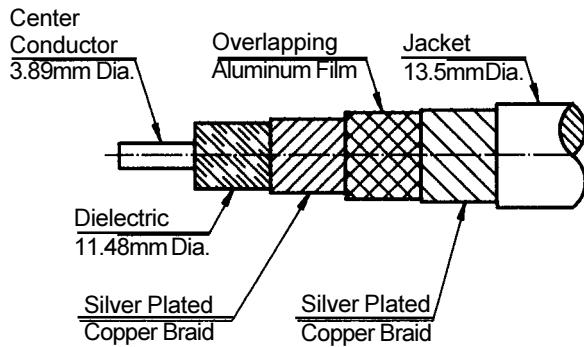
Characteristics:

- Excellent Performance to 20.0 GHz
- Rugged Construction.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 3.5mm, 7mm, 7/16, HN, N, SBX, SBY, SMA, SC, and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



Characteristics:

- Ultra low loss to 9.5 GHz.
- Rugged Construction.
- The Ideal Receive/Transmit Cable.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 3.5mm, 7mm, 7/16, C, HN, N, SC and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



Cable - Type 300

Low Loss, High Power

DC - 9.5 GHz

SPECIFICATION		Type 300
Cable Code	Standard	300
	Armored	300x
	X Please find Armor & Ruggedizing Options on Pages 15 - 19.	
Frequency Range		DC 9.5 GHz
Outer Diameter in mm	Standard	13.5
	Armored	See Pages 18 -19
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		77
Capacitance in pF/m		87
Dielectric Strength (60 Hz) in KV rms		8.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		2.0
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.07
	2.0 GHz	0.15
	4.0 GHz	0.22
	6.0 GHz	0.27
	8.0 GHz	0.32
	9.0 GHz	0.35
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	4500
	2.0 GHz	1960
	4.0 GHz	1380
	6.0 GHz	1070
	8.0 GHz	900
	9.0 GHz	850
RF - Leakage at 9.5 GHz		- 90 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		Silver Plated Copper Ribbon Braid, Aluminum Film, Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		11.48
Dielectric Material		Low Density PTFE
Dielectric Constant		1.7
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		3.89
Weight in Gramms/Meter		350
Minimum Bend Radius, Inside, Static (mm)		90
Minimum Bend Radius, Inside,		

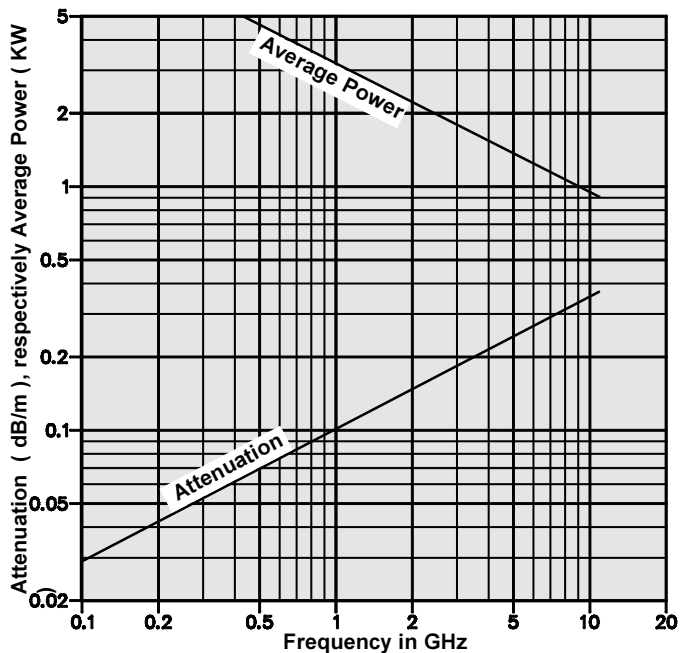
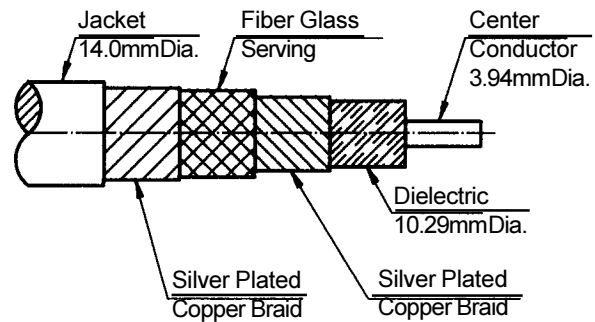
Cable - Type 500

DC - 11.0 GHz

SPECIFICATION		Type 500
Cable Code 500	Low Power Assembly <10W	500L
	High Power Assembly >10W	500B
	500L Armored	500H/500K
	500B Armored	500R/500T
X Please find Armor & Ruggedizing Options on Pages 15 - 19.		
Frequency Range		DC 11.0 GHz
Outer Diameter in mm	Standard	14.0
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 1
Velocity in %, ± 2%		81.6
Capacitance in pF/m		82
Dielectric Strength (60 Hz) in KV rms		5.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		2.5
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.07
	2.0 GHz	0.15
	4.0 GHz	0.22
	8.0 GHz	0.32
	10.0 GHz	0.36
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	4500
	2.0 GHz	2260
	4.0 GHz	1610
	8.0 GHz	1050
	10.0 GHz	950
RF - Leakage at 11.0 GHz		- 100 dBC
Operating Temperature Range		-65°C to +150°C
Outer Conductor Construction		Silver Plated Copper Braid, Fiber Glass Serving, Silver Plated Copper Braid
Outer Jacket		Neoprene
Dielectric Diameter in mm		10.29
Dielectric Material		Low Density PTFE
Dielectric Constant		1.5
Center Conductor Material		Copper, Silver Plated
Center Conductor Dia. in mm		3.94
Weight in Gramms/Meter		360
Minimum Bend Radius, Inside, Static (mm)		90
Minimum Bend Radius, Inside, Dynamic (mm)		180

Characteristics:

- Performance to 11.0 GHz.
- Ideal as a Test Cable and a System Cable as well.
- Procurement for completely terminated assemblies, fully tested. The test documentation for VSWR and Insertion Loss will be supplied with the cable assembly.
- Available connectors: 7/16, HN, N, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 107 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- Bead captivated connectors available for low power applications.
- Specify power level when ordering:
 - 500L:** Low Power Assembly: <10 W (DC-11.0 GHz).
 - 500B:** High Power Assembly: >10 W (DC- 7.0 GHz).
- The Frequency Range is limited by the connector designs.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.



Commercial Cable Assemblies (RG - Cable Assemblies)

Cable	Type	Page
RG-58C/U	58	62
RG-142B/U	42	61
RG-214/U	21	56
RG-223/U	23	57
RD-316/U	32	59
RG-316/U	31	58
RG-400/U	40	60

■ **Connector Outline Drawings:** 131 f.f.

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RG - Flexible Cable Assemblies



54 Spectrum Elektrotechnik GmbH P.O. Box 45 05 33, 80905 Munich, Germany Tel. (89) 354 804-0, Fax (89) 354 804-90 (Country Code: 49)

Commercial Cable Selection Chart										
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18		
Band		L	S		C		X		KU	
Cable Type	Operational Range →									
Increasing Insertion Loss ↓	21	RG-214/U (Dia. 10.8mm).					10.0 GHz			
	23	RG-223/U (Dia. 5.5mm).					10.0 GHz			
	42	RG-142B/U (Dia. 4.95mm).					12.4 GHz	Degradaded performance to 18.0 GHz		
	40	RG-400/U (Dia. 4.95mm).					12.4 GHz	Degradaded performance to 18.0 GHz		
	58	RG-58C/U (Dia. 4.95mm).		3.0 GHz						
	32	RD-316/U Double shielded. (Dia. 3.1mm).		3.0 GHz						
	31	RG-316/U (Dia. 2.5mm).		3.0 GHz						

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Cable - Type 21

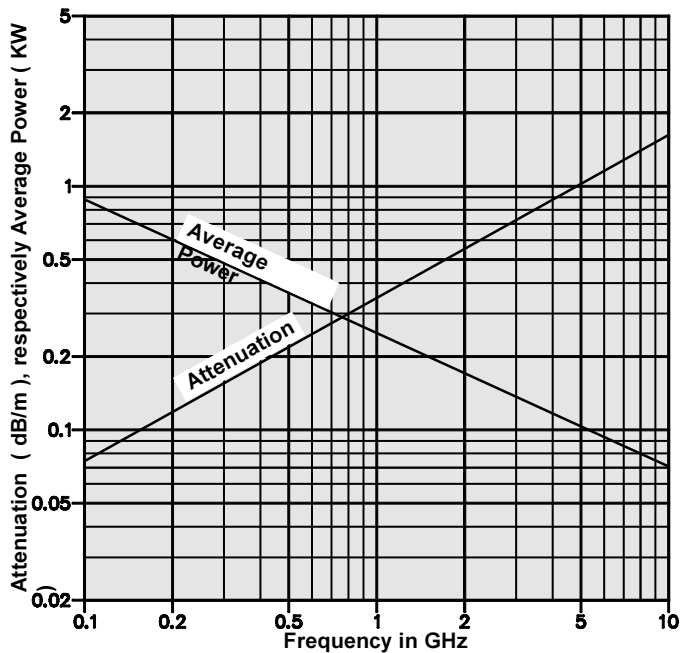
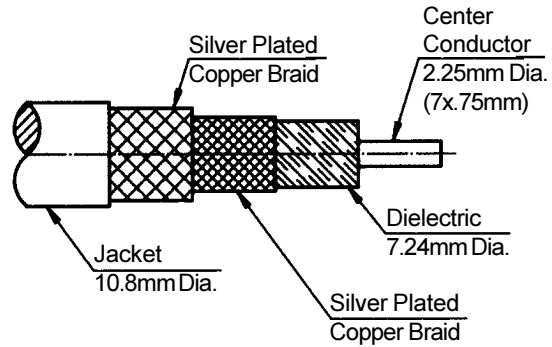
RG - 214/U

DC - 10.0 GHz

Characteristics:

- Performance to 10.0 GHz.
- Commercial applications or Test Centers where Insertion Loss and price are of importance.
- Procurement for the raw cable only, or completely terminated assemblies, 100% tested in VSWR and Insertion Loss.
- Available connectors: 7mm, 7/16, HN, N, SBX, SBY, SC, SMA and TNC. For Connector Outline Drawings please refer to Page 131 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For information on armor please refer to Pages 15 - 19.
- For ordering information please refer to Page 27.

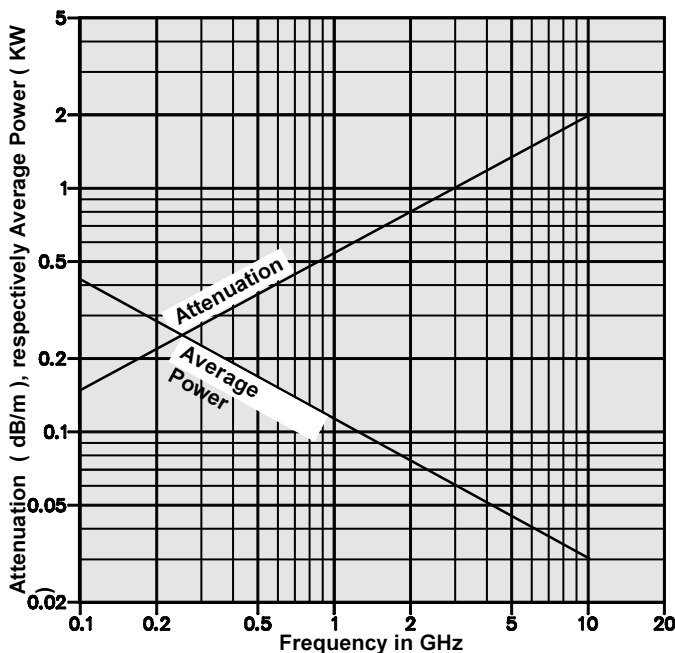
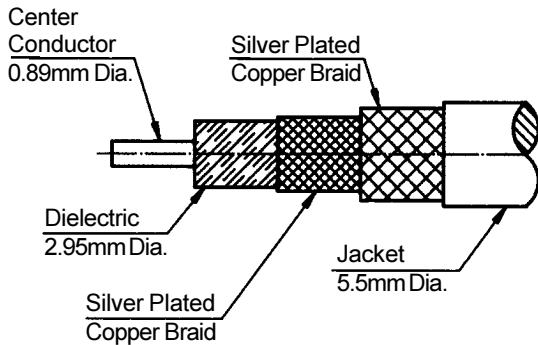
SPECIFICATION		Type 21
Cable Code		21
Frequency Range		DC 10.0 GHz
Outer Diameter in mm	Standard	10.8
	Armored	See Pages 18 - 19
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		65.9
Capacitance in pF/m		106
Dielectric Strength (60 Hz) in KV rms		10.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		3.7
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.22
	2.0 GHz	0.55
	4.0 GHz	0.86
	8.0 GHz	1.39
	10.0 GHz	1.60
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	370
	2.0 GHz	180
	4.0 GHz	120
	8.0 GHz	80
	10.0 GHz	70
RF - Leakage at 10.0 GHz		-90 dBC
Operating Temperature Range		-40°C to +85°C
Outer Conductor Construction		2x Silver Plated Copper Braid
Outer Jacket		PVC
Dielectric Diameter in mm		7.24
Dielectric Material		PE
Dielectric Constant		2.3
Center Conductor Material		Silver Plated stranded copper
Center Conductor Dia. in mm		2.25
Weight in Grams/Meter		209
Minimum Bend Radius, Inside, Static (mm)		55
Minimum Bend Radius, Inside, Dynamic (mm)		165



Cable - Type 23
RG - 223/U
DC - 10.0 GHz

Characteristics:

- Performance to 10.0 GHz
- Double shielded for lower leakage.
- Usage in Commercial Systems.
- Low Price.
- Procurement for the raw cable only, or completely terminated assemblies, 100% tested in VSWR and Insertion Loss.
- Available connectors: BNC, N, SMA and TNC. For Connector Outline Drawings please refer to Page 131 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.



SPECIFICATION		Type 23
Cable Code	Standard	23
Frequency Range		DC 10.0 GHz
Outer Diameter in mm	Standard	5.5
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		65.9
Capacitance in pF/m		101.0
Dielectric Strength (60 Hz) in KV rms		5.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.9
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.38
	2.0 GHz	0.80
	4.0 GHz	1.22
	8.0 GHz	1.85
	10.0 GHz	2.00
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	170
	2.0 GHz	75
	4.0 GHz	51
	8.0 GHz	35
	10.0 GHz	30
RF - Leakage at 10.0 GHz		- 90 dBC
Operating Temperature Range		-40°C to +85°C
Outer Conductor Construction		2x Silver Plated Copper Braid
Outer Jacket		PVC
Dielectric Diameter in mm		2.95
Dielectric Material		PE
Dielectric Constant		2.3
Center Conductor Material		Silver Plated Copper
Center Conductor Dia. in mm		0.89
Weight in Gramms/Meter		61
Minimum Bend Radius, Inside, Static (mm)		30
Minimum Bend Radius, Inside, Dynamic (mm)		80

Cable - Type 31

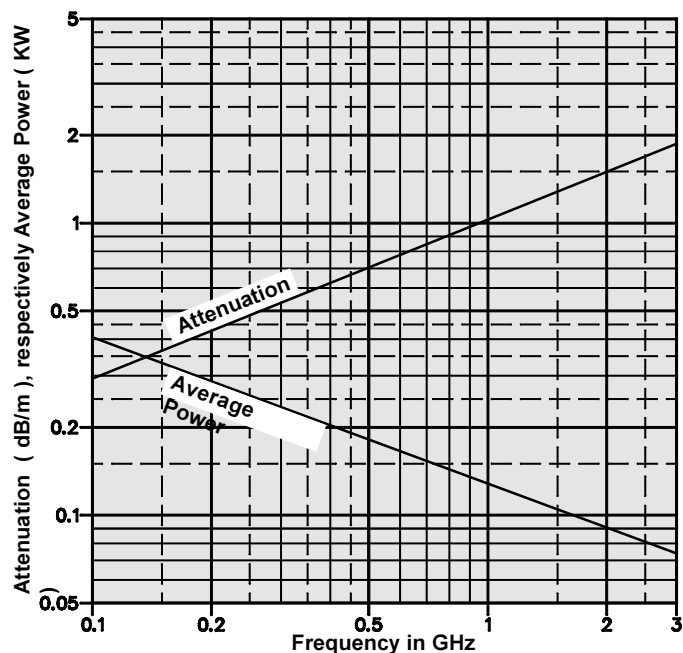
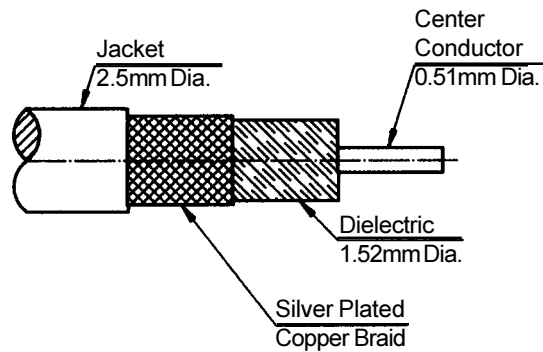
RG - 316/U

DC - 3.0 GHz

Characteristics:

- Performance to 3.0 GHz
- Usage in Commercial Systems for low frequency applications.
- Low Price.
- Procurement for the raw cable only, or completely terminated assemblies, 100% tested in VSWR and Insertion Loss.
- Available connectors: 1.8/5.6, SMA, SMP, N and TNC. For Connector Outline Drawings please refer to Page 131 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.

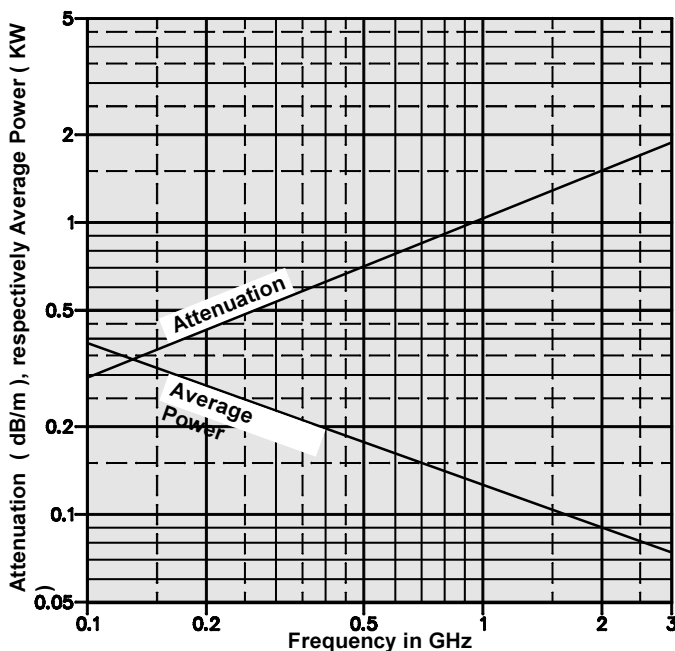
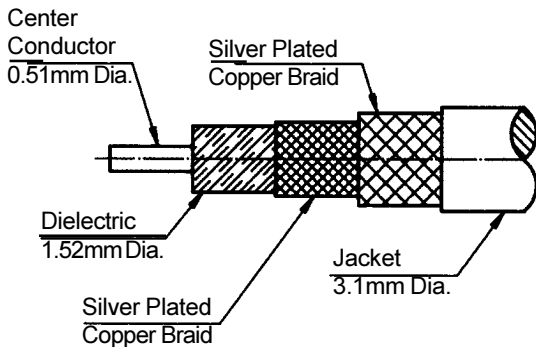
SPECIFICATION		Type 31
Cable Code	Standard	31
Frequency Range		DC 3.0 GHz
Outer Diameter in mm	Standard	2.5
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		69.5
Capacitance in pF/m		105
Dielectric Strength (60 Hz) in KV rms		2.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		0.9
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.70
	1.0 GHz	1.10
	2.0 GHz	1.57
	3.0 GHz	1.89
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	170
	1.0 GHz	130
	2.0 GHz	91
	3.0 GHz	75
RF - Leakage at 3.0 GHz		-80 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		1x Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		1.52
Dielectric Material		PTFE
Dielectric Constant		2.0
Center Conductor Material		Stranded Silver Plated Copperweld Steel
Center Conductor Construction		7x.17 mm
Center Conductor Dia. in mm		0.51
Weight in Gramms/Meter		17
Minimum Bend Radius, Inside, Static (mm)		24
Minimum Bend Radius, Inside, Dynamic (mm)		60



Cable - Type 32
RD - 316/U
DC - 3.0 GHz

Characteristics:

- Performance to 3.0 GHz
- This cable is similar to the RG316/U, but it is double shielded for lower leakage.
- Usage in Commercial Systems for low frequency applications.
- Low Price.
- Procurement for the raw cable only, or completely terminated assemblies, 100% tested in VSWR and Insertion Loss.
- Available connectors: 1.8/5.6, SMA, SMP, N and TNC.
- For Connector Outline Drawings please refer to Page 131 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.



SPECIFICATION		Type 32
Cable Code	Standard	32
Frequency Range		DC 3.0 GHz
Outer Diameter (mm)	Standard	3.1
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		69.5
Capacitance in pF/m		105
Dielectric Strength (60 Hz) in KV rms		2.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		0.9
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.70
	1.0 GHz	1.10
	2.0 GHz	1.57
	3.0 GHz	1.89
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	170
	1.0 GHz	130
	2.0 GHz	91
	3.0 GHz	75
RF - Leakage at 3.0 GHz		-80 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		2x Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		1.52
Dielectric Material		PTFE
Dielectric Constant		2.0
Center Conductor Material		Stranded Silver Plated Copperweld Steel
Center Conductor Construction		7x.17 mm
Center Conductor Dia. in mm		0.51
Weight in Gramms/Meter		24
Minimum Bend Radius, Inside, Static (mm)		24
Minimum Bend Radius, Inside, Dynamic (mm)		60

Cable - Type 40

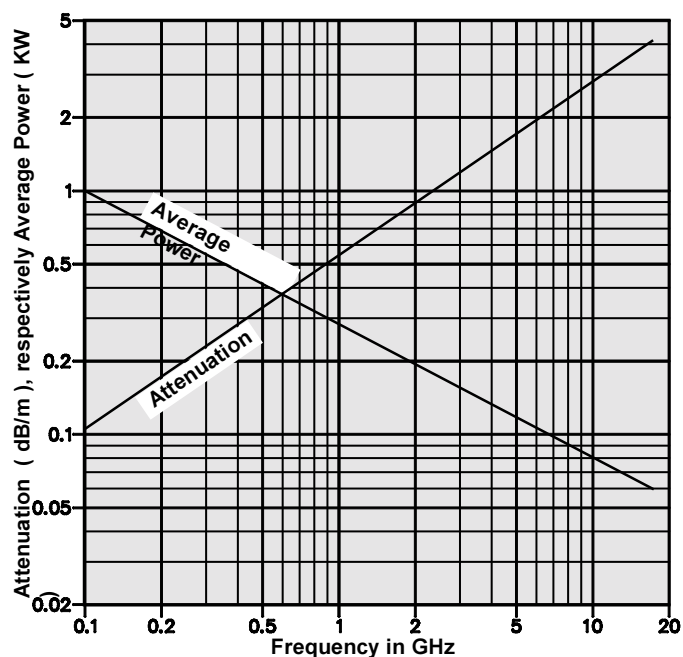
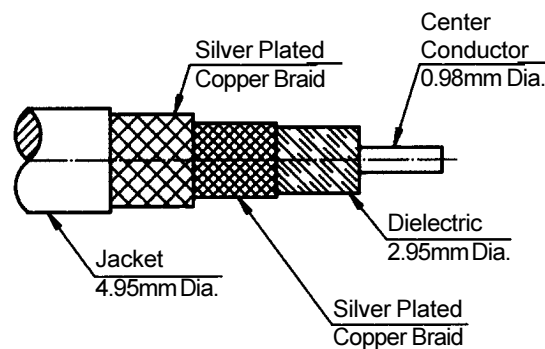
RG - 400/U

DC - 12.4 GHz

Characteristics:

- Performance to 12.4 GHz, degraded Performance to 18.0 GHz.
- Almost identical to RG-142/U, with the exception of the center conductor: RG-400/U has a stranded center conductor.
- Usage in Commercial Applications where price is of utmost importance.
- Procurement for the raw cable only, or completely terminated assemblies, 100% tested in VSWR and Insertion Loss.
- Available connectors: 1.8/5.6, BNC, N, SMA and TNC. For Connector Outline Drawings please refer to Page 131 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.

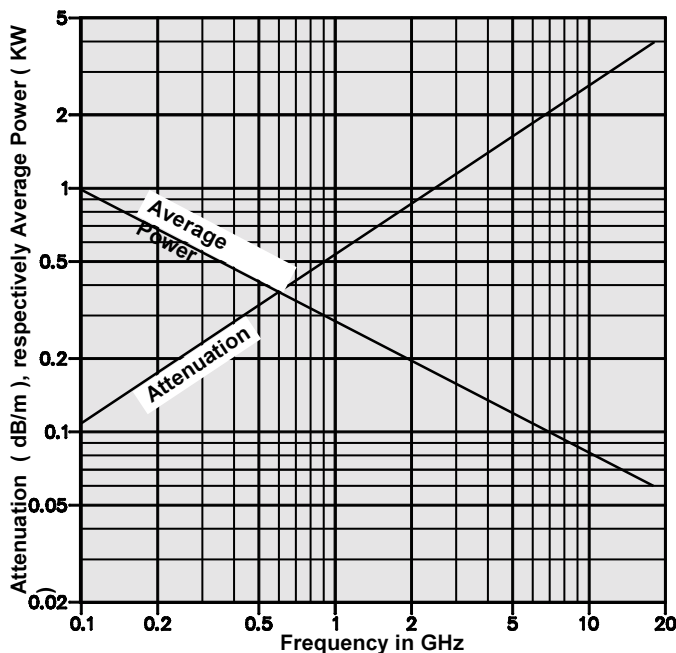
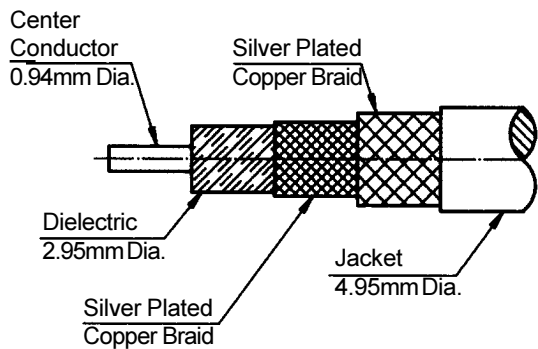
SPECIFICATION		Type 40
Cable Code	Standard	40
Frequency Range		DC 12.4 GHz
Outer Diameter in mm	Standard	4.95
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		69.5
Capacitance in pF/m		105
Dielectric Strength (60 Hz) in KV rms		5.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.4
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.34
	2.0 GHz	0.87
	4.0 GHz	1.40
	8.0 GHz	2.24
	12.4 GHz	3.00
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	400
	2.0 GHz	192
	4.0 GHz	132
	8.0 GHz	92
	12.4 GHz	75
18.0 GHz	60	
RF - Leakage at 18.0 GHz		-80 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		2x Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		2.95
Dielectric Material		PTFE
Dielectric Constant		2.0
Center Conductor Material		Stranded Silver Plated Copper wire
Center Conductor Construction		19 x 0.20 mm
Center Conductor Dia. in mm		0.98
Weight in Gramms/Meter		74
Minimum Bend Radius, Inside, Static (mm)		40



Characteristics:

- Performance to 12.4 GHz, degraded Performance to 18.0 GHz.
- Almost identical to RG-400/U, with the exception of the center conductor: RG-142/U has a solid center conductor.
- Usage in Commercial Applications where price is of utmost importance.
- Procurement for the raw cable only, or completely terminated assemblies, 100% tested in VSWR and Insertion Loss.
- Available connectors: 1.8/5.6, BNC, N, SMA and TNC. For Connector Outline Drawings please refer to Page 131 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.

Cable - Type 42
RG - 142B/U
DC - 12.4 GHz



SPECIFICATION		Type 42
Cable Code	Standard	42
Frequency Range		DC 12.4 GHz
Outer Diameter (mm)	Standard	4.95
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		69.5
Capacitance in pF/m		105
Dielectric Strength (60 Hz) in KV rms		5.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.4
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.34
	2.0 GHz	0.87
	4.0 GHz	1.40
	8.0 GHz	2.24
	12.4 GHz	3.00
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	400
	2.0 GHz	192
	4.0 GHz	132
	8.0 GHz	92
	12.4 GHz	75
18.0 GHz	60	
RF - Leakage at 18.0 GHz		-80 dBC
Operating Temperature Range		-54°C to +110°C
Outer Conductor Construction		2x Silver Plated Copper Braid
Outer Jacket		PTFE
Dielectric Diameter in mm		2.95
Dielectric Material		PTFE
Dielectric Constant		2.0
Center Conductor Material		Silver Plated Copperweld Steel
Center Conductor Construction		1 x 0.94 mm
Center Conductor Dia. in mm		0.94
Weight in Gramms/Meter		69
Minimum Bend Radius, Inside,		40

Cable - Type 58

RG - 58C/U

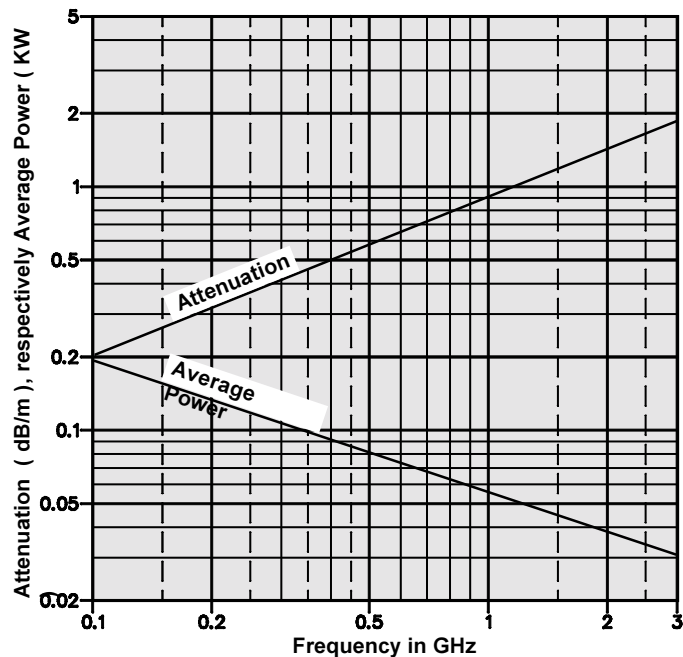
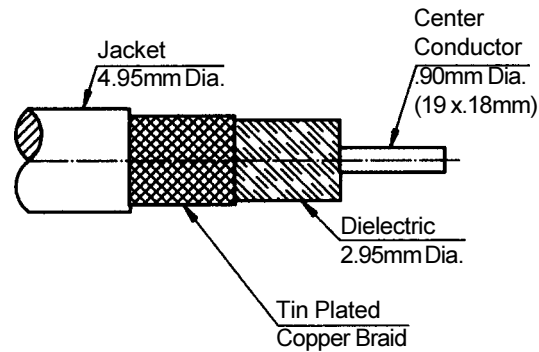
For Lower Frequency Applications

DC - 3.0 GHz

Characteristics:

- Performance to 3.0 GHz.
- Usage in Commercial applications or Test Centers where the Insertion Loss is of little importance.
- Procurement for the raw cable only, or completely terminated assemblies, 100% tested in VSWR and Insertion Loss.
- Available connectors: BNC and SMA. For Connector Outline Drawings please refer to Page 131 f.f.
- For Connector Code details please refer to Pp. 24 - 25.
- For ordering information please refer to Page 27.

SPECIFICATION		Type 58
Cable Code	Standard	58
Frequency Range		DC 3.0 GHz
Outer Diameter (mm)	Standard	4.95
Impedance in Ohms at Sea Level and +25°C		50 ± 2
Velocity in %, ± 2%		65.9
Capacitance in pF/m		106
Dielectric Strength (60 Hz) in KV rms		5.0
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz		1.4
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.55
	1.0 GHz	0.85
	2.0 GHz	1.42
	3.0 GHz	1.89
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	82
	1.0 GHz	58
	2.0 GHz	39
	3.0 GHz	32
RF - Leakage at 1.0 GHz		-80 dBC
Operating Temperature Range		-45°C to +85°C
Outer Conductor Construction		1x Tin Plated Copper Braid
Outer Jacket		PVC-II A
Dielectric Diameter in mm		2.95
Dielectric Material		PE
Dielectric Constant		2.3
Center Conductor Material		Stranded Tinned Copper
Center Conductor Construction		19 x 0.18 mm
Center Conductor Dia. in mm		0.90
Weight in Gramms/Meter		39
Minimum Bend Radius, Inside, Static (mm)		25



Quick Connections Cable Assemblies with PUSH-ON Connectors



Cable Types available with PUSH-ON Connectors			
10	14	18	22
40	42	100	140



Detailed Information on the Cables	
Type	Page
10	36
14	39
18	70
22	70
40	60
42	61
100	48
140	50

- **Quick Connection Cable Selection Chart** Page 65
- **Quick Connections Specifications** Page 66
- **Purchasing Information** Page 68
- **Connector Outline Drawings**
 - for PUSH - ON Connectors Page 67
 - for High Performance Cables Page 107 f.f.
 - for Commercial Cables Page 131 f.f.
 - for ANA - Cables Page 143 f.f.

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Quick Connection Cable Selection Chart												
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18	26.5	30	40	50
Band	L		S	C	X		KU	K		KA		
Cable Type	Operational Range →											
Increasing Insertion Loss ↓	14 Page 39	(Dia. 7.4mm).						20.0 GHz				
	140 Page 50	(Dia. 7.4mm).						20.0 GHz				
	10 Page 36	(Dia. 7.0mm).						26.5 GHz				
	100 Page 48	(Dia. 5.2mm).						26.5 GHz				
	18 Page 70	ANA-Cable (Dia. 6.0mm).						26.5 GHz				
	22 Page 70	ANA-Cable (Dia. 9.2mm).						26.5 GHz				
	42 Page 61	RG-142B/U (Dia. 4.95mm).					12.4 GHz					
	40 Page 60	RG-400/U (Dia. 4.95mm).					12.4 GHz					
	Connector Selection Charts							Regular Connectors			Pages 24 - 25	
PUSH - ON Connectors								Page 67				
Connector Outline Drawings							Regular Connectors			Page 105 f.f.		
							PUSH - ON Connectors			Page 67		

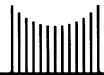
Quick Connections (PUSH-ONS) Specifications



The specifications below are general specifications for all PUSH -ON connectors. Specifications in the following table are recommended for any procurement documents or drawings. In the event of any conflict, these specifications shall govern. The Push-ON Connectors were developed to eliminate the time consuming lightening, torquing and loosening of connectors during test. The connector slides directly onto any Female of the same connector style, allowing quick connecting and disconnecting. Its mechanism locks safely onto the standard thread of the Female connector.

GENERAL				
Standard Materials	STEEL corrosion resistant 1.4305 per DIN 17440 (QQ-S-764, class 303 or ASTM-A-582-80). ALUMINUM AlMg4.5Mn per DIN 1725, AlMgSi0.5 per DIN 1725, AlMgSi1 per DIN 1725 (6061-T6 per QQ-A-225/8). BRASS CuZn39Pb3 per DIN 17660 (QQ-B-626, half hard). COPPER BERYLLIUM 33-25 CuBe2Pb H per DIN 17666 (QQ-C-530). TFE Fluorocarbon per DIN 52900 (MIL-P-19468 and L-P403). SILICONE RUBBER per DIN 3771 (MIL-R-5847 and ZZ-R-765, Class II B.) Grade 50 - 75.			
Finish for COPPER BERYLLIUM STAINLESS STEEL ALUMINUM BRASS VARIOUS	BORRMIUM NITRITE Dielectric for high power applications per inhouse specification. Center Contacts shall be gold plated to a minimum thickness of .00005 inch (1.27 µm) in accordance with MIL-G-45204, Type II, Grade C. shall be passivated per QQ-P-35. Conductive Parts shall have an iridited finish per MIL-C-5541. Other parts, such as Coupling Nuts and Back-Bodies shall be anodized per MIL-A-8625. .00003 inch (0.8 µm) min. gold plating per MIL-G-45204, or nicle plating per QQ-N-190, as specified.			
Design	Imoloy .0001 inch (2.5 µm) min. plating, consisting of 55% Copper / 20% Zinc / 25% Tin (on special request).			
ELECTRICAL				
	The design shall be such that the outline dimensions in this catalog are met. In addition, the assembled connector shall meet the interface dimensions.			
Frequency Range	DC to 7.5 GHz	DC to 18.0 GHz	DC to 26.5 GHz	DC to 18.0 GHz
Insulation Resistance	Not less than 1.000 megaohms.	Not less than 5.000 megaohms.	Not less than 5.000 megaohms.	Not less than 5.000 megaohms.
Voltage Standing Wave Ratio (VSWR)	1.10 : 1	1.15 : 1	1.15 : 1 (DC - 18.0 GHz)	1.15 : 1
Contact Resistance	1.0 milliohms max.	1.0 milliohms max.	1.20 : 1 (18.0 - 26.5 GHz)	1.0 milliohms max.
Dielectric Withstanding Voltage	3000 VRMS, 60 Hz	2500 VRMS, 60 Hz	3.0 milliohms max.	2500 VRMS, 60 Hz
RF High Potential Withstanding Voltage	4000 VRMS @ a 5 MHz	1500 VRMS @ a 5 MHz	1500 VRMS, 60 Hz	1500 VRMS @ a 5 MHz
RF Leakage	90 dB max. to 3.0 GHz -80 dB max to 7.5 GHz	-90 dB max. to 3.0 GHz	1000 VRMS @ a 5 MHz	90 dB max. to 3.0 GHz -65 dB max to 18.0 GHz
Insertion Loss	0.15 dB max. at 7.5 GHz	-75 dB max to 18.0 GHz	-80 dB max. to 3.0 GHz	0.2 dB max. at 18.0 GHz
Impedance	50 Ohms Nominal	0.2 dB max. at 18.0 GHz	-65 dB max to 26.5 GHz	50 Ohms Nominal
Corona Level Voltage	2800 Volts @ 0 ft.	50 Ohms Nominal	0.3 dB max. at 18.0 GHz	500 Volts @ 70,000 ft.
MECHANICAL				
Connector Durability	500 mating cycles min.	500 Volts @ 70,000 ft. 500 mating cycles min.	50 Ohms Nominal 500 mating cycles min. 250 Volts @ 70,000 ft.	500 mating cycles min.
Temperature	-55°C to +155°C	-65°C to +100°C	-65°C to +165°C	-65°C to +100°C
Force to Engage and Disengage	Not applicable.	Not applicable.	Shall not exceed 2 inch pounds (0.226 Nm)	Shall not exceed 2-4 inch pounds (0.452-0.678Nm)
Longitudinal Force max.	Not applicable.	Shall not exceed 6 inch-pounds (0.678 Nm).	Not applicable.	Not applicable.
ENVIRONMENTAL				
Corrosion (Salt Spray)	Specification MIL-STD-202, Method 101, Test Condition B. The salt solution shall be 5%.			
Vibration	Specification MIL-STD-202, Method 204, Test Condition D.			
Shock	Specification MIL-STD-202, Method 213, Test Condition I.			
Thermal Shock	Specification MIL-STD-202, Method 107, Test Condition B, except high temperature shall be + 200°C.			
Moisture Resistance	Specification MIL-STD-202, Method 106. Step 7b (vibration) shall be omitted. Insulation resistance shall be 200 megaohms minimum within 8 minutes of removal from humidity.			

66 Spectrum Elektrotechnik GmbH P.O. Box 49855, 80985 Munich, Germany Tel. (89) 354804-0, Fax (89) 354804-96 (Country Code: 49)



Connector Code	Connector Body Material	Dimensions	Outline
7S	passivated Stainless Steel	7/16 Push-On Locking	
7SB	Brass, Silver Plated for lower Intermodulation Products		
NS	passivated Stainless Steel	N Push-On Locking	
NSB	Brass, Silver Plated for lower Intermodulation Products		
ND	passivated Stainless Steel		
NDB	Brass, Silver Plated for lower Intermodulation Products		
SM	passivated Stainless Steel	SMA Push-On Non Locking	
SML	passivated Stainless Steel	SMA Push-On Locking	Available mid 1997
TS	passivated Stainless Steel	TNC Push-On Locking	

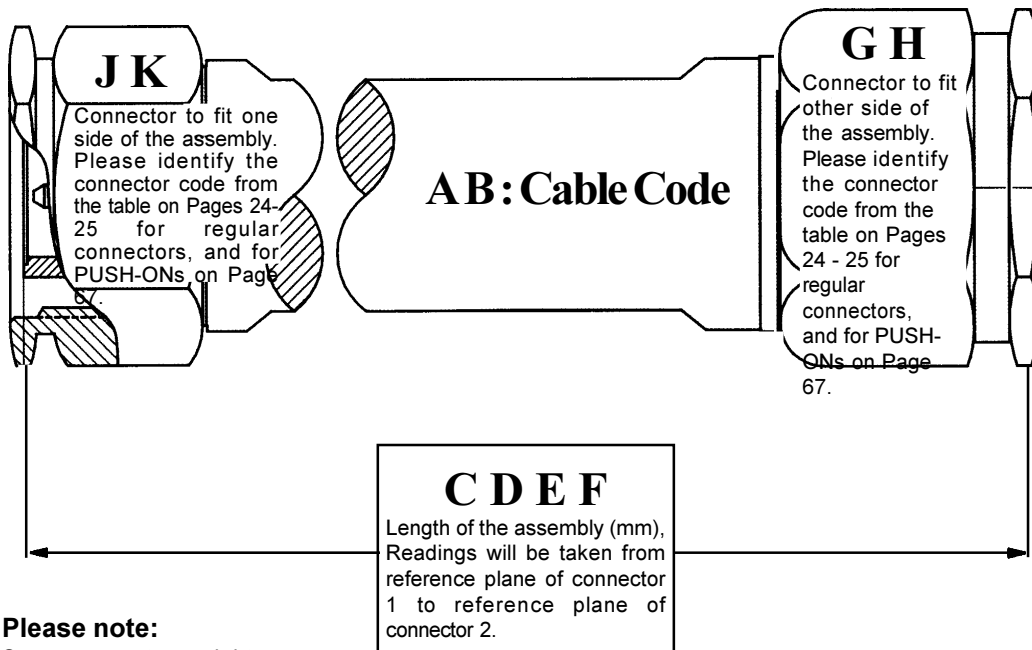
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Purchasing Information on Quick Connecting Assemblies

Ordering Details:

The Part Number Sequence is:

AB - CDEF - GH - JK



Please note:

Some connectors might not be available for certain cables as standard with short deliveries. On the other hand, more connectors than listed might be available.

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 '18' shall have the length of 80 cm. It shall be terminated with 'TNC PUSH-ON locking' (Code from Page 67) and 'SMA female' - (Code from Page 25). Length is from interface to interface.
 AB = cable code = 18 * CDEF = length in mm = 0800 * GH and JK are the connectors = TS and 21.

Part Number for the cable assembly in this example: 18 - 0800 - TS - 21.

Phase Stable Assemblies (ANA-Cable Assemblies)



The Cable Assemblies of Series 16, 18 and 22 are Phase Stable Assemblies, designed for the Vector Network Analyzers of HP and Wiltron.

The Cables of Types 18 and 22 operate to 26.5 GHz, while Cable Type 16 works to 50.0 GHz (when supplied with 2.4mm connectors).

One end of the Assembly is usually terminated with a "special" 2.4mm, 3.5mm, or K* connector. These connectors are designed with a larger than standard coupling nut for greater stability, mating directly with the RF ports of the Network Analyzers.

The other end of the ANA - Assembly may be terminated with any of the connectors available and needed in the customers test application, mating in direct connection with the device under test. By eliminating expensive adapters the test setup becomes simple and trustworthy.

The cable assemblies can be manufactured in various lengths up to 6 meters (20ft.). All necessary piece parts will be carried in stock, helping to facilitate fast deliveries.

Cable assemblies of the most popular lengths, e.g. 30 cm. (11.8") and 45 cm. (17.7"), 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.

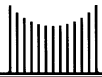
Note:

For special requirements, the cable can be terminated with almost any connector style. Please call your nearest Spectrum Representant or contact our Marketing or Engineering Staff.

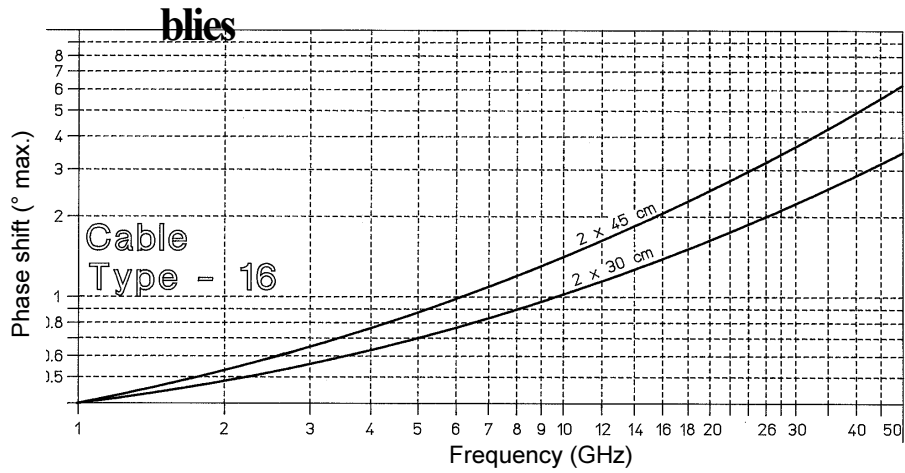
ANA Cable Assembly Characteristics:

Cable Code	16	18	22
Frequency Range	50.0 GHz	26.5 GHz	26.5 GHz
Cable Outer diameter	9.2mm (.36")	6.0mm (.24")	9.2mm (.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 2.4mm connectors	17 dB up to 50.0 GHz	20 dB up to 26.5 GHz	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 71. 5.0° max. @ 40.0 GHz	Please see also Diagrams on Page 71. 4.0° max. @ 26.5 GHz	Please see also Diagrams on Page 71. 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	-

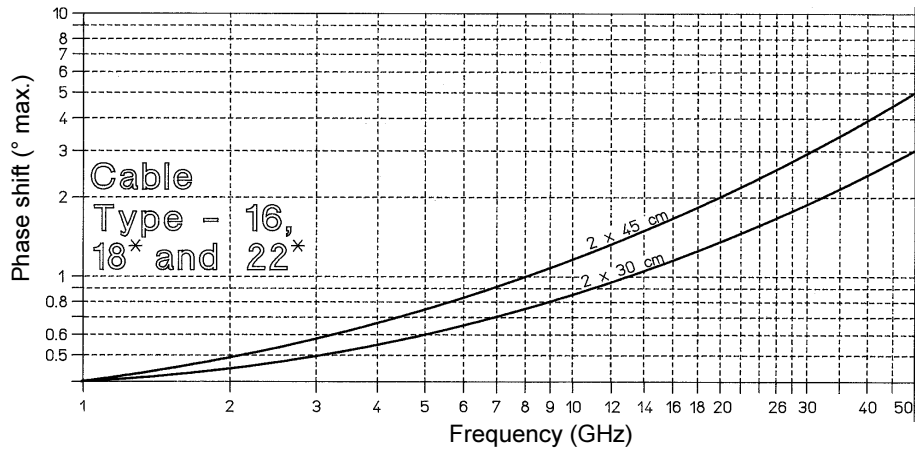
* 'K' Connector is a trademark of Wiltron Company.



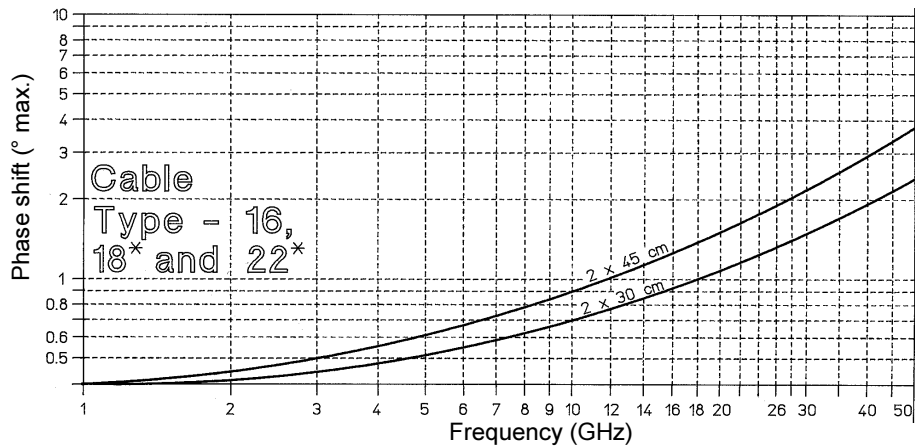
Phase Stability, with manual flexing/ torque



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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Connector Selection Chart

Phase Stable
Cable Assemblies

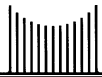


Type	Frequency	Sex	Description	Remarks	Connector Code	Finish
2.4 mm	DC - 50.0 GHz ¹⁾	Male	straight		HM	passivated Stainless Steel
				Maxi Nut	M2	
				The H2M and H2 developed at Spectrum, have larger than standard coupling threads for greater stability. The connectors are used on test ports, test port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

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

Note: For Connector Outline Drawings please refer to Page 143 f.f.

* 'K' Connector is a trademark of Wiltron Company.

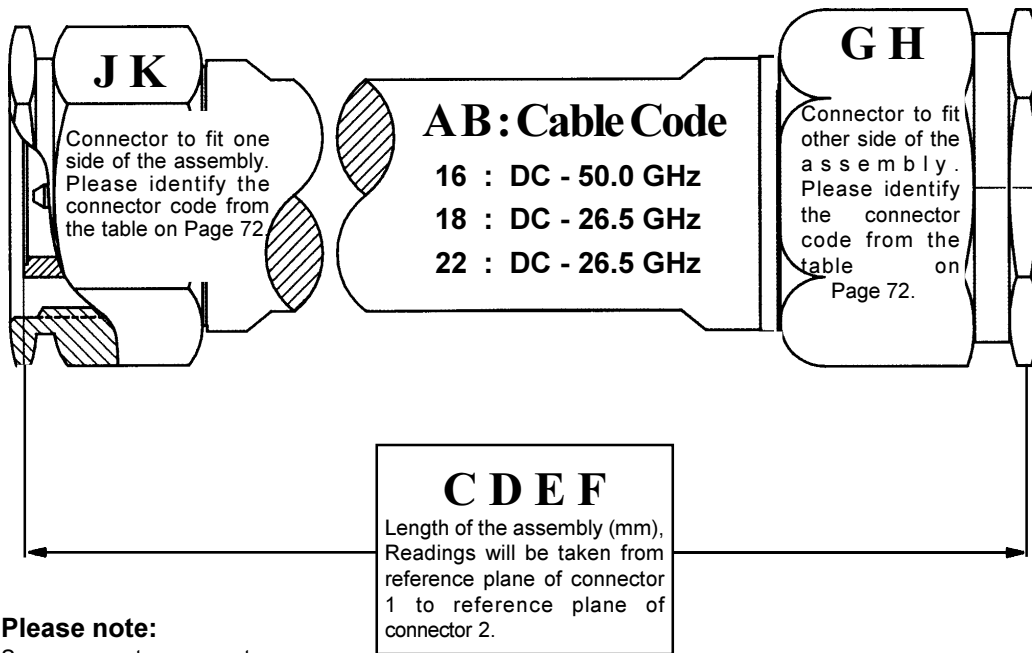


Purchasing Information on Phase Stable Assemblies

Ordering Details:

The Part Number Sequence is:

AB - CDEF - GH - JK



Please note:

Some connectors are not available for certain cables as standard with short deliveries. On the other hand, more connectors than listed might be available.

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 * CDEF = length in mm = 0650 * GH and JK are the connectors = 92 and KM.

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

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Cable Assemblies with interchangeable Connectors (Field Replaceable Connectors) Types 22 & 100

- **Connector Selection Chart** Page 76
- **Field Replaceable Interface Options** Page 77
- **Purchasing Information** Page 78
- **Connector Outline Drawings**
 - for Field Replaceable Connectors Page 77
 - for regular Connectors for Cable Type 22 Page 143 f.f.
 - for regular Connectors for Cable Type 100 Page 107 f.f.
- **Detailed Information on the Cables:**
 - **Type 22, a Phase Stable Cable** Page 70
 - **Type 100, a High Performance Cable** Page 48

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Connector Selection Chart

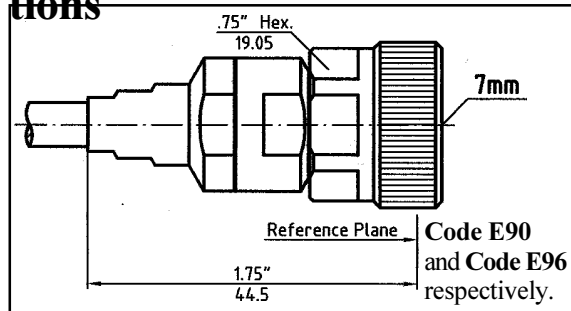
Interchangeable
Connectors



Type	Sex	Description	Remarks	Code	Finish
7mm	Connector	straight	Contact 4 equally spaced slots	E90	passivated Stainless Steel
			Contact 6 equally spaced slots	E96	
N	Male	straight		E51	passivated Stainless Steel
	Female			E61	
SMA	Male	straight	Maxi-Nut	E11	passivated Stainless Steel
	Female			E21	
TNC	Male	straight		E31	passivated Stainless Steel
	Female			E41	

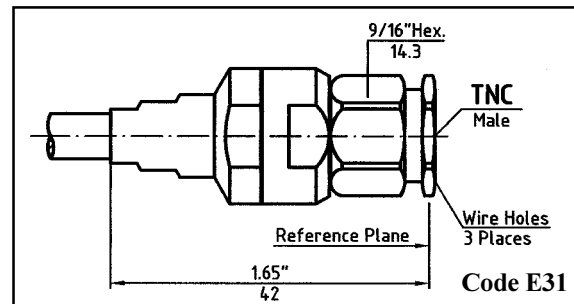
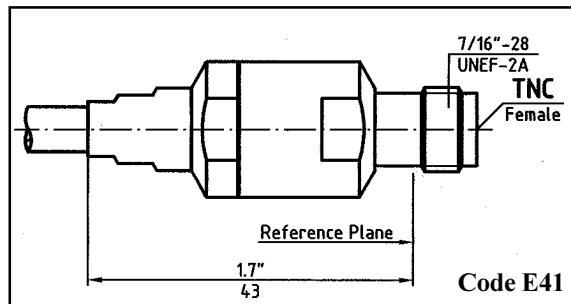
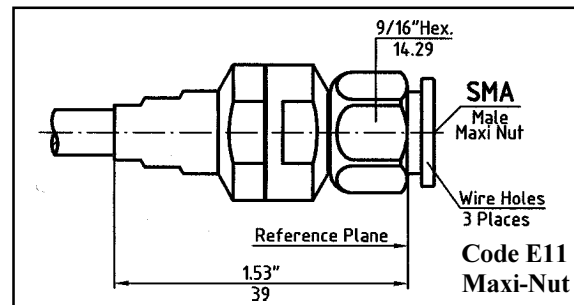
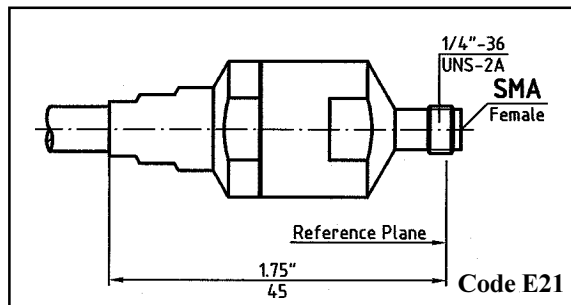
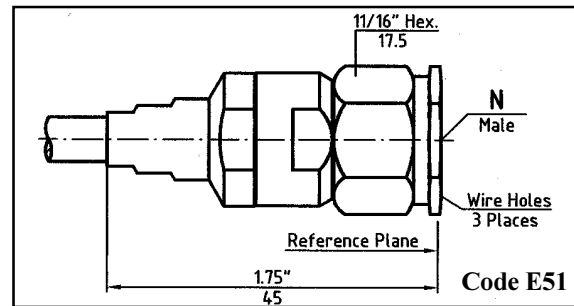
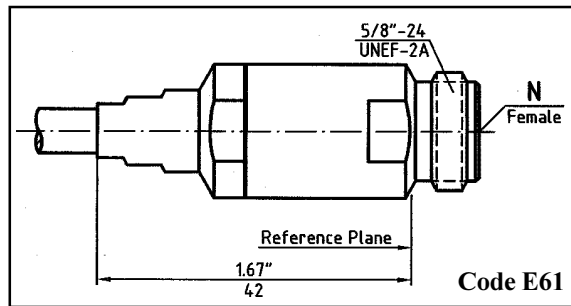
Spectrum Elektrotechnik GmbH offers a series of field replaceable connectors for Cable Types 22 and 100, allowing the user to repair worn connector interface parts quickly and easily. Replacement of the damaged or worn connector parts can be accomplished in a matter of minutes, using two standard wrenches.

Field Replaceable Interface Options



Additional the connector head of one connector style can be exchanged with a connector head of another style, a 7mm can be substituted for an SMA, or an N, or TNC, a male can be replaced by a female, etc. Instead of using adapters, the customer can modify within minutes his cable assembly for the connector style and sex needed in the application.

For Connector codes please refer also to Page 76.



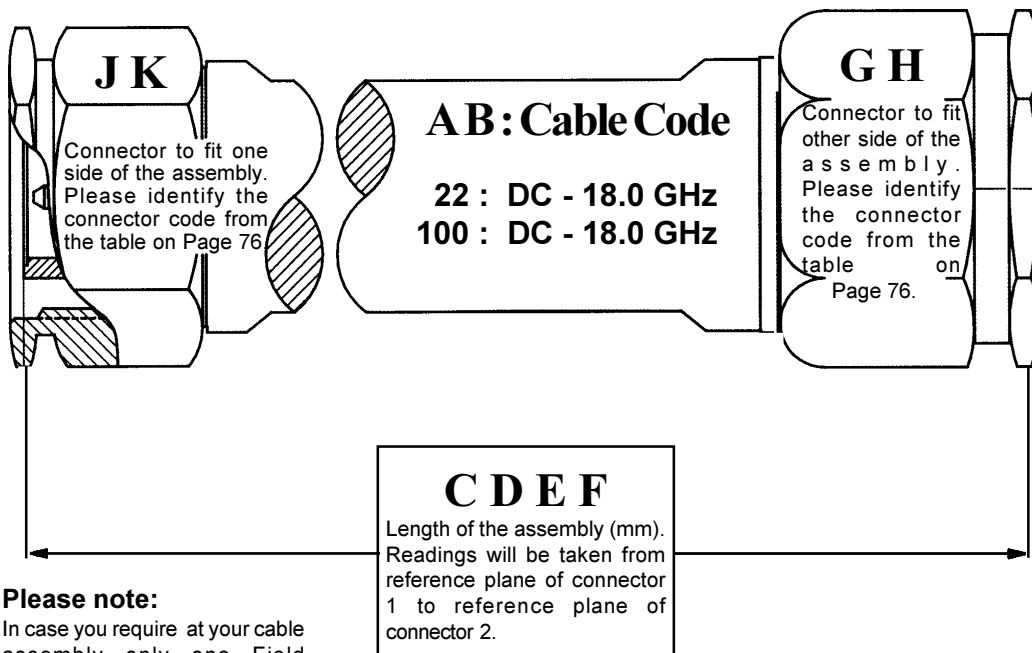
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Purchasing Information on Field Replaceable Cable Assemblies

Ordering Details:

The Part Number Sequence is:

AB - CDEF - GH - JK



Please note:

In case you require at your cable assembly only one Field Replaceable Connector and you would like the other end of the assembly to be terminated with a standard connector, please refer to Pages 24 and 25 for standard connectors and their codes.

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 '22' shall have the length of 75 cm (length is measured from interface to interface). It shall be terminated with Field Replaceable Connectors, N-female.

AB = cable code = 22 * CDEF = length in mm = 0750 * GH and JK are the connectors = E61 and E90.

Part Number for the cable assembly in this example: 22 - 0750 - E61 - E90.

Handy Form



Handy Form Cable Selection Chart														
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18	26.5	30	40	60	110	
Band	L		S		C		X		KU		K		KA	
Cable Type	Operational Range →													
Increasing Insertion Loss ↓	422-250-3	Outer Conductor Construction: Aluminum Tin Plated (Dia. 6.35mm). Code 250L. Low Density Dielectric.							20.0 GHz					
	422-900-3	Outer Conductor Construction: Copper Tin Plated (Dia. 3.58mm). Code 141L. Low Density Dielectric.									40.0 GHz			
	422-121-3	Outer Conductor Construction: Seamless Aluminum Tin Plated (Dia. 6.35mm). Code 150.							20.0 GHz					
	422-800	Outer Conductor Construction: Seamless Aluminum (Dia. 3.58mm). Code 168.									36.0 GHz			
	422-800-3	Outer Conductor Construction: Seamless Aluminum Tin Plated (Dia. 3.58mm). Code 167.									36.0 GHz			
	422-700-3	Outer Conductor Construction: Copper Tin Plated (Dia. 2.20mm). Code 85L. Low Density Dielectric.										60.0 GHz		
	501-19	Outer Conductor Construction: Copper/Tin Composite (Dia. 3.58mm). Code 67.								26.5 GHz				
	422-600	Outer Conductor Construction: Seamless Aluminum (Dia. 2.20mm). Code 165.									40.0 GHz			
	422-600-3	Outer Conductor Construction: Seamless Aluminum Tin Plated (Dia. 2.20mm). Code 166.									40.0 GHz			
	502-13	Outer Conductor Construction: Copper/Tin Composite (Dia. 2.18mm). Code 66.								26.5 GHz				
	422-100-3	Outer Conductor Construction: Copper Tin Plated (Dia. 1.19mm). Code 47L. Low Density Dielectric.									110.0 GHz			
	422-130	Outer Conductor Construction: Seamless Aluminum (Dia. 1.19mm). Code 145.									110.0 GHz			
	422-130-3	Outer Conductor Construction: Copper/Tin Composite (Dia. 1.19mm). Code 146.									110.0 GHz			

Characteristics:

Easily formable by hand. Electrical Performance is close to regular Semi - Rigid Cable with slightly higher insertion loss. The outer conductor consists of a tinned copper braid with almost 100% coverage.

SPECIFICATION		Handy-Form - I	
Cable Model No.		502-13	501-19
Cable Code for Cable Assemblies		66	67
Max. Operating Frequency (GHz)		26.5	26.5
Mechanical Requirements			
Outer Diameter Dia. in mm	in inch	0.086"	0.141"
	in mm	2.18	3.58
Outer Conductor Construction		Copper/Tin Composite 100% shield coverage	
Dielectric Diameter in mm		1.68	2.98
Dielectric Material		PTFE	PTFE
Dielectric Constant		2.00	2.00
Center Conductor Material		Silver Plated Steel	Silver Plated Steel
Center Conductor Dia. in mm		0.51	0.91
Weight in Gramms/Meter		22	48
Minimum Bend Radius, Inside, Static (mm)		35	70
Electrical Requirements			
Impedance in Ohms at Sea Level and +25°C		50 ± 1.0	50 ± 1.0
Velocity in %, ± 2 %		69.5	69.5
Capacitance in pF/m		29.1	29.1
Dielectric Strength (60 Hz) in KV ms		2.5	5.0
Max. Operating Voltage at Sea Level, in KVrms, 60 Hz		1.5	1.9
Nominal Insertion Loss in dB/m, vs. Frequency	0.5 GHz	0.39	0.26
	1.0 GHz	0.63	0.42
	5.0 GHz	1.88	1.22
	10.0 GHz	3.10	2.05
	18.0 GHz	4.90	3.30
	26.5 GHz	6.00	3.90
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and +20°C	0.5 GHz	130	450
	1.0 GHz	88	290
	5.0 GHz	32	110
	10.0 GHz	22	72
	18.0 GHz	13	48
	26.5 GHz	12	40
40.0 GHz	-	-	
Environmental Requirements			
Operating Temperature Range		-54°C to +110°C	-54°C to +110°C

Handy Form II



Characteristics:

Easily formable by hand. Electrical Performance is identical when compared to regular Semi - Rigid Cables. Outer Conductor consists of a seamless aluminum tubing, resulting in lower weight.

SPECIFICATION		Handy-Form - II						
Cable Model No.		422-130	422-130-3	422-600	422-600-3	422-800	422-800-3	422-121-3
Cable Code for Cable Assemblies		145	146	165	166	168	167	150
Max. Operating Frequency (GHz)		110.0	110.0	40.0	40.0	36.0	36.0	20.0
Mechanical Requirements								
Outer Diameter	in inch	0.047"	0.047"	0.087"	0.087"	0.141"	0.141"	0.250"
	in mm	1.19	1.19	2.20	2.20	3.58	3.58	6.35
Outer Conductor Construction		Seamless Aluminum	Seamless Aluminum Tin Plated	Seamless Aluminum	Seamless Aluminum Tin Plated	Seamless Aluminum	Seamless Aluminum Tin Plated	Seamless Aluminum Tin Plated
Dielectric Diameter in mm		0.94	0.94	1.68	1.68	2.99	2.99	5.31
Dielectric Material		PTFE	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE
Dielectric Constant		2.00	2.00	2.00	2.00	2.00	2.00	2.00
Center Conductor Material		Silver Plated Steel	Silver Plated Steel	Silver Plated Steel	Silver Plated Steel	Silver Plated Steel	Silver Plated Steel	Silver Plated Copper
Center Conductor Dia. in mm		0.29	0.29	0.51	0.51	0.92	0.92	1.63
Weight in Gramms/Meter		3.6	3.6	11	11	24.5	24.5	77.5
Minimum Bend Radius, Inside, Static (mm)		1.5	1.5	1.5	1.5	3.0	3.0	6.5
Electrical Requirements								
Impedance in Ohms at Sea Level and +25°C		50 ± 0.5	50 ± 0.5	50 ± 1.0	50 ± 1.0	50 ± 1.0	50 ± 1.0	50 ± 0.5
Velocity in %, ± 2 %		69.9	69.9	69.9	69.9	69.9	69.9	69.9
Capacitance in pF/m		105	105	105	105	98	98	97
Dielectric Strength (60 Hz) in KV ms		2.0	2.0	5.0	5.0	5.0	5.0	7.5
Max. Operating Voltage at Sea Level, in KVrms, 60 Hz		1.0	1.0	1.5	1.5	1.9	1.9	3.0
Nominal Insertion Loss in dB/m, vs. Frequency	0.5 GHz	0.81	0.81	0.42	0.42	0.28	0.28	0.19
	1.0 GHz	1.15	1.15	0.64	0.64	0.41	0.41	0.29
	5.0 GHz	2.80	2.80	1.60	1.60	1.05	1.05	0.71
	10.0 GHz	4.60	4.60	2.40	2.40	1.55	1.55	1.12
	18.0 GHz	6.50	6.50	3.40	3.40	2.20	2.20	1.50
	26.5 GHz	8.10	8.10	4.20	4.20	2.70	2.70	-
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and +20°C	0.5 GHz	50	50	195	195	680	680	2000
	1.0 GHz	32	32	130	130	450	450	1400
	5.0 GHz	12	12	47	47	170	170	470
	10.0 GHz	8	8	31	31	120	120	300
	18.0 GHz	5.5	5.5	22	22	74	74	210
	26.5 GHz	4.5	4.5	17	17	59	59	-
Environmental Requirements								
Operating Temperature Range		-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +200°C

II

Characteristics:

Easily formable by hand. Electrical Performance is identical when compared to Low Density Semi - Rigid Cables. The outer conductor consists of a seamless aluminum tubing, resulting in lower weight.

SPECIFICATION		Low Density			
Cable Model No.		422-100-3	422-700-3	422-900-3	422-250-3
Cable Code for Cable Assemblies		47L	85L	141L	250L
Max. Operating Frequency (GHz)		110.0	60.0	40.0	20.0
Mechanical Requirements					
Outer Diameter	in inch	0.047"	0.087"	0.141"	0.250"
	in mm	1.19	2.20	3.58	6.35
Outer Conductor Construction		Copper/Tin	Copper/Tin	Copper/Tin	Aluminum/Tin
Dielectric Diameter in mm		0.95	1.68	3.05	5.31
Dielectric Material		Low Density Dielectric	Low Density Dielectric	Low Density Dielectric	Low Density Dielectric
Dielectric Constant		1.5	1.5	1.5	1.5
Center Conductor Material		Silver Plated Copper	Silver Plated Copper	Silver Plated Copper	Silver Plated Copper
Center Conductor Dia. in mm		0.32	0.65	1.16	2.05
Weight in Gramms/Meter		6.25	20.53	41.66	75.9
Minimum Bend Radius, Inside, Static (mm)		3.2	3.2	15.9	25.4
Electrical Requirements					
Impedance in Ohms at Sea Level and +25°C		50 ± 2.0	50 ± 2.0	50 ± 1.0	50 ± 0.5
Velocity in %, ± 2 %		81	81	81	81
Capacitance in pF/m		105.0	87.3	85.9	85.0
Dielectric Strength (60 Hz) in KV ms		2.0	5.0	5.0	7.5
Max. Operating Voltage at Sea Level, in KVrms, 60 Hz		0.6	1.0	1.0	1.8
Nominal Insertion Loss in dB/m, vs. Frequency	0.5 GHz	0.80	0.31	0.17	0.14
	1.0 GHz	1.15	0.46	0.25	0.20
	5.0 GHz	2.55	1.20	0.62	0.52
	10.0 GHz	3.66	1.74	0.92	0.67
	18.0 GHz	4.98	2.55	1.31	1.05
	26.5 GHz	6.10	3.20	1.66	-
	40.0 GHz	7.60	4.10	2.15	-
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and +20°C	0.5 GHz	92	410	1400	4300
	1.0 GHz	60	260	900	2800
	5.0 GHz	23	100	300	1000
	10.0 GHz	15	70	200	700
	18.0 GHz	11	43	110	420
	26.5 GHz	9	35	83	-
	40.0 GHz	7	26	60	-
Environmental Requirements					

Cable - Type 33

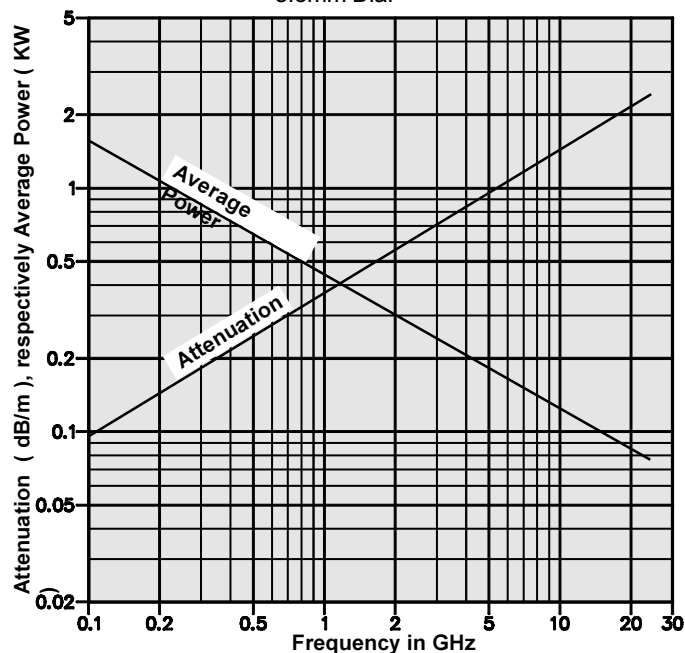
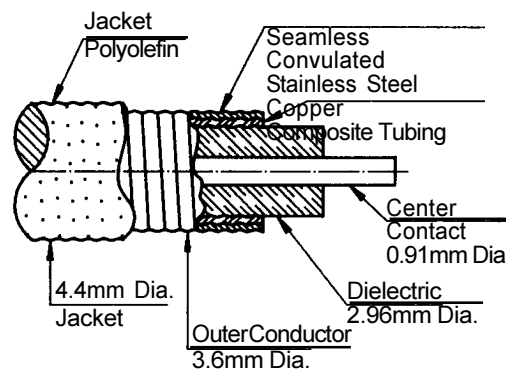
Exceptional Flexibility

DC - 24.0 GHz

Characteristics:

- Performance to 24.0 GHz.
- Electrical Performance identical when compared with regular Semi - Rigid Cables of Dia. 0.141".
- A weight reduction of 15% is achieved with improved mechanical strength when compared with standard Semi-Rigid Cables.
- Exceptional flexibility due to a perpetual convoluted seamless Stainless Steel Copper Composite Tubing.
- The Stainless steel ensures ruggedness, whilst the inner copper tubing contributes to excellent electrical performance.
- Reduces assembly costs.
- Can be easily flexed and formed down to small bends without degradation.
- Available connectors: 3.5mm, N, SMA and TNC. For Connector Outline Drawings please refer to Page 149 f.f. (regular connectors as used for 0.141" Semi-Rigid).

SPECIFICATION		Type 33
Cable Code	Standard	33
Frequency Range	DC 24.0 GHz	
Outer Diameter in mm	Standard	4.4
Impedance in Ohms at Sea Level and +25°C	50 ± 1	
Velocity in %, ± 2%	69.5	
Capacitance in pF/m	95	
Dielectric Strength (60 Hz) in KV rms	4.0	
Max. Operating Voltage at Sea Level, in KV rms, 60 Hz	1.3	
Nominal Insertion Loss in dB/m vs. Frequency	0.5 GHz	0.25
	2.0 GHz	0.56
	4.0 GHz	0.84
	8.0 GHz	1.25
	12.4 GHz	1.59
	18.0 GHz	2.00
Nominal CW-Power in Watts, vs. Frequency, at Sea Level and + 20°C	0.5 GHz	650
	2.0 GHz	300
	4.0 GHz	220
	8.0 GHz	135
	12.4 GHz	115
	18.0 GHz	90
24.0 GHz	78	
RF - Leakage at 18.0 GHz	-110 dBC	
Operating Temperature Range	-54°C to +110°C	
Outer Conductor Construction	Stainless Steel - Copper Composite Tube	
Outer Jacket	Polyolefin	
Dielectric Diameter in mm	2.96	
Dielectric Material	PTFE	
Dielectric Constant	2.0	
Center Conductor Material	Silver Plated Copper	
Center Conductor Dia. in mm	0.91	
Weight in Gramms/Meter	40	
Minimum Bend Radius, Inside, Static (mm)	13	



Semi - Rigid Cable Assemblies

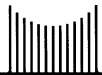
- **Semi-Rigid Cable Selection Chart,
Cables with Solid Dielectric** Page 86
- **Semi-Rigid Cable Selection Chart,
Cables with Low Density Dielectric** Page 87
- **Semi - Rigid Cables with solid Dielectric** Page 88 f.f.
- **Semi - Rigid Cables with Low Density
Dielectric** Page 90
- **Low Density, Regular and Solid
PTFE Comparison** Page 92
- **Custom Made Cable Assemblies** Page 94
- **Purchasing Information** Page 95
- **Connector Outline Drawings** Page 149 f.f.

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Semi - Rigid Cables with solid Dielectric



Semi - Rigid Cable Selection Chart																
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18	26.5	30	40	60	109	150		
Band	L		S		C	X			KU		K	KA				
Cable Type	Operational Range →															
Increasing Insertion Loss ↓	421-608	Outer Conductor Construction: Aluminum (Dia. 8.26mm). Code 08						14.0 GHz								
	421-250	Outer Conductor Construction: Aluminum (Dia. 6.35mm). Code 50						19.0 GHz								
	421-252	Outer Conductor Construction: Copper (Dia. 6.35mm). Code 52						19.0 GHz								
	421-669	Outer Conductor Construction: Copper (Dia. 3.58mm). Code 69									33.0 GHz					
	421-670	Outer Conductor Construction: Copper (Dia. 3.58mm). Code 670									33.0 GHz					
	421-086	Outer Conductor Construction: Copper (Dia. 2.18mm). Code 89									60.0 GHz					
	421-087	Outer Conductor Construction: Copper (Dia. 2.18mm). Code 83									60.0 GHz					
	421-669SS	Outer Conductor Construction: Stainless Steel (Dia. 3.58mm). Code 69S									33.0 GHz					
	421-047	Outer Conductor Construction: Copper (Dia. 1.19mm). Code 46									109.0 GHz					
	421-086SS	Outer Conductor Construction: Stainless Steel (Dia. 2.18mm). Code 94									60.0 GHz					
	421-034	Outer Conductor Construction: Copper (Dia. 0.86mm). Code 434									150.0 GHz					
	421-669SSSS	Outer Conductor Construction: Stainless Steel (Dia. 3.58mm). Code 76									33.0 GHz					



Semi - Rigid Cable Selection Chart (Low Density)														
Frequency in (GHz) →	1	2	3	4	8	12.4	15	18	26.5	30	40	50	60	
Band	L		S		C		X		KU		K		KA	
Cable Type	Operational Range →													
Increasing Insertion Loss ↓	421-202	Outer Conductor Construction: Aluminum (Dia. 12.7mm). Code 20					10.0 GHz							
	421-227	Outer Conductor Construction: Aluminum (Dia. 9.53mm). Code 27						14.0 GHz						
	421-281	Outer Conductor Construction: Aluminum (Dia. 6.35mm). Code 81								20.0 GHz				
	421-336-3	Outer Conductor Construction: Tin Plated Copper (Dia. 6.35mm). Code 363								20.0 GHz				
	421-336-1	Outer Conductor Construction: Silver Plated Copper (Dia. 6.35mm). Code 361								20.0 GHz				
	421-336	Outer Conductor Construction: Copper (Dia. 6.35mm). Code 36								20.0 GHz				
	421-298-3	Outer Conductor Construction: Tin Plated Copper (Dia. 3.58mm). Code 99									35.0 GHz			
	421-298-1	Outer Conductor Construction: Silver Plated Copper (Dia. 3.58mm). Code 97									35.0 GHz			
	421-298	Outer Conductor Construction: Copper (Dia. 3.58mm). Code 98									35.0 GHz			
	421-307-3	Outer Conductor Construction: Tin Plated Copper (Dia. 2.18mm). Code 07										65.0 GHz		
	421-307-1	Outer Conductor Construction: Silver Plated Copper (Dia. 2.18mm). Code 06										65.0 GHz		
	421-307	Outer Conductor Construction: Copper (Dia. 2.18mm). Code 05										65.0 GHz		

Semi - Rigid Cables with solid Dielectric



Semi - Rigid Cables with solid PTFE, 50 Ohms															
All cables in this table have a:															
- Velocity (in % ± 2%) of 69.5						- Dielectric Constant of ~2.0									
- Capacitance (pF/m) of 95.1						- Solid Density PTFE as Dielectric Material									
Specification															
Cable Model No.	421-034	421-034-1	421-034-3	421-047	421-047-1	421-047-3	421-086	421-086-1	421-086-3	421-086-G	421-086DS	421-086SS	421-087	421-087-1	421-087-3
Cable Code for Cable Assemblies	434	435	436	46	47	48	89	90	91	92	86D	94	83	84	85
Cable MIL-C17-No.	M17/154-00001		M17/154-00002	M17/151-00001		M17/151-00002	M17/133-RG405		M17/133-00001				M17/133-00002		M17/133-00003
Cut Off Frequency (GHz)	150	150	150	109	109	109	60	60	60	60	60	60	60	60	60
Mechanical Requirements															
Outer Conductor Diameter (mm)	0.86	0.86	0.86	1.19	1.19	1.19	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18
Semi-Rigid Type (^ Dia in inch)	0.034"	0.034"	0.034"	0.047"	0.047"	0.047"	0.086"	0.086"	0.086"	0.086"	0.086"	0.086"	0.086"	0.086"	0.086"
Dielectric Diameter DD in mm	0.66	0.66	0.66	0.94	0.94	0.94	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68
Outer Conductor Material	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Steel	Cu	Cu	Cu
Outer Conductor Finish	-	Silver	Tin	-	Silver	Tin	-	Silver	Tin	Gold	-	-	-	Silver	Tin
Center Conductor, Dia. in mm	0.20	0.20	0.20	0.29	0.29	0.29	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Center Conductor Material	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Cu	Cu
Center Conductor Finish	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver
Weight in Gramms/ Meter	2.8	2.8	2.8	6.5	6.5	6.5	21.1	22.3	22.3	22.3	20.8	21.1	20.8	21.7	21.7
Minimum Bend Radius, Inside, Static (mm)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	1.3	6.4	3.2	3.2	3.2
Electrical Requirements															
Impedance (Ohms)	50±3.0	50±3.0	50±3.0	50±2.5	50±2.5	50±2.5	50±1.5	50±1.5	50±1.5	50±1.5	50±1.5	50±1.5	50±1.5	50±1.5	50±1.5
Dielectric Strength (60 Hz) in KV ms	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Max. Operating Voltage at Sea Level (in KV rms)	0.75	0.75	0.75	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Operating Temp. Range (°C)	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125	-54/+125
** Only the most common cables are listed on this page. A number of special cables were developed and manufactured for individual															

88 Spectrum Elektrotechnik GmbH P.O. Box 45 05 33, 80905 Munich, Germany Tel. (89) 354 804-0, Fax (89) 354 804-90 (Country Code: 49)

Semi - Rigid Cables with solid PTFE, 50 Ohms															
All cables in this table have a:															
- Velocity (in % ± 2%) of 69.5								- Dielectric Constant of ~2.0							
- Capacitance (pF/m) of 95.1								- Solid Density PTFE as Dielectric Material							
															Specification
421-669	421-669-1	421-669-3	421-669-3	421-669DS	421-669SS	421-669SSSS	421-670	421-670-1	421-670-3	421-250	421-252	421-252-1	421-252-3	421-608	Cable Model No.
69	70	71	72	69D	69S	76	670	671	673	50	52	53	54	08	Cable Code for Cable Assemblies
M17/130-RG402		M17/130-00001	M17/130-00001								M17/129-RG401		M17/129-00001		Cable MIL-C17-No.
33	33	18	33	33	33	33	33	33	33	19	19	19	19	14	Cut Off Frequency (GHz)
															Mechanical Requirements
3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	6.35	6.35	6.35	6.35	8.26	Outer Conductor Diameter (mm)
0.141"	0.141"	0.141"	0.141"	0.141"	0.141"	0.141"	0.141"	0.141"	0.141"	0.250"	0.250"	0.250"	0.250"	0.325"	Semi-Rigid Type (^ Dia in inch)
2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	2.98	5.31	5.31	5.31	5.31	7.16	Dielectric Diameter DD in mm
Cu	Cu	Cu	Cu	Cu	Steel	Steel	Cu	Cu	Cu	Alu	Cu	Cu	Cu	Alu	Outer Conductor Material
-	Silver	Tin	Tin	-	-	-	-	Silver	Tin	-	-	Silver	Tin	-	Outer Conductor Finish
0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	1.63	1.63	1.63	1.63	7x.79	Center Conductor, Dia. in mm
Steel	Steel	Steel	Steel	Steel	Cu	Steel	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Center Conductor Material
Silver	Silver	Silver	Silver	Silver	Silver	-	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Center Conductor Finish
47.6	47.6	47.6	47.6	47.6	47.6	47.6	47.6	47.6	47.6	103.0	148.8	150.3	150.3	142.9	Weight in Gramms/ Meter
6.4	6.4	6.4	6.4	2.5	12.7	12.7	6.4	6.4	6.4	9.5	9.5	9.5	9.5	19.1	Minimum Bend Radius, Inside, Static (mm)
															Electrical Requirements
50±1.0	50±1.0	50±1.0	50±1.0	50±1.0	50±1.0	50±1.0	50±1.0	50±1.0	50±1.0	50±0.5	50±0.5	50±0.5	50±0.5	50±2.0	Impedance (Ohms)
5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7.0	7.0	7.0	7.0	7.5	Dielectric Strength (60 Hz) in KV ms
1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	3.0	3.0	3.0	3.0	3.0	Max. Operating Voltage at Sea Level (in KV rms)
-54/+115	-54/+115	-54/+115	-54/+115	-54/+115	-54/+115	-54/+115	-54/+115	-54/+115	-54/+115	-40/+90	-40/+90	-40/+90	-40/+90	-40/+90	Operating Temp. Range (°C)

** Only the most common cables are listed on this page. A number of special cables were developed and manufactured for individual

Semi - Rigid Cables with Low Density Dielectric

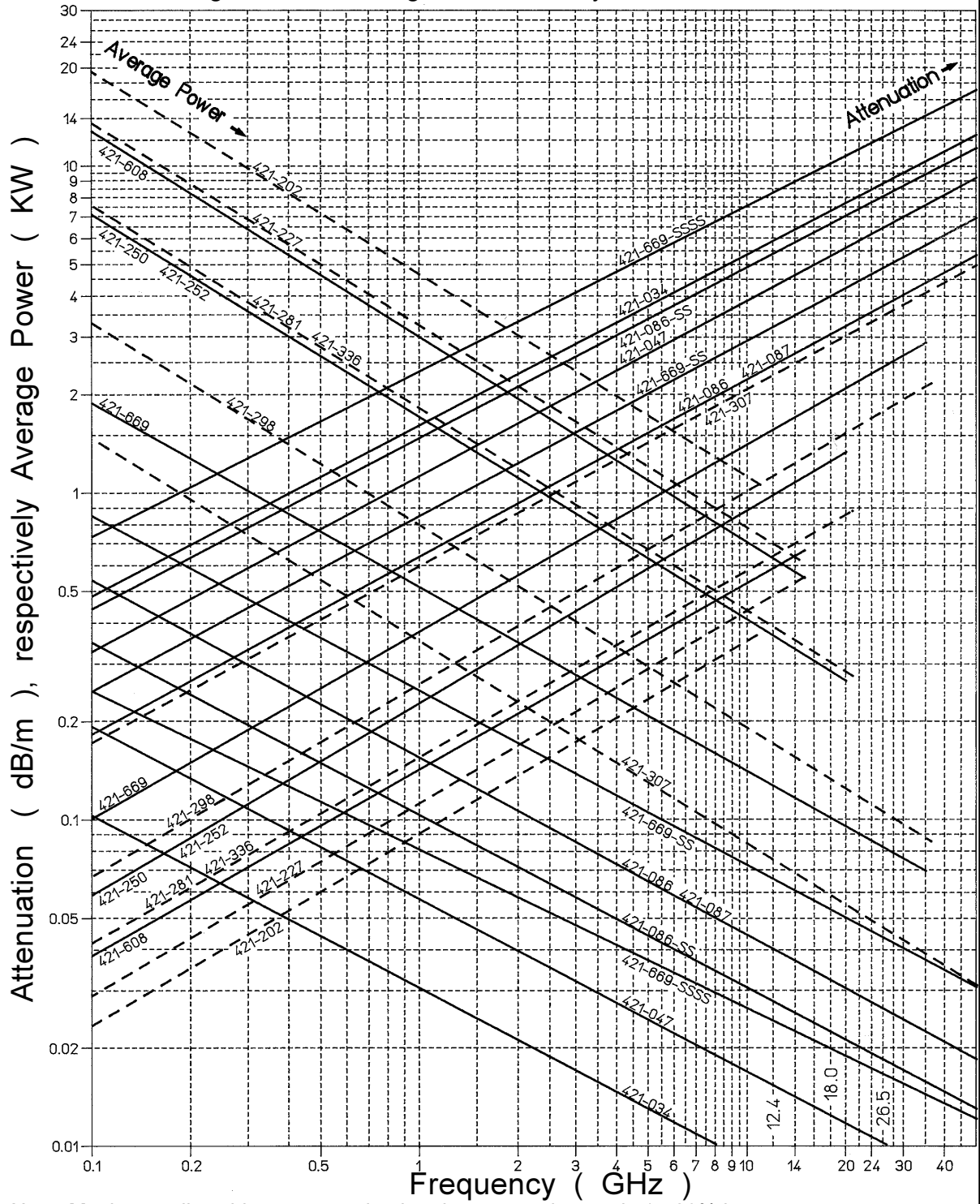


Semi - Rigid Cables with Low Density Dielectric, 50 Ohms												
All cables in this table have a(n): - Copper Center Conductor - Silver Center Conductor Finish - Low Density PTFE as Dielectric Material - Operating Temperature of -100 to +250°C - Impedance (Ohms) of 50±2.0 - Dielectric Constant of ~1.5												
Specification												
Cabel Model No.	421-307	421-307-1	421-307-3	421-298	421-298-1	421-298-3	421-336	421-336-1	421-336-3	421-281	421-227	421-202
Cable Code for Cable Assemblies	05	06	07	98	97	99	36	361	363	81	27	20
Cut Off Frequency (GHz)	65	65	65	35	35	35	20	20	20	20	14	10
Mechanical Requirements												
Outer Conductor Dia. (mm)	2.18	2.18	2.18	3.58	3.58	3.58	6.35	6.35	6.35	6.35	9.53	12.7
Semi-Rigid Type (^ Dia in inch)	.086"	.086"	.086"	.141"	.141"	.141"	.250"	.250"	.250"	.250"	.375"	.495"
Dielectric Diameter DD in mm	1.47	1.47	1.47	2.95	2.95	2.95	5.28	5.28	5.28	5.28	7.80	10.7
Outer Conductor Material	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Alu	Alu	Alu
Outer Conductor Finish	-	Silver	Tin	-	Silver	Tin	-	Silver	Tin	-	-	-
Center Conductor, Dia. (mm)	0.51	0.51	0.51	1.09	1.09	1.09	1.88	1.88	1.88	1.88	2.97	3.89
Weight in Gramms/m	22.7	23.9	23.9	40.9	42.3	42.3	136.2	137.7	137.7	75.7	159.2	282.8
Minimum Bend Radius, Inside, Static (mm)	6.4	6.4	6.4	11.1	11.1	11.1	38.1	38.1	38.1	38.1	50.8	57.2
Electrical Requirements												
Velocity in %, ± 2%	80	80	80	80	80	80	80	80	80	80	84	84
Capacitance in pF/m	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	78.7	78.7
Dielectric Strength (60 Hz) in KV ms	2.0	2.0	2.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	8.0	9.0
Max. Operating Voltage at Sea Level (in KV rms)	0.6	0.6	0.6	1.0	1.0	1.0	1.5	1.5	1.5	1.5	2.0	2.5
** Only the most common cables are listed on this page. A number of special cables were developed and manufactured for individual Programs and unique requirements. Please contact us, if you need further assistance.												

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Insertion Loss and Power Handling Cables

Data for Semi - Rigid Cables with regular Low Density Dielectric and with solid PTFE.



Note: Maximum allowable power on tin plated outer conductors is 15-20% less.

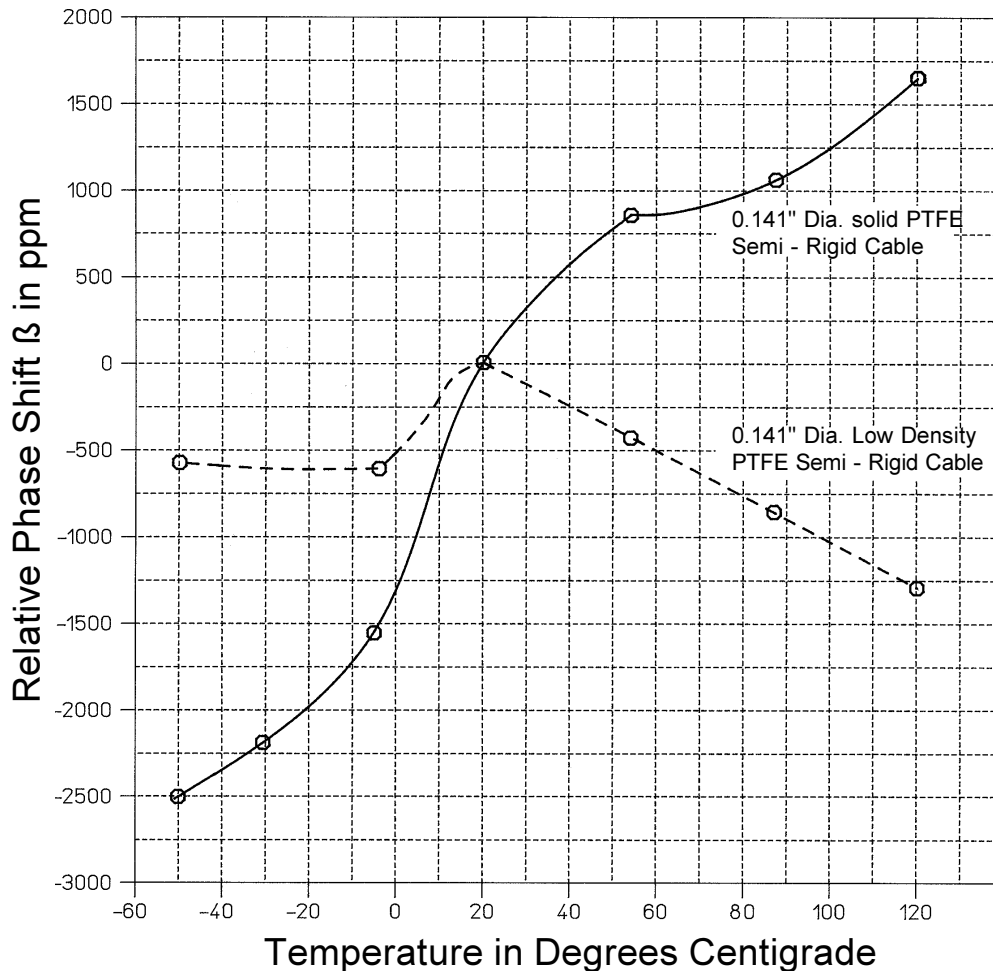
Comparison of Regular PTFE and Low Density PTFE



	Regular PTFE Dielectric	Low Density Dielectric
Mechanical Stability vs. Temperature	Poor	Good Lower coefficient of thermal expansion results in improved dimensional stability from -100°C to +250°C.
Phase Stability vs. Temperature	Poor	Good Lower coefficient of thermal expansion results in lower Phase Shift vs. Temperature.
Change in Propagation Time vs. Temperature	Poor	Improved The change in propagation time of Delay Lines is 70 - 80% less than when using solid PTFE.
Attenuation	Higher	Lower Lower dissipation factor of the dielectric, lower dielectric constant, larger center conductor result in lower attenuation.
Power Handling	Lower	Higher Good temperature stability allows higher operating temperature, and therefore higher power.
Weight	Higher	Lower Low density dielectric results in lower weight.

Phase vs. Temperature

Comparison of Solid PTFE and Low Density PTFE.



To determine the phase shift (due to temperature) that is contributed to your system by any particular Semi - Rigid Cable assembly or assemblies, first find the relative phase shift β in ppm from above diagram. Then calculate the phase shift ξ using:

$$\xi = 11.8 * 10^{-6} * \beta * l * t * f (^{\circ})$$

l = Total length of cable that is exposed to the temperature change (expressed in cm).

t = Time delay. This is approximately 1.25 for our Low Density Dielectric cables and 1.44 for solid Teflon cables.

f = Frequency in GHz.

β = Relative shift in ppm = $\xi/dl * 10^6$.

dl = Total electrical length of cable (in degrees) that was inside of the temperature chamber for the test results plotted above.

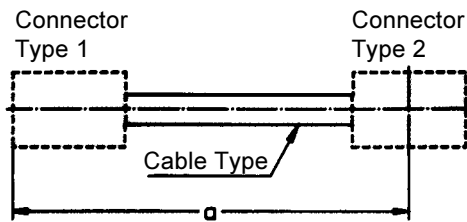
Note: Approximately 30' (9.15m) of 0.141" Dia. Semi - Rigid Cable was inside the chamber. Other sizes of solid and Low Density PTFE cables have diagrams that are similar to the ones above.

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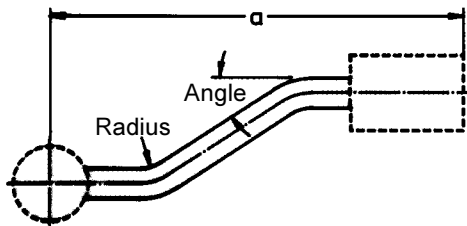
Custom Made Cable Assemblies

The manufacturing of high performance cable assemblies and connectors with integrity and reliability of performance, requires the use of fully trained personnel, specialized techniques, tools, jigs and machinery.

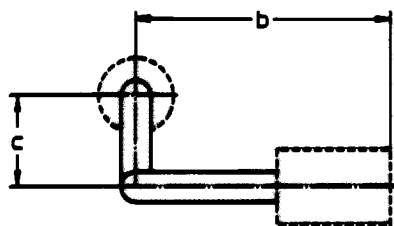
Spectrum Elektrotechnik GmbH has developed over more than 15 years processes, and specialized equipment, many unique to Spectrum, to enable the production of state-of-the-art cable assemblies, for customers' individual needs.



Only materials of the highest grade, conforming to IEC, DIN, MIL-Specifications and DIN ISO are used. Spectrum Elektrotechnik GmbH ensures optimum electrical and mechanical performance between connector and the coaxial cable by designing and manufacturing their own extensive range of connectors. A stringent quality assurance program ensures that every product, leaving the factory, meets the highest quality level. All products are 100% tested. With the exception of the "Low Cost" assemblies, RF test plots are supplied with each individual assembly.



Our Sales and engineering department will respond promptly to every inquiry. With the request for quotation, please send the complete specification and a mechanical drawing, or sketch, showing the complete information on the mechanical configuration, mechanical tolerances on all lengths and radii, etc. The electrical specification should mention all key parameters, such as VSWR, insertion loss, power, phase match. Our engineering department will assist you with your specification and can discuss possible alternatives on cable materials and connectors, suitable to your application.



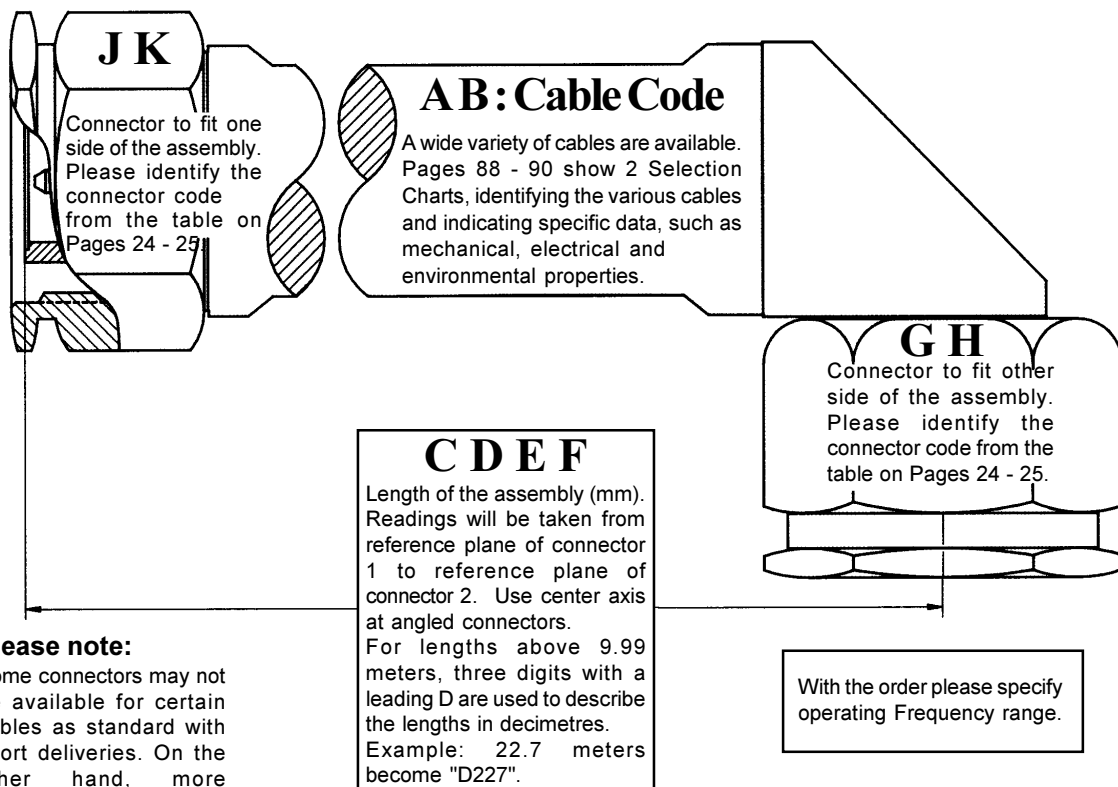
For cable assemblies, formed to customer specification, or complying to special requirements, the company will issue an individual part number. For cable assemblies being ordered in straight lengths, the customer can develop his own part number, using the Purchasing Information shown on the next page.

Purchasing Information on Semi - Rigid Cable Assemblies

Ordering Details:

The Part Number Sequence is:

AB - CDEF - GH - JK



For cable assemblies, manufactured and shaped to customer specification, or complying to special requirements, the company will issue a special part number. For cable assemblies being ordered in straight length, the customer can develop his own part number, using the code shown on the Connector Selection Chart on Pages 24 - 25. An example is given below.

Ordering Example: The cable assembly of Semi-Rigid Cable 421-669 Cable Code 69 shall have the length of 45 cm. The length of the assembly is measured from the interface of a straight connector to the center axis of an angled connector. It shall be terminated with a TNC straight male and a N right angle male.

AB = cable code = 69 * CDEF = length in mm = 0450 * GH and JK are the connectors (their code has been identified from Pages 24 - 25) = 31 and 55.

Part Number for the cable assembly in this example: 69 - 0450 - 31 - 55.

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Special Products & Services

- **Delay Lines** Page 98
- **Quick Response Manufacturing** Page 99
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Delay Lines

Microwave delay devices are designed and manufactured to meet delay requirements in frequency ranges from UHF through KA-Band. Several techniques are used to achieve the delays. It is the responsibility of the design engineer to decide about the best method for delaying the signals in his particular application. The decision depends on the frequency range, the delay needed, the desired VSWR, the suppression of undesired signals, the size of the device and its form, and last but not least, the price of the device will be an important factor.

The coaxial delay line is the classical device. The length of the delay line can easily be calculated from the propagation delay of the signal within the coaxial cable and the delay needed. Other advantages are the good electrical performance of the professional delay line, the usually fast availability and the attractive price. Disadvantages are in some cases the large size and the high insertion loss, especially for longer delays at higher frequencies.

Spectrum Elektrotechnik GmbH offers a wide variety of coaxial delay lines. All the designs use Semi-Rigid Cable, from very small diameters, such as 0.047" up to diameters of 0.250", for certain applications even bigger. The Semi-Rigid Cables are using either Solid Dielectric, or Low Density Dielectric. The advantage of the Low Density Dielectric is lower insertion loss, a wider temperature range and smaller delay changes over temperature.

All Delay Lines are made to the customer specifications: a specific delay that is needed in the applications, a maximum attenuation, a minimum return loss, a maximum change vs. temperature, a certain mechanical configuration and an environment that often only allows the best.

Delay Lines Packaging Options

The delay line can be packaged in a number of different ways, such as:

- * **An especially designed housing:** it can be made of any kind of material, although mostly used is aluminum excarvated.
- * **19" Rack Mounting:** this is common for larger delay lines, or for applications in laboratories or test sets.
- * **Spool Mounting:** this is an economical way of packaging, using a spool as supporting and mounting fixture.
- * **Free Coils:** this is definitely the most inexpensive packaging, winding the delay line in a free coil and then using either tape, plastic or stainless steel ties, or just solder, to hold the delay line together.

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Delay Lines:

The following Table can be used as a quick reference. Comparing the data of the different cables listed in attenuation, diameter, length and weight will allow a fast decision which of the cables may be suited best in any specific application.

Dielectric	Cable P/N	Code	Outer Diameter	Attenuation dB (10 GHz)			Phase Stability	Min. Bend Radius (mm)	Length (Nom.) (m)			Weight (grs)		
				/10ns	/50ns	/100ns			/10ns	/50ns	/100ns	/10ns	/50ns	/100ns
Low Density	421-307	05	0.085"	5.00	24.9	49.8		15.2	2.33	11.6	23.3	54	272	544
	422-700-3	-	0.085"	4.20	21.1	43.3		15.0	2.43	12.2	24.3	50	250	501
	421-069	-	0.116"	3.10	15.5	31.0	Best	17.80	2.35	11.7	23.5	82	408	816
	421-298	98	0.141"	2.40	12.0	24.0	Best	25.4	2.43	12.2	24.3	100	499	998
	422-900-3	141L	0.141"	2.24	11.2	22.4		25.4	2.43	12.2	24.3	102	508	1017
	421-336	36	0.250"	1.12	5.6	11.2	Best	50.8	2.40	12.0	24.0	327	1633	3266
	421-281	81	0.250"	1.12	5.6	11.2	Best	50.8	2.40	12.0	24.0	181	907	1814
Solid	RG-405 421-086	89	0.086"	5.22	26.10	52.2	Note "A"	5.1	2.12	10.6	21.2	45	226	454
	RG-402 421-669	69	0.141"	2.92	14.60	29.2	Note "A"	8.9	2.12	10.6	21.2	100	499	998
	RG-401 421-252	52	0.250"	1.80	9.0	18.0	Note "A"	12.7	2.12	10.6	21.2	318	1588	3175
	421-250	50	0.250"	1.80	9.0	18.0		12.7	2.12	10.6	21.2	315	1575	3150

* "A" - At higher temperatures, 21 to 120 degrees C, microporous PTFE dielectric Cable has only slightly better phase response than solid PTFE dielectric cable. However, from 21°C to -50°C microporous cable displays far superior phase response.

Quick Response Manufacturing

The Quick Response Manufacturing is another good example for the commitment to providing excellent Customer Service. The Quick Response Group was implemented to react immediately to customer needs. Sometimes Products will be shipped within 24 hours. All Products manufactured in the Quick Response Area will meet the same Quality Standard as all the other products, they are submitted to the same inspection criteria, they are tested to the same procedures.

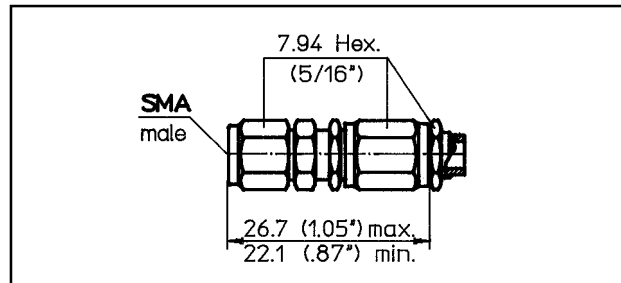
Phase & Amplitude Matched Cable Assemblies

Since 1981, Spectrum Elektrotechnik GmbH has been manufacturing high quality phase and amplitude matched cable assemblies. Experience staff is available to assist the customer to select the proper cable for the specific application and to provide information on the product performance.

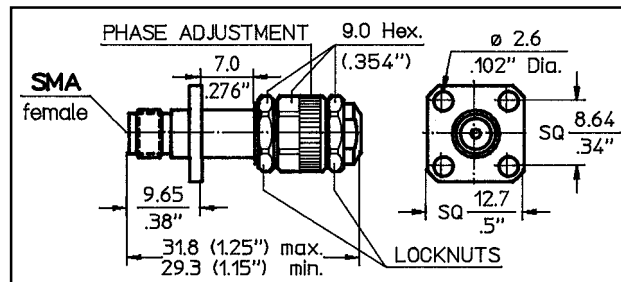
Matching cable assemblies must not necessarily mean to trim the cables to the exact lengths. Spectrum Elektrotechnik GmbH manufactures a variety of Phase Adjusters that can be attached directly to the cable. Using these devices, cable assemblies can easily be matched to perfection, at any frequency. An example of phase adjustable connectors are shown below.

Phase Adjustable SMA Connectors

Adjustable coaxial Phase Shifters Models LS-0141-02 and LS-0085-02	
Frequency Range	DC - 26.0 GHz
Adjustment	Max. 126° at 26.0 GHz
Impedance	50 Ohms
Max. VSWR	1.05 + .008f(GHz)
Insertion Loss	(.05 SQT(f(GHz)))dB
R.F. Leakage	-90 dBC



Adjustable coaxial Phase Shifter Model LS-0085-S001	
Frequency Range	DC - 18.0 GHz
Adjustment	Max. 50° at 18.0 GHz
Impedance	50 Ohms
Max. VSWR	1.12:1 at 18.0 GHz
Insertion Loss	0.25 dB at 18.0 GHz
R.F. Leakage	-90 dBC
Temperature Range	-65°C to +115°C



The Models LS-0141-02 and LS-0085-02 are adjustable coaxial Phase Shifters, covering the full frequency range of DC to 26.0 GHz with an adjustment capability of max. 127°C at 26.0 GHz. Phase Shifters practically eliminate the need to trim cables to predetermined lengths, in order to achieve the exact phase requirements of a microwave network. Cables only need to be trimmed to the approximate electrical length. The Phase Shifter then allows to make the necessary adjustment between the other components in the system. As a result of the small size and light weight, these Phase Shifters can be used in applications with space limitations, such as airborne and satellite equipment.

Part Number	Cable Type	Frequency Range	VSWR max.	Insertion Loss max.	Phase Shift min.	No. of Turns	Nom. Phase Shift Deg./GHz/Tur	Time Delay (psec.) min. max.	Weight max.
LS-0141-02	0.141" Semi-Rigid	DC - 26.0 GHz	1.25 : 1	0.26 dB	127° at 26.0 GHz	9	0.55	72.2 87.6	9 g
LS-0085-02	0.085" Semi-Rigid								9 g
LS-0085-S001	0.085"	DC - 18.0 GHz	1.12 :	0.25 dB	50° at	5	0.55	85.3 93.7	9 g

Design & Engineering:

Spectrum Elektrotechnik GmbH is a very innovative Company. It employs a strong and successful team of experienced engineers. If your application requires a product that is not available as standard, Spectrum Elektrotechnik GmbH is the Company to contact. Our engineers are ready and willing and capable to listen to your problem and they will try their best to propose something that will fit your needs perfectly. There is also a possibility that we may have solved already a similar problem for somebody else and that we have a solution available, almost off the shelf.

Following, a few examples of areas where our engineering staff has proposed and designed and manufactured hardware to the customers requirements, or has developed Products to widen and strengthen the Product Range.

The Cable Assembly Group:

- * Low Loss Cable Assemblies
- * Extra Light Weight Assemblies
- * High Velocity and Thermal Stable Cable Assemblies
- * High Power Cable Assemblies
- * Light weight, low loss delay lines

The Component Group:

- * Products designed and manufactured to customer specifications, such as Duplexers, Limiters, Gain Equalizers, Phase Shifters, Mismatches, etc.
- * Widen and strengthen the Standard Product Line, by designing Products, such as Phase Adjustable Adapters, Precision Terminations, Calibration Kits, etc.

The Connector Group:

- * Designing and manufacturing successfully new Connector Series, e.g. of Types SBX, SBY and SPM, connectors that were not available with the physical and electrical performance, as needed for specific programs.
- * Adapters for special applications and programs to fit exactly the customers needs mechanically and electrically.
- * Designing a complete series of Right Angle Connectors, showing electrical performance similar to straight connectors.
- * Developing a wide range of High Power Connectors and Adaptors using unique techniques for heat dissipation.
- * Engineering of a whole new Product Line: the PUSH - ON Connectors & Adapters.
- * Developing the RF-Multipin Connector, the SQ-8 in a MIL-C-38999 Shell, Series III, Size 21.

Process Engineering:

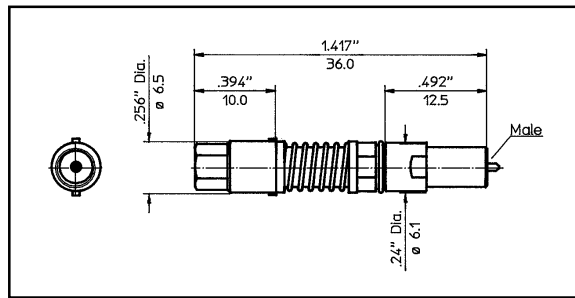
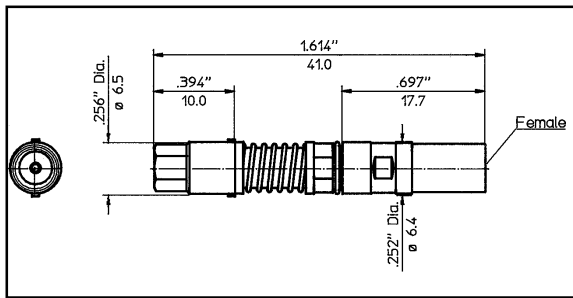
- * Developing Tools and Machines and Processes that are needed in manufacturing but not available on the market as standard.
- * Design and manufacturing of the CNCA-700, an Automatic Cable Cutting and Stripping Machine.

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RF-Multipin Connector SQ-



8 Spectrum's new 'SQ-8' Multipin Connector incorporates EIGHT NEW GENERATION precision microwave connectors. The advantage of being able to connect and disconnect EIGHT microwave links simultaneously is one of its major benefits. The 'SQ-8' is blind mating and automatically locks the individual links into place. The need for a torque wrench, and the difficulties sometimes experienced with mating miniature connectors in confined space, is also eliminated. Although designed and constructed with reliability and performance foremost in mind, every individual microwave assembly within the component is field replaceable. These connector inserts can be exchanged or replaced in the very minimum of time, by the simple task of disengaging or engaging a bayonet catch. When using the 'SQ-8' Multipin Connector, the design, manufacture, and servicing of RF and microwave systems and test equipments is made infinitely easier. Electrically, the individual RF connector inserts used, offer an excellent performance, and are comparable, and in some cases better than those exhibited by SMA series connectors. 'SQ-8' Multipin Connector has been designed to accommodate a variety of different cable types. These include cable diameters from 3mm to 5mm; from ultra flexible to extremely rugged; electrically phase stable and very low loss. The 'SQ-8' is the fore runner of a series of NEW MULTIPIN CONNECTOR developments. Other choices of outer body shell styling with different number of microwave inserts, are to be made available. Frequencies up to 40.0 GHz, and above, with combinations of RF-Inserts and regular pins are available.



SPECIFICATIONS

ELECTRICAL

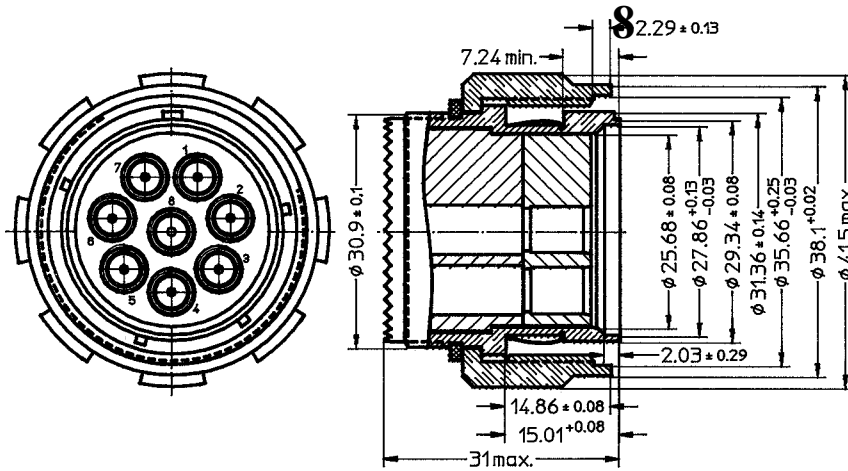
Frequency Range	DC - 24.0 GHz min., DC - 40.0 GHz optional.
Insulation Resistance	The insulation resistance shall not be less than 5,000 megohms.
Voltage Standing Wave Ratio (VSWR)	1.02 + .005 * f (GHz)
Contact Resistance	The center contact resistance drop shall not exceed 3.0 milliohms and the outer contact resistance drop shall not exceed 2.0 milliohms.
Dielectric Withstanding Voltage	The magnitude of the test voltage shall be 1,000 volts rms at sea level.
RF High Potential Withstanding Voltage	The RF high potential withstanding Jvoltage is 670 volts rms at 5 MHz. Leakage is not applicable.
RF Leakage	- (100 - f (GHz)) dB
Insertion Loss	(.03 SQT(f(GHz))) dB

Mechanical

Connector Durability	The connector is to be tested and its mating connector shall be subjected to 500 insertions and withdrawal cycles at 12 cycles per minute max. The connector shall show no evidence of mechanical failure and the connector shall meet the mating characteristic requirements.
Cable Retention Force	60 pounds (267 N) min., without stress relief.
Coupling Nut Retention Force	Not applicable.
Force to Engage and Disengage	Not applicable.
Longitudinal Force max.	Longitudinal force is not applicable.
Mating Characteristics	Applicable to Females only: oversize pin .0372 inch (.945 mm) max. dia., .045 inch (1.14 mm) deep; insertion force 3 lbs. (13.34 N) max. with .037 inch (.94 mm) min. dia. pin; withdrawal force 1.00 oz (.278 N) min. with .0355 inch (.90 mm) max. dia. pin.

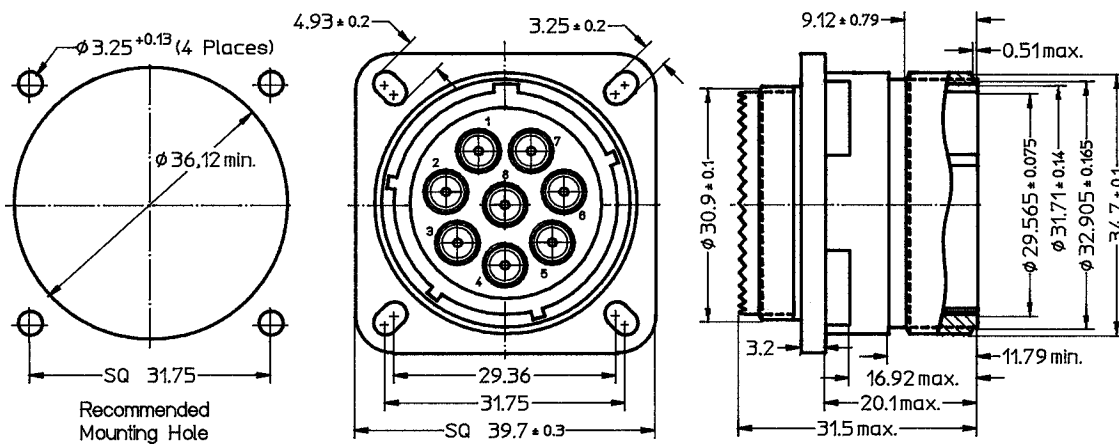
Recommended Mating Torque

Not applicable

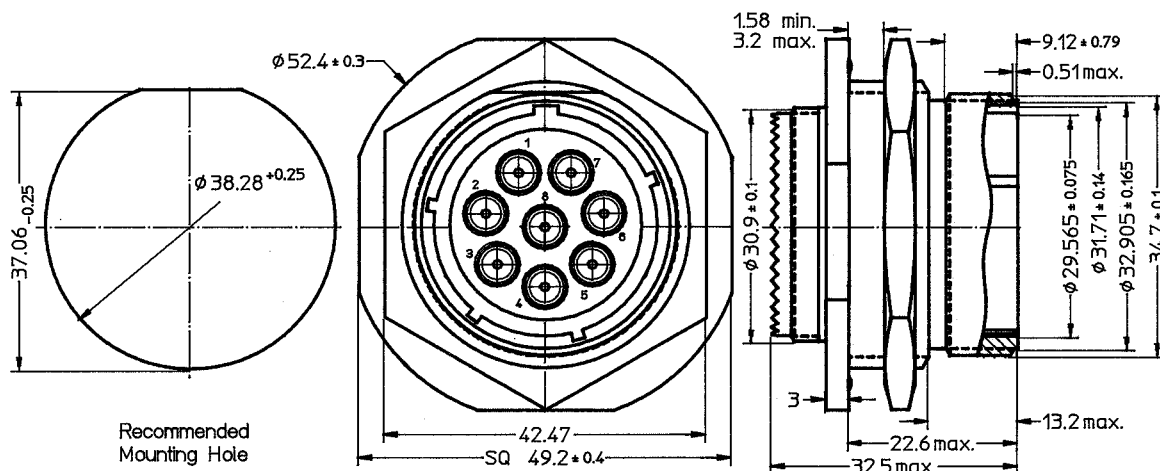


**RF-Multipin
Connector
SQ-8**

SQ-8 MALE Cable Connector P/N SQ-8MLE



SQ8 4-Hole Flange Mount P/N SQ-8FMJ



SQ-8 Bulkhead Feedthrough Jack P/N SQ-8BFJ

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