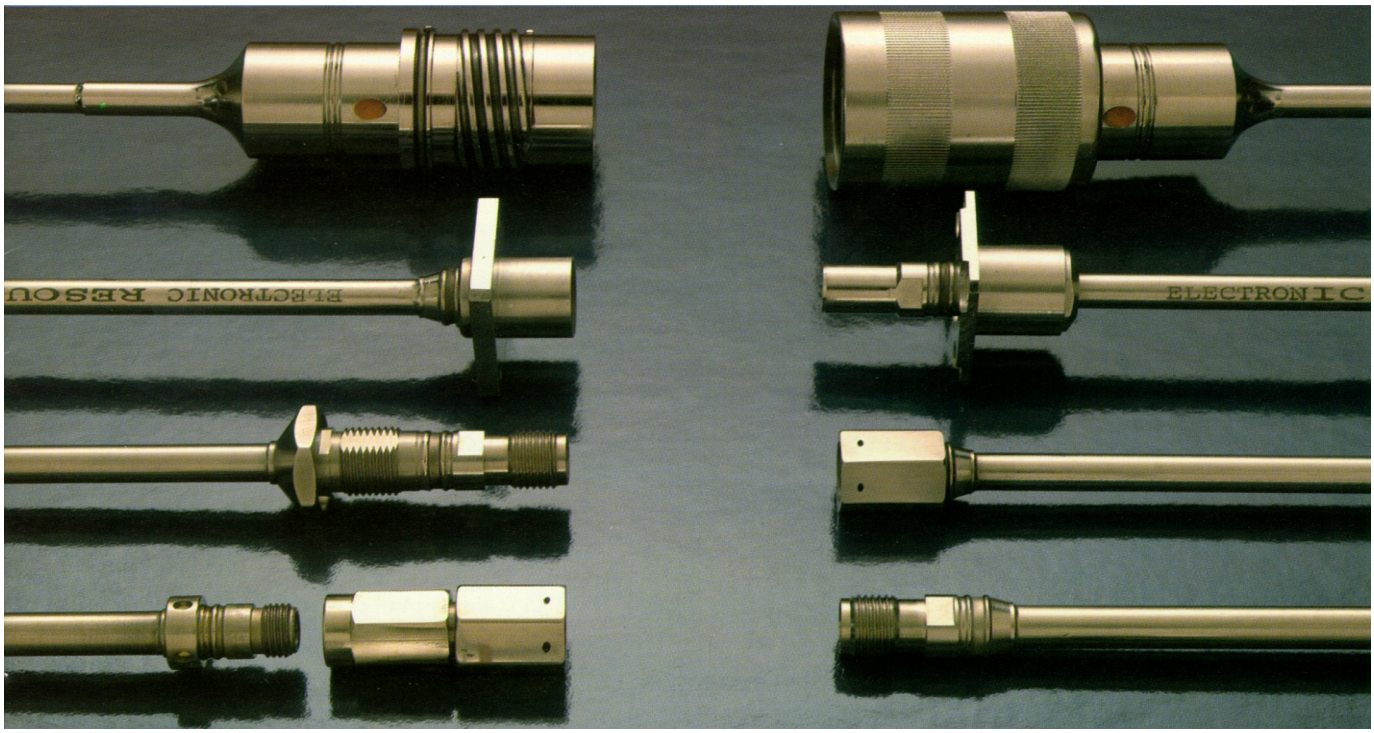
Meggitt Safety Systems

RF SiO_2 cables



Meggitt Safety System cables employ silicon dioxide dielectric, stainless steel copper composite outer jackets and hermetically sealed connectors to provide all welded assemblies that have set the industry standard for high performance and reliability in harsh or adverse environments.

In 1957, Electronic Specialties – subsequently acquired by Whittaker and renamed Whittaker Electronic Resources – successfully introduced a unique cable solution to the microwave industry when they developed and patented SiO_2 cables. With the acquisition of Whittaker by Meggitt in 1999, Meggitt Safety Systems has become a major supplier of coaxial and multi-conductor transmission line assemblies for a wide range of military and commercial applications.

The loss and phase stability allows the use of silicon dioxide coaxial cables in the most critical applications. Some of these applications include precision delay lines, phased arrays, and space borne applications and a variety of interconnection requirements for military aircraft and electronic warfare systems.

This high reliability performance, electrical stability and rugged construction results in an MTBF calculated to be in excess of one million hours. In addition, our semi-rigid cable is typically 30% lighter than the equivalent PTFE cable and yet has a flexibility that permits hand forming in tight installations with a bend radius as small as 1.5 times the cable diameter in some cases.

MEGGITT
smart engineering for
extreme environments

Coaxial cable specifications

Cable meets or exceeds the requirements for semi-flexible cables per MIL-T-81490

Materials

Dielectric	Silicon Dioxide (99.985% pure) SiO_2
Center conductor	OFHC copper
Outer conductor	OFHC copper
Outer jacket	AISI series stainless steel

Construction

The silicon dioxide dielectric is blended with a controlled amount of de-ionized water to form an extrusion mixture. The mixture is extruded around the copper center conductor in random lengths. After air drying, the extrusion is inserted into an oversized stainless steel copper lined jacket and is heated in a vacuum furnace to remove any residual impurities. The dielectric is then compacted by drawing or swaging the outer jacket to a predetermined diameter to provide 50 ohm impedance and the desired electrical density. When sized to required customer length, the cable is terminated by hermetic sealed connectors to provide a completely hermetic sealed cable assembly. Any required identification markings are permanently chem etched on the stainless steel jacket.

Environmental

Altitude	No limit (welded & hermetic design)
Chemical resistance	Hydraulic fluid, epoxy stripper, jet fuel, etc.
Hermeticity	Leakage less than 1 x 10^{-8}cc/sec of helium leak rate (when terminated)
Humidity	0 to 100% relative
Tensile strength	100 to 500 pounds (dependent on diameter)
Random vibration	40 G's rms
Salt fog	MIL-STD-202
Shock	1200 G's pyrotechnical
Thermal	-200C to +950C (Cable only. Assemblies limited by organic materials required by interface.)
Thermal shock	-200C to +950C (Cable only)
Vibration	20G's, 50 to 2000 Hertz
Flexure	Exceeds requirements of MIL-T-81490 for Class 2 coaxial cable when mounted in accordance with accepted airframe practices. Qualified to EW-5230-341-70 for large and small angle deflection.

Mechanical

Outer jacket diameter in (mm)	0.090 (2.29)	0.125 (3.18)	0.142 (3.61)	0.200 (5.08)	0.275 (6.99)	0.296 (7.52)	0.532 (13.51)
Outer copper conductor	0.003 (0.08)	0.004 (0.10)	0.004 (0.10)	0.004 (0.10)	0.004 (0.10)	0.004 (0.10)	0.004 (0.10)
Dielectric diameter	0.061 (1.55)	0.095 (2.40)	0.109 (2.77)	0.170 (4.32)	0.246 (6.25)	0.267 (6.78)	0.499 (12.67)
Inner conductor diameter	0.022 (0.56)	0.034 (0.85)	0.039 (0.99)	0.060 (1.53)	0.087 (2.21)	0.096 (2.44)	0.177 (4.50)
Minimum bend radius	0.30 (7.62)	0.50 (12.70)	0.50 (12.70)	0.60 (15.24)	0.70 (17.80)	0.70 (17.80)	1.50 (38.10)
Weight per foot lbs (gms)	0.017 (7.71)	0.024 (10.83)	0.035 (15.58)	0.048 (21.83)	0.078 (35.38)	0.090 (40.82)	0.210 (95.26)

Electrical

Dielectric constant	1.56
Velocity of propagation	80%
Impedance	50 Ohms 1 Ohm
Capacitance	25 pF/FT
Attenuation	See Chart
Power CW (cable only)	0.090" 0.4 KW 0.125 1.0 KW 0.142" 1.6 KW 0.200 2.6 KW 0.275" 3.4 KW 0.296" 3.4 KW 0.532" 7.0 KW
Peak power	20 KW at 8 GHz
Delay	1.26 Nano Sec./ft.
Insulation resistance	1 x 10^{14} ohms/ft. (Ambient) 1 x 10^{7} ohms/ft. (760C)
VSWR	2-4 GHz 1.20: 1 Maximum 4-8 GHz 1.25: 1 8-12 GHz 1.30: 1 12-16 GHz 1.35: 1 16-18 GHz 1.50: 1
EMI shielding	-120 dB

If you have special requirements for coaxial cable assemblies, our professionally seasoned engineering staff will assist you in finding a solution that reliably meets your specifications.

Insertion loss vs frequency

Freq. GHz	.090"	.125"	.142"	.200"	.275"	.296"	.532"	Band Designation
.01	.017	.010	.010	.006	.004	.004	.002	
.05	.038	.023	.022	.014	.010	.009	.005	
.10	.055	.033	.031	.020	.014	.013	.007	VHF
.20	.078	.048	.045	.029	.020	.019	.011	
.30	.096	.060	.056	.036	.025	.023	.013	
.40	.112	.069	.065	.042	.029	.027	.016	
.50	.126	.078	.073	.047	.033	.031	.018	
.60	.138	.086	.081	.052	.037	.034	.020	UHF
.70	.150	.094	.088	.057	.040	.037	.022	
.80	.161	.101	.094	.062	.043	.040	.024	
.90	.172	.108	.101	.066	.046	.043	.026	
1.00	.182	.114	.107	.070	.049	.045	.027	
1.50	.226	.144	.133	.088	.062	.057	.035	L
2.00	.264	.169	.157	.105	.073	.068	.043	
2.50	.299	.193	.179	.120	.084	.078	.049	
3.00	.331	.214	.198	.134	.098	.087	.056	S
3.50	.361	.234	.217	.147	.103	.096	.062	
4.00	.389	.235	.235	.160	.112	.104	.068	
4.50	.416	.273	.252	.172	.120	.112	.074	
5.00	.442	.291	.269	.184	.128	.120	.080	
5.50	.467	.309	.285	.196	.136	.127	.085	
6.00	.491	.326	.300	.207	.144	.135	.091	C
6.50	.514	.342	.315	.218	.152	.142	.096	
7.00	.537	.359	.330	.229	.159	.149	.102	
7.50	.559	.374	.344	.240	.167	.156	.107	
8.00	.581	.390	.358	.250	.174	.163	.112	
8.50	.602	.405	.372	.260	.181	.170	.117	
9.00	.623	.420	.386	.270	.188	.176		
9.50	.643	.435	.399	.280	.195	.183		
10.00	.663	.450	.412	.290	.202	.189		
10.50	.683	.464	.425	.300	.209	.196		X
11.00	.702	.478	.438	.309	.216	.202		
11.50	.721	.492	.450	.319	.222	.208		
12.00	.740	.506	.463	.328	.229	.214		
12.50	.759	.519	.475	.337	.235	.220		
13.00	.777	.533	.487	.347	.242	.226		
13.50	.795	.546	.499	.356	.248	.232		
14.00	.813	.560	.511	.365	.254	.238		
14.50	.830	.573	.523	.374	.261	.244		
15.00	.848	.586	.535	.383	.267	.250		
15.50	.865	.599	.547	.392	.273	.256		KU
16.00	.882	.612	.558	.400	.279	.262		
16.50	.899	.624	.570	.409	.285			
17.00	.916	.637	.581	.418	.291			
17.50	.933	.649	.592	.427	.297			
18.00	.949	.662	.603	.436	.303			
20.00	1.014	.711	.647	.469				
22.00	1.077	.759	.690	.502				K
24.00	1.138	.806	.732	.535				
26.00	1.198	.851	.773	.567				
28.00	1.256	.897	.813					
30.00	1.313	.941	.853					
32.00	1.370	.985	.892					KP
34.00	1.425	1.028	.931					
36.00	1.479	1.071	.969					
38.00	1.533	1.113	1.007					
40.00	1.586	1.155	1.004					
42.00								
44.00								

To calculate insertion loss for a cable assembly multiply length in feet times loss in dB/ft as indicated above. Add the applicable loss for the connector pair. Round up the total to the next highest tenth dB. For maximum insertion loss of a cable assembly calculate loss at the highest frequency.

EXAMPLE: Cable assembly: .296" dia., 6' length, TNC-M/M, Freq. 8 Ghz
0.163 dB x 6 = .978
0.978 + 0.375 = 1.353 1.4 dB max.

Connector loss

Frequency		dB/Pair
0.5 Ghz	–	0.050
2 GHz	–	0.300
4 GHz	–	0.325
8 GHz	–	0.375
12 GHz	–	0.425
16 GHz	–	0.475
18 GHz	–	0.500

RF SiO_2 cables

Cable assembly configurations and applications

Configurations

Semi-Rigid SiO_2 coaxial cable features rugged all-welded construction with a composite stainless steel outer jacket and fusion bonded copper outer conductor, high purity silicon dioxide insulation and oxygen free high conductivity copper center conductor. Combined with hermetically sealed, welded connectors the resulting cable assembly provides unparalleled phase and attenuation stability over a wide range of temperatures with high accuracy and reliability in critical operational situations.

Standard SiO_2 cable assemblies are available with all standard military connector configurations and cable diameters as listed below:

- .047"*
- .079"
- .090"
- .125"
- .142"
- .200"
- .275"
- .296"
- .532"

* (Please request our flyer for more information on this product)

Consult the factory for special cable diameters. We offer a variety of standard connector interfaces. Connectors are fabricated per MIL-STD-345, MIL-T-81490, MIL-C-87104 and other standards.

Interfaces include SMP, 2.4 mm, 3.5 mm, SMA, TNC, N, HN, SSMA, SC, to name the most commonly used. Custom interface connectors can be provided to meet unique customer specifications. Blind mate and replaceable connectors are also available.

Applications

Meggitt Safety System cable assemblies are qualified to MIL-T-81490, MIL-C-39012 and other military and commercial specifications. Our cable assemblies have been installed on the majority of military airborne platforms since 1968.

A partial list of program participation includes:

- AH-64
- AV-8B
- A-6
- B-1B
- B-2
- C-17
- C130
- F-14
- F-15E
- F-16
- GPS
- Imarsat
- MX Missile
- SR-71
- Space Shuttle
- Tomahawk
- U-2
- F-5
- J-Stars
- Trident
- AH-1
- UH-60

Common applications include:

- Electronic Warfare Systems
- Radar Systems
- Satellite Systems
- Cryogenic Feedthroughs
- High Power Interconnects
- Phase and Amplitude Stable Interconnections
- High Temperature Umbilicals
- Delay Lines
- Antenna Elements and Interconnect Cables
- Calibrated Test Cables
- Preformed Cable Assemblies with complex bends and configurations requiring tight bend radius

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