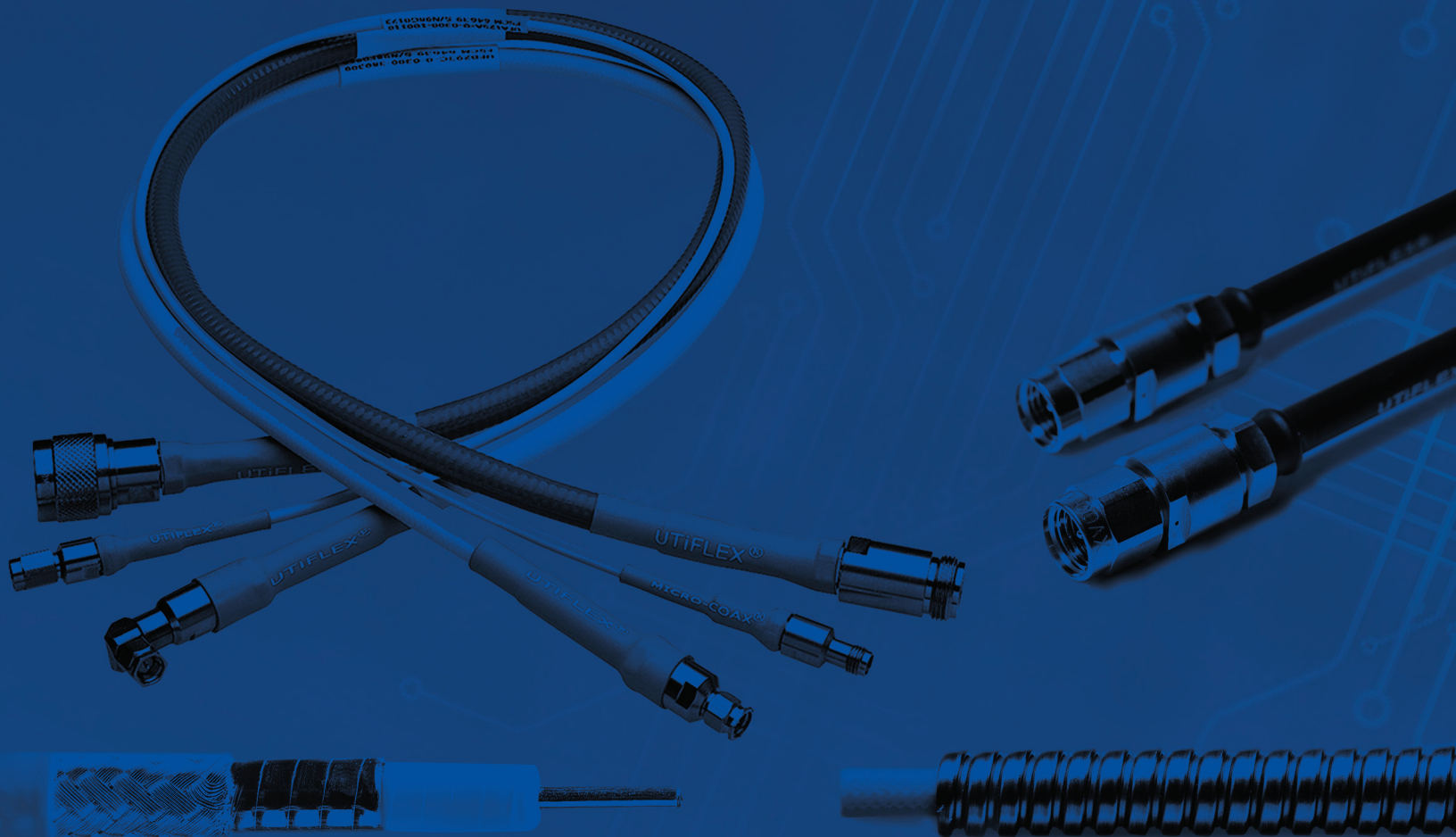
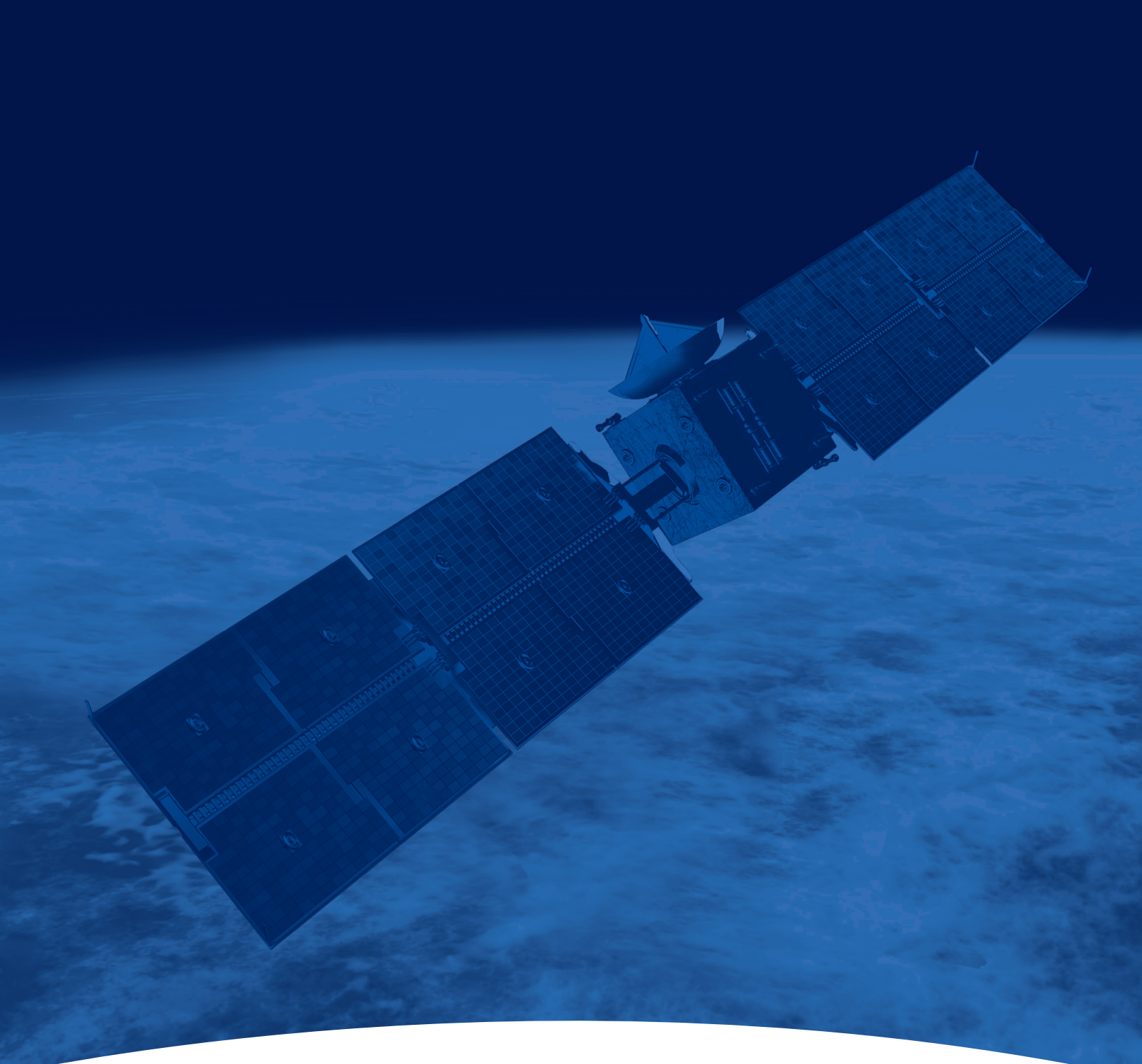




# UTIFLEX<sup>®</sup>

Flexible Microwave  
Cable Assemblies





## UTiFLEX® in Action

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Thermal vacuum testing is a risk-mitigation strategy utilized in some hi-rel applications, notably space equipment such as satellites. Our TVAC Test Assemblies are thermal vacuum compatible for use in TVAC chambers. These assemblies utilize high-performance, Ultra-Low-Loss UTiFLEX Cable, and are produced to exacting space-grade standards utilizing low-outgassing materials and vented connectors.

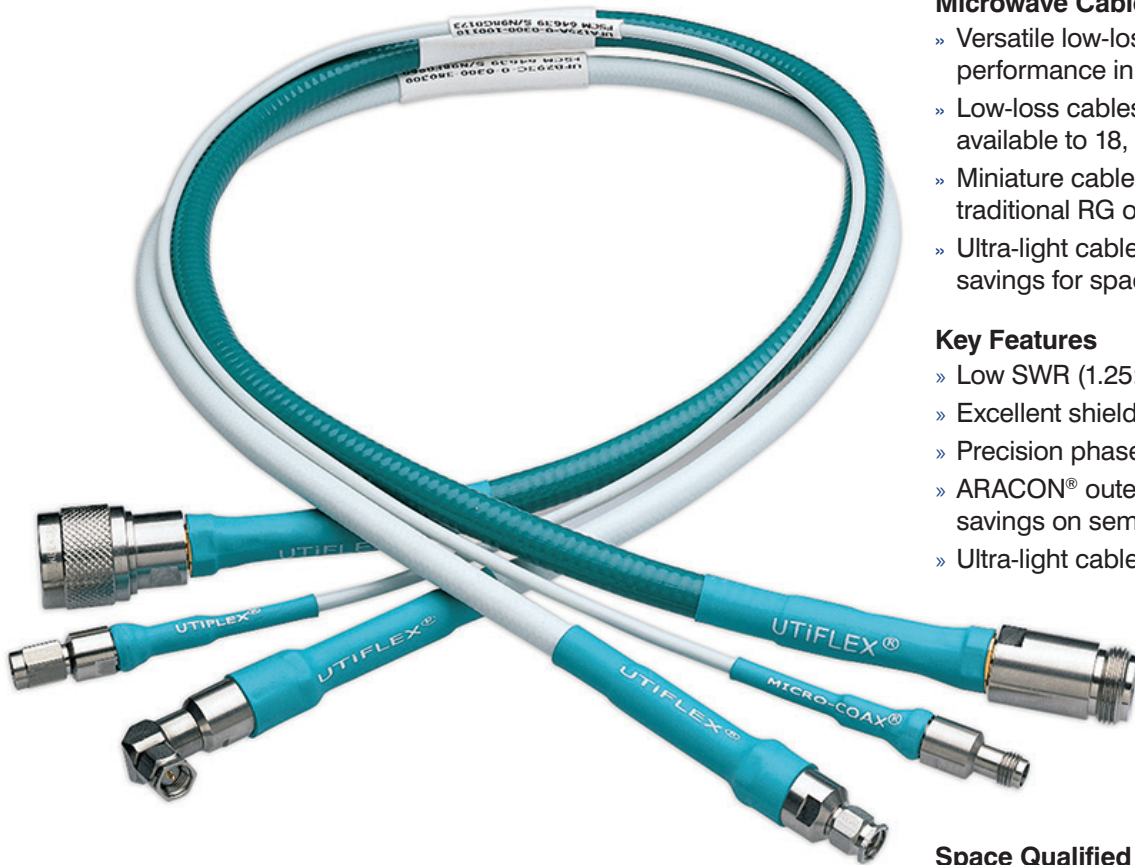


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# Introduction



## Bends to Your Application. Stands Up to Everything Else.

UTiFLEX® microwave cable assemblies are constructed using a low or ultra-low-density PTFE dielectric coupled with fully shielded outer conductors and a unique connector attachment that withstands mechanical and thermal stresses far better than standard connectors. The result: Excellent loss characteristics, outstanding phase stability, and superb flexibility compared to standard flexible cables — all without sacrificing mechanical integrity.

Manufactured in our Pottstown, PA, location, under the expert guidance of our professional engineering team, every UTiFLEX cable assembly is tested for insertion loss and SWR, and shipped with an individual test certificate.

### Microwave Cable for Almost Any Application

- » Versatile low-loss cables offer outstanding performance in almost any environment.
- » Low-loss cables have the lowest insertion loss available to 18, 26.5, 40, 50, 65 GHz.
- » Miniature cables are a superior alternative to traditional RG or semi-rigid cables.
- » Ultra-light cables provide up to 25% weight savings for spaceflight applications.

### Key Features

- » Low SWR (1.25:1 to 40 GHz typical)
- » Excellent shielding effectiveness
- » Precision phase matching
- » ARACON® outer shield for superior weight savings on semi-rigid cables
- » Ultra-light cables

### Space Qualified

- » J-STD-001 Space Addendum certified assemblers and inspectors
- » Class 10,000 clean-room assembly processes
- » Low-outgassing materials (1% TML, 0.1% CVCM per ASTM E-595)
- » Radiation-resistant up to 100 Mrads
- » Real-time X-ray capability

### Available Variants

- » Miniature
- » Low-Loss
- » Ultra-Low-Loss
- » MKR Ruggedized
- » External Armor
- » Ultra-Light
- » TVAC



# Typical Cable Construction



## Center Conductor

**Solid or stranded silver-plated copper wire per ASTM B-298 or silver-plated copper clad steel wire per ASTM B-501.** In comparison to equal-sized center conductors, the solid center conductor has less RF resistance and lower attenuation, and is more amplitude-stable with flexure. The stranded center conductor is more flexible and more phase-stable with flexure.

## Dielectric

**Low-density PTFE per MIL-DTL-17, with a dielectric constant ranging from 1.4 to 1.7 depending on the cable type.** Most transmission losses are caused either directly or indirectly by the dielectric. In addition, the dielectric determines the velocity of propagation, temperature range, power rating, and phase and amplitude stability, and contributes to cable flexibility. The UTIFLEX PTFE dielectric is ideal for these critical parameters due to its low density and low thermal coefficient of expansion.

## Inner Shield

**Silver-plated copper tape per ASTM B-298, helically wrapped with 40% minimum overlap between layers.** This shield allows for outstanding flexibility while providing 100% coverage. By closely monitoring the precision wrapping process and carefully matching the elasticity of the dielectric to the properties of the silver-plated copper tape, uniform impedance and ideal contact between individual layers of the shield are maintained.

## Outer Shield

**Silver-plated copper wire per ASTM B-298, tightly braided over the inner shield.** The braids are primarily a strength member that also add additional RF shielding. For applications such as spaceflight, where weight is critical, CarlisleIT offers ARACON® as the braiding material.

## Jacket

**Fluorinated Ethylene Propylene (FEP), colored light aqua blue.** The FEP is excellent because of its high-temperature resistance and chemical inertness. Other jacket materials are available such as DuPont™ Tefzel® and carbon-loaded Tefzel® for spaceflight applications.

# Cable Selection Guide

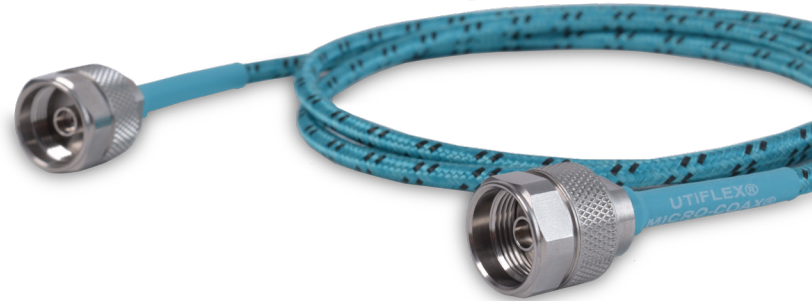
In order to simplify the cable selection process, individual cables have been grouped into product families. Most flexible cable users want minimal insertion loss consistent with the smallest size and weight, without sacrificing flexibility. Other parameters will influence price and performance. Use the tables and information below to select the cable that best suits your needs.

- » Cables with stranded center conductors tend to be more phase-stable with flexure.
- » Cables with solid center conductors tend to be more amplitude-stable with flexure.
- » For applications less than 26.5 GHz, start with the low-loss UFA210A cable.
- » If the cable will be used in a test lab environment, consider MKR300C for applications less than 26.5 GHz.
- » If lower insertion loss is required, ultra-low-loss UFB205A or UFB197C should be chosen. If the application is less than 18 GHz, choose the ultra-low-loss UFB311A or UFB293C.
- » If size and flexibility are critical, consider the low-loss UFA147B or ultra-low-loss UFB142C cables.

MINIATURE LOW-LOSS		UGF070D	UFF092D	UFF092F
Impedance		50 Ω	50 Ω	50 Ω
Max. Frequency		18 GHz	18 GHz	18 GHz
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.29 (0.95)	0.20 (0.66)	0.22 (0.72)
	@ 10 GHz	1.01 (3.31)	0.66 (2.17)	0.71 (2.33)
	@ 18 GHz	1.41 (4.63)	0.90 (2.95)	0.98 (3.22)
Power Handling <i>Watts (CW)</i>	@ 10 GHz	36	63	60
Nom. Outer Diameter <i>in (mm)</i>		0.070 (1.78)	0.092 (2.34)	0.092 (2.34)
Max. Weight <i>g/ft (g/m)</i>		3 (9.8)	5.0 (16.4)	5.0 (16.4)
Center Conductor Type		Solid	Solid	Stranded
Static Bend Radius <i>in (mm)</i>		0.10 (2.54)	0.13 (3.30)	0.25 (6.35)
Detailed Information		Pages 10 - 11		

LOW-LOSS		UFC092D	UFA125A	UFA147A	UFA147B	UFA210A	UFA210B
Impedance		50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω
Max. Frequency		65 GHz	50 GHz	40 GHz	40 GHz	26.5 GHz	26.5 GHz
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.20 (0.66)	0.14 (0.46)	0.11 (0.36)	0.16 (0.52)	0.08 (0.26)	0.09 (0.30)
	@ 10 GHz	0.67 (2.20)	0.48 (1.57)	0.39 (1.28)	0.52 (1.71)	0.27 (0.89)	0.30 (0.98)
	@ 18 GHz	0.92 (3.02)	0.66 (2.17)	0.54 (1.77)	0.72 (2.36)	0.38 (1.25)	0.42 (1.38)
	@ 26.5 GHz	1.13 (3.71)	0.82 (2.69)	0.67 (2.20)	0.89 (2.92)	0.48 (1.57)	0.53 (1.74)
	@ 40 GHz	1.42 (4.66)	1.04 (3.41)	0.85 (2.79)	1.12 (3.67)	-	-
	@ 50 GHz	1.61 (5.28)	1.19 (3.90)	-	-	-	-
	@ 65 GHz	1.86 (6.10)	-	-	-	-	-
Power Handling <i>Watts (CW)</i>	@ 10 GHz	63	112	159	149	303	283
Nom. Outer Diameter <i>in (mm)</i>		0.092 (2.34)	0.125 (3.18 mm)	0.147 (3.73)	0.147 (3.73)	0.210 (5.33)	0.210 (5.33)
Max. Weight <i>g/ft (g/m)</i>		5.0 (16.4)	8.8 (28.9)	12.1 (39.7)	12.1 (39.7)	22 (72.2)	22 (72.2)
Center Conductor Type		Solid	Solid	Solid	Stranded	Solid	Stranded
Static Bend Radius <i>in (mm)</i>		0.13 (3.30)	0.20" (5.08)	0.25 (6.35)	0.25 (6.35)	0.38 (9.65)	0.38 (9.65)
Detailed Information		page 12-13					

MKR TEST CABLE		MKR300C
Impedance		50 Ω
Max. Frequency		26.5 GHz
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.08 (0.26)
	@ 10 GHz	0.27 (0.89)
	@ 18 GHz	0.36 (1.18)
	@ 26.5 GHz	0.44 (1.44)
	@ 40 GHz	-
Power Handling <i>Watts (CW)</i>	@ 10 GHz	175
Nom. Outer Diameter <i>in (mm)</i>		0.300 (7.62)
Max. Weight <i>g/ft (g/m)</i>		51 (167.3)
Center Conductor		Stranded
Static Bend Radius <i>in (mm)</i>		1.50 (38.10)
Detailed Information		page 18-19



ULTRA-LOW-LOSS	UFB088D	UFB142C	UFB142A	UFC185A	UFB197C	UFB205A	UFB293C	UFB311A	
Impedance	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	
Max. Frequency	18 GHz	40 GHz	40 GHz	32 GHz	26.5 GHz	26.5 GHz	18 GHz	18 GHz	
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.20 (0.66)	0.11 (0.36)	0.10 (0.33)	0.08 (0.26)	0.09 (0.28)	0.07 (0.23)	0.06 (0.20)	0.05 (0.16)
	@ 10 GHz	0.66 (2.17)	0.36 (1.18)	0.33 (1.08)	0.27 (0.89)	0.28 (0.93)	0.23 (0.75)	0.18 (0.59)	0.15 (0.49)
	@ 18 GHz	0.89 (2.92)	0.49 (1.61)	0.44 (1.44)	0.36 (1.18)	0.38 (1.26)	0.32 (1.05)	0.25 (0.82)	0.21 (0.69)
	@ 26.5 GHz	-	0.59 (1.94)	0.54 (1.77)	0.44 (1.44)	0.47 (1.55)	0.39 (1.28)	-	-
	@ 32 GHz	-	0.66 (2.16)	0.60 (1.97)	0.49 (1.61)	-	-	-	-
	@ 40 GHz	-	0.74 (2.43)	0.68 (2.23)	-	-	-	-	-
Power Handling <i>Watts (CW)</i>	@ 10 GHz	66	166	175	267	296	326	570	648
Nom. Outer Diameter <i>in (mm)</i>	0.088 (2.235)	0.142 (3.61)	0.142 (3.61)	0.185 (4.699)	0.197 (5.00)	0.205 (5.21)	0.293 (7.44)	0.311 (7.90)	
Max. Weight <i>g/ft (g/m)</i>	4.2 (13.78)	9.9 (32.5)	10.1 (33.1)	17.6 (57.74)	19.8 (65.0)	20 (65.6)	42 (137.8)	44.5 (146.0)	
Center Conductor	Solid	Stranded	Solid	Solid	Stranded	Solid	Stranded	Solid	
Static Bend Radius <i>in (mm)</i>	0.25 (6.35)	0.38 (9.65)	0.38 (9.65)	0.375 (9.525)	0.50 (12.70)	0.50 (12.70)	0.75 (19.05)	1.25 (31.75)	
Detailed Information	page 14-15								

ULTRA-LIGHT*	MCJ088D	MCJ142A	MCJ185A	MCJ205A	MCJ311A	
Impedance	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	
Max. Frequency	18 GHz	40 GHz	32 GHz	26.5 GHz	18 GHz	
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.20 (0.66)	0.10 (0.33)	0.08 (0.26)	0.07 (0.23)	0.05 (0.16)
	@ 10 GHz	0.66 (2.17)	0.33 (1.08)	0.27 (0.89)	0.23 (0.75)	0.15 (0.49)
	@ 18 GHz	0.89 (2.92)	0.44 (1.44)	0.36 (1.18)	0.32 (1.05)	0.21 (0.66)
	@ 26.5 GHz	-	0.54 (1.77)	0.44 (1.44)	0.39 (1.28)	-
	@ 32 GHz	-	0.60 (1.97)	0.49 (1.61)	-	-
	@ 40 GHz	-	0.68 (2.23)	-	-	-
Power Handling <i>Watts (CW)</i>	@ 10 GHz	64	173	267	326	648
Nom. Outer Diameter <i>in (mm)</i>	0.088 (2.24)	0.142 (3.61)	0.185 (4.70)	0.205 (5.21)	0.310(7.87)	
Max. Weight <i>g/ft (g/m)</i>	3.6 (11.8)	8.8 (28.9)	12.4 (40.7)	16.0 (52.5)	35 (114.8)	
Center Conductor	Solid	Solid	Solid	Solid	Solid	
Static Bend Radius <i>in (mm)</i>	0.25 (6.35)	0.38 (9.65)	0.38 (9.65)	0.50 (12.70)	1.25 (31.75)	
Detailed Information	page 16-17					

\*Ultra-Light cables are also available with an aluminum center conductor, which offers an additional weight savings of up to 10% depending on cable type.



# Connector Selection Guide

We specialize in custom, high-performance connectors that cannot be obtained from conventional sources. Please contact us to discuss your unique and demanding connector requirements.

Design and materials of all connectors and connector parts conform to MIL-PRF-39012. The UTiFLEX connectors have been optimized to achieve the lowest possible SWR across the bandwidth. In addition, the unique connector attachment has been designed to provide high reliability and withstand heavy stress. The connector body, dielectric, and center contact are completely captivated, guaranteeing the cable assembly will keep its excellent properties even after hard use.

Description	Part Number	Cable Group*	Rated Frequency	Maximum SWR (per connector)
2.4 mm Plug	100	04, 05	40 / 50 GHz	1.16:1 – 18 GHz 1.22:1 – 40/50 GHz
2.4 mm Jack	110	04, 05	40 / 50 GHz	1.16:1 – 18 GHz 1.22:1 – 40/50 GHz
SMK Plug	200 (20V Space)	05, 09	32/40 GHz	1.16:1 – 18 GHz 1.20:1 – 40 GHz
SMK Right-Angle Plug	280 (2QV Space)	05, 09	32/40 GHz	1.16:1 – 18 GHz 1.20:1 – 40 GHz
SMK Jack	210	05	40 GHz	1.16:1 – 18 GHz 1.20:1 – 40 GHz
Precision 3.5 mm Plug	000	05, 07	26.5 GHz	1.16:1 – 18 GHz 1.20:1 – 26.5 GHz
Precision 3.5 mm Jack	010	05, 07	26.5 GHz	1.16:1 – 18 GHz
SMA Plug	300 (30V Space)	01, 02, 05, 06, 07, 08, 09	18 GHz	1.16:1 – 18 GHz
SMA Jack	310 (31V Space)	01, 02, 05, 06, 07, 08	18 GHz	1.16:1 – 18 GHz
SMA Right Angle Plug	380 (3QV Space)	02, 05, 06, 07, 08	18 GHz	1.20:1 – 18 GHz
SMA Bulkhead Jack	320 (32V Space)	02, 05, 06, 07	18 GHz	1.16:1 – 18 GHz
Precision 7 mm	460	05, 06, 07, 08	18 GHz	1.16:1 – 18 GHz
Precision N Plug 50U	50U	05, 06, 07, 08	18 GHz	1.16:1 – 18 GHz
Precision N Jack	510	05, 06, 07, 08	18 GHz	1.16:1 – 18 GHz
Precision TNC Plug	60u (A0V Space)	05, 06, 07, 08	18 GHz	1.20:1 – 18 GHz
Precision TNC Jack	610 (A1R Space)	05, 06, 07, 08	18 GHz	1.20:1 – 18 GHz
N Plug 70U	70U	07, 08	12.4 GHz	1.16:1 – 12.4 GHz
N Jack	710	07, 08	12.4 GHz	1.16:1 – 12.4 GHz
BNC Plug	804	07	4 GHz	1.20:1 – 4 GHz
SMP Jack	F10	01, 02, 04	18 GHz	1.16:1 – 18 GHz
SMP Right Angle Jack	F80	01, 02, 04	18 GHz	1.20:1 – 18 GHz

*Cable Groups	Number
UGF070D	01
UFF092D, UFF092F, MCJ088D, UFB088D, UFC092D	02
UFA125A	04
UFA147A, UFB142A, MCJ142A	05
UFA147B, UFB142C	06
UFA210A, UFA210B, UFB205A, UFB197C, MCJ205A	07
UFB311A, UFB293C, MCJ311A	08
MCJ185A, UFC185A	09

Most connector types are also available in a right-angle elbow configuration. Additional connector types (not listed) are available upon request. Please contact us for outline drawings or any special requirements.

# Armor Selection Guide

Most UTiFLEX Cable Assemblies are available with armor. The armor extends the assembly life and adds additional physical protection. Two standard armors are detailed below. Additional armor types are available. Please contact us with any special requirements.

## -1 POLYURETHANE JACKET OVERBRAID/STAINLESS STEEL SPIRAL

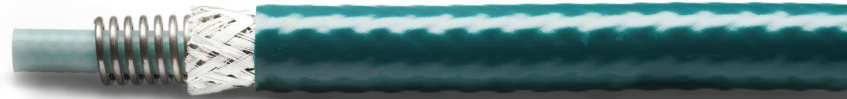
Cable Groups (see page 8)	04, 05, 06	07	08
Diameter in (mm)	0.35 (8.89)	0.41 (10.41)	0.53 (13.46)
Min. Bend Radius in (mm)	0.5 (12.70)	1.0 (25.40)	1.5 (38.10)
Max. Temperature	80 °C	80 °C	80 °C
Crush Resistance lbs/in (N/mm)	450 (79.4)	450 (79.4)	450 (79.4)

### Features

- » Very flexible
- » Waterproof and UV-resistant
- » Good abrasion and cut-through resistance
- » Torque resistant and adds pull strength

### Typical Application

- » Test lab or antenna range



## -2 STAINLESS STEEL INTERLOCKED HOSE

Cable Groups (see page 8)	04, 05, 06	07	08
Diameter in (mm)	0.28 (7.11)	0.38 (9.65)	0.49 (12.45)
Min. Bend Radius in (mm)	1.5 (38.10)	2.0 (50.80)	2.0 (50.80)
Max. Temperature	165 °C	165 °C	165 °C
Crush Resistance lbs/in (N/mm)	420 (74.1)	420 (74.1)	420 (74.1)

### Features

- » Suitable for higher temperature environments
- » Prevents over-bending
- » Excellent abrasion and cut-through resistance
- » Cost-effective

### Typical Application

- » Military hardware



# UTiFLEX® Miniature Low-Loss Cable Assemblies

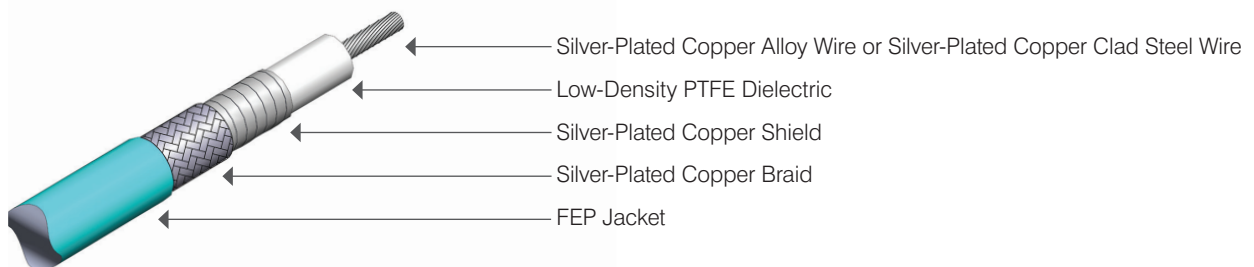
These general purpose microwave miniature cables have been designed to offer superior electrical performance in the smallest possible package for fixed installations. They are a cost-effective alternative when an RG cable cannot perform to your system needs, or when a semi-rigid cable is too cumbersome. The UTiFLEX miniature cables are available with a large selection of connectors, and can be easily customized to meet your exact requirements.

Mechanical Characteristics		UGF070D	UFF092D	UFF092F
Outer Diameter <i>in (mm)</i>		0.070 (1.78)	0.092 (2.34)	0.092 (2.34)
Center Conductor Type		Solid	Solid	Stranded
Max. Weight <i>g/ft (g/m)</i>		3 (9.8)	5 (16.4)	5 (16.4)
Min. Bend Radius <i>in (mm)</i>		0.10 (2.54)	0.13 (3.30)	0.25 (6.35)
Cable Flex Life		100,000 *	25,000 *	170,000 *
Electrical Characteristics		UGF070D	UFF092D	UFF092F
Impedance		50 Ω	50 Ω	50 Ω
Frequency Range		DC to 18 GHz	DC to 18 GHz	DC to 18 GHz
Velocity of Propagation		87%	77%	77%
Capacitance <i>pF/ft (pF/m)</i>		26.2 (86)	26.2 (86)	26.2 (86)
Shielding Effectiveness		@ 1 GHz > 100 dB	@ 1 GHz > 100 dB	@ 1 GHz > 100 dB
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.29 (0.92)	0.20 (0.66)	0.22 (0.72)
	@ 10 GHz	1.01 (3.31)	0.67 (2.20)	0.71 (2.33)
	@ 18 GHz	1.41 (4.63)	0.92 (3.02)	0.98 (3.22)
Phase Stability vs. Flexure		See figure on next page		
Phase Stability vs. Temp.	@ 10 GHz	2° †	2° ‡	2° ‡
	@ 18 GHz	3° †	3° ‡	3° ‡
Power Handling		See figure on next page		
VSWR		See figure on next page		
Environmental Characteristics		UGF070D	UFF092D	UFF092F
Temperature Range		-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C
See Page 22 for applicable environmental test				

\* Cable shall withstand specified number of unrestrained flexures (snake test)

† Cable wrapped once around a 1.5 in diameter mandrel

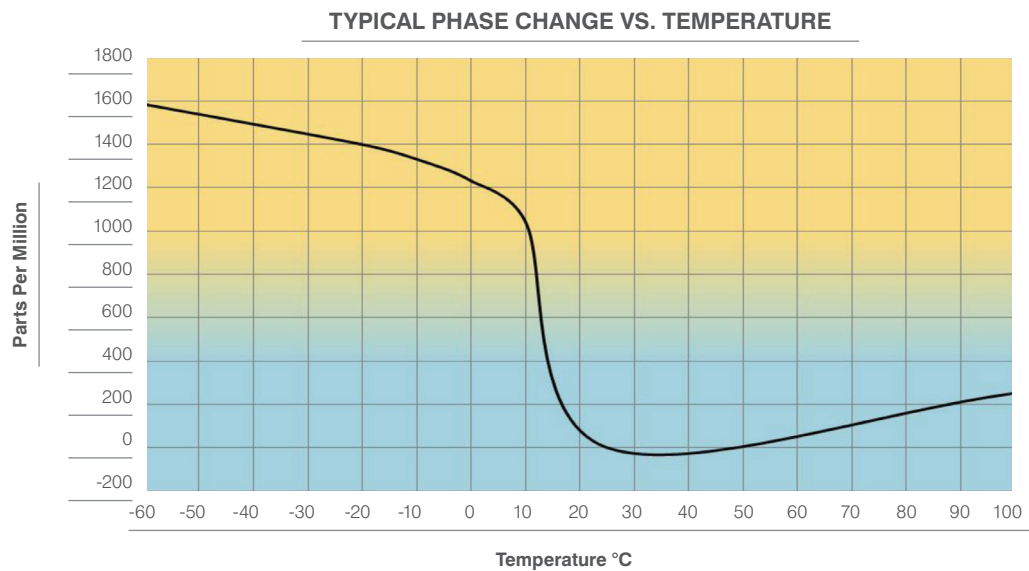
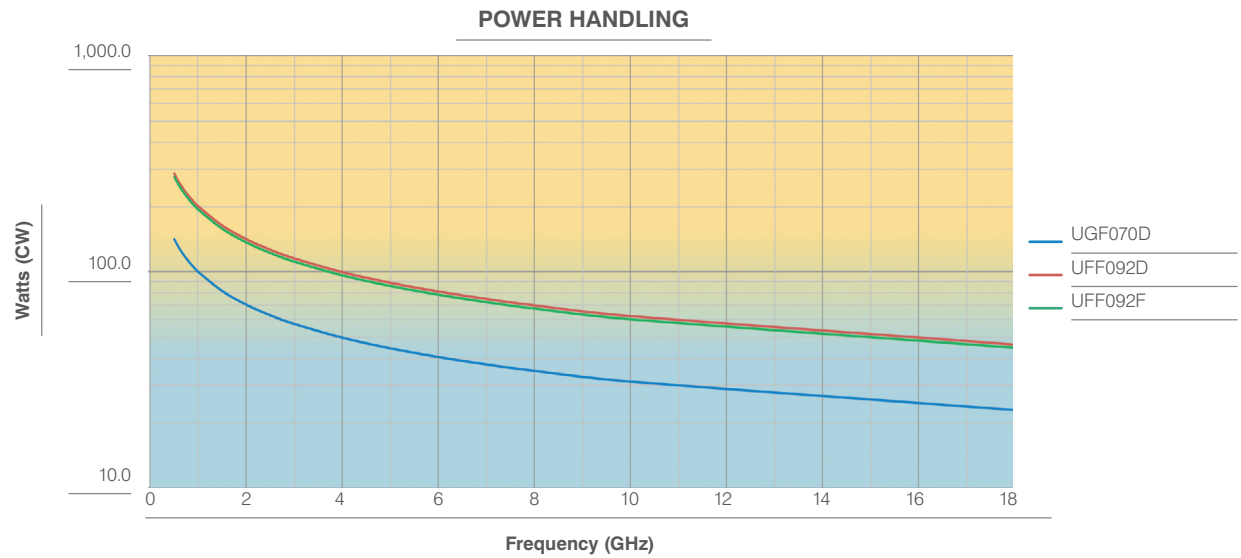
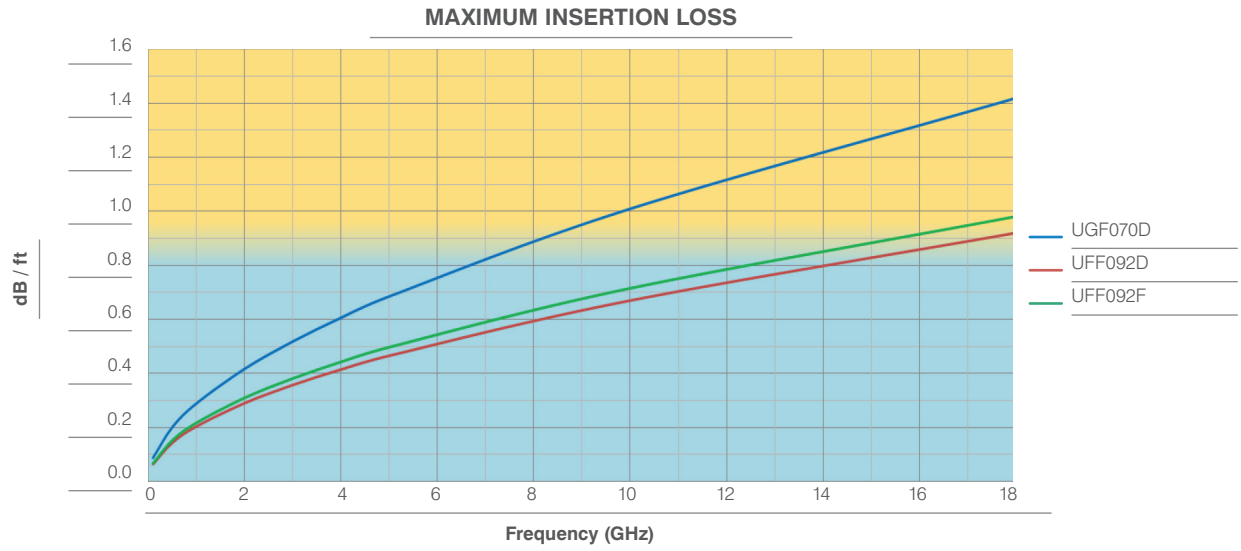
‡ Cable wrapped once around a 3 in mandrel



We are constantly improving products. Please contact us for the latest detailed specification sheet for any individual cable.



# Performance



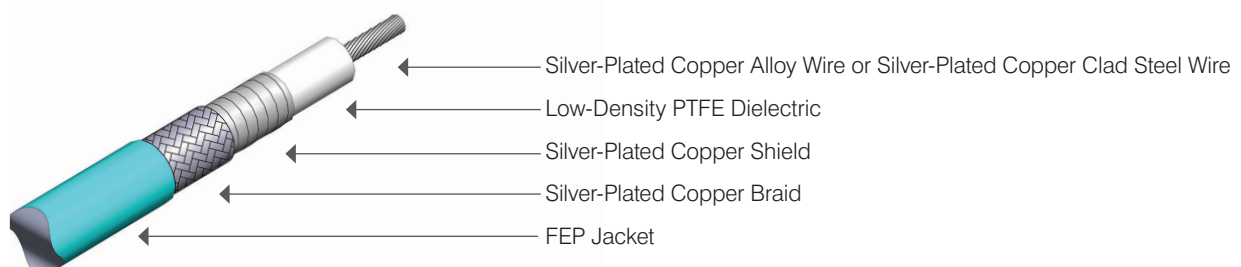
# UTiFLEX® Low-Loss Cable Assemblies

UTiFLEX Low-Loss Cable Assemblies provide you with the complete high-performance microwave cable. They have outstanding mechanical integrity without sacrificing insertion loss, phase stability, or SWR. UTiFLEX Low-Loss Cable Assemblies are extremely versatile and moderately priced, and fit a large variety of applications.

Mechanical Characteristics		UFC092D	UFA125A	UFA147A	UFA147B	UFA210A	UFA210B
Outer Diameter <i>in (mm)</i>		0.092 (2.34)	0.125 (3.18)	0.147 (3.73)	0.147 (3.73)	0.210 (5.33)	0.210 (5.33)
Center Conductor Type		Solid	Solid	Solid	Stranded	Solid	Stranded
Max. Weight <i>g/ft (g/m)</i>		5 (16.4)	8.8 (28.9)	12.1 (39.7)	12.1 (39.7)	22 (72.2)	22 (72.2)
Min. Bend Radius <i>in (mm)</i>		0.13 (3.30)	0.20 (5.08)	0.25 (6.35)	0.25 (6.35)	0.38 (9.65)	0.38 (9.65)
Cable Flex Life		-	3,000 *	10,000 *	100,000 *	100,000 *	250,000 *
Electrical Characteristics		UFC092D	UFA125A	UFA147A	UFA147B	UFA210A	UFA210B
Impedance		50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω
Frequency Range		DC to 65 GHz	DC to 50 GHz	DC to 40 GHz	DC to 40 GHz	DC to 26.5 GHz	DC to 26.5 GHz
Velocity of Propagation		78%	77%	77%	77%	77%	77%
Capacitance <i>pF/ft (pF/m)</i>		26.2 (87.9)	26.2 (86)	26.2 (86)	26.2 (86)	26.2 (86)	26.2 (86)
Shielding Effectiveness		@ 1 GHz > 100 dB	@ 1 GHz > 100 dB	@ 1 GHz > 100 dB	@ 1 GHz > 100 dB	@ 1 GHz > 100 dB	@ 1 GHz > 100 dB
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.20 (0.66)	0.14 (0.46)	0.11 (0.36)	0.16 (0.52)	0.08 (0.25)	0.09 (0.30)
	@ 10 GHz	0.67 (2.20)	0.48 (1.57)	0.39 (1.28)	0.52 (1.71)	0.27 (0.89)	0.30 (0.98)
	@ 18 GHz	0.92 (3.02)	0.66 (2.17)	0.54 (1.77)	0.72 (2.36)	0.38 (1.25)	0.42 (1.38)
	@ 26.5 GHz	1.13 (3.71)	0.82 (2.64)	0.67 (2.20)	0.89 (2.92)	0.48 (1.57)	0.53 (1.74)
	@ 40 GHz	1.42 (4.66)	1.04 (3.41)	0.85 (2.79)	1.12 (3.67)	1.12 (3.67)	-
	@ 50 GHz	1.61 (5.28)	1.19 (3.90)	-	-	-	-
	@ 65 GHz	1.86 (6.10)	-	-	-	-	-
Phase Stability vs. Flexure	@ 10 GHz	<0.5°	3° †	2° †	1° †	2° †	2° †
	@ 18 GHz	<0.5°	5° †	4° †	2° †	4° †	3° †
Phase Stability vs. Temp.		See figure on next page					
Power Handling		See figure on next page					
VSWR		See connector selection guide					
Environmental Characteristics		UFC092D	UFA125A	UFA147A	UFA147B	UFA210A	UFA210B
Temperature Range		-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C
See Page 22 for applicable environmental test							

\* Cable shall withstand specified number of unrestrained flexures (snake test)

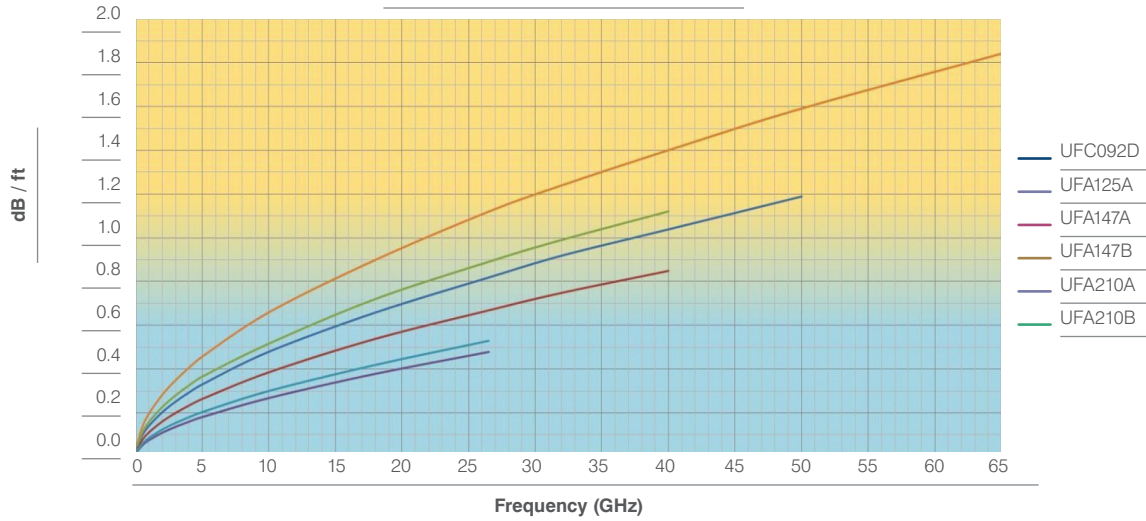
† Cable wrapped once around a 3 in diameter mandrel



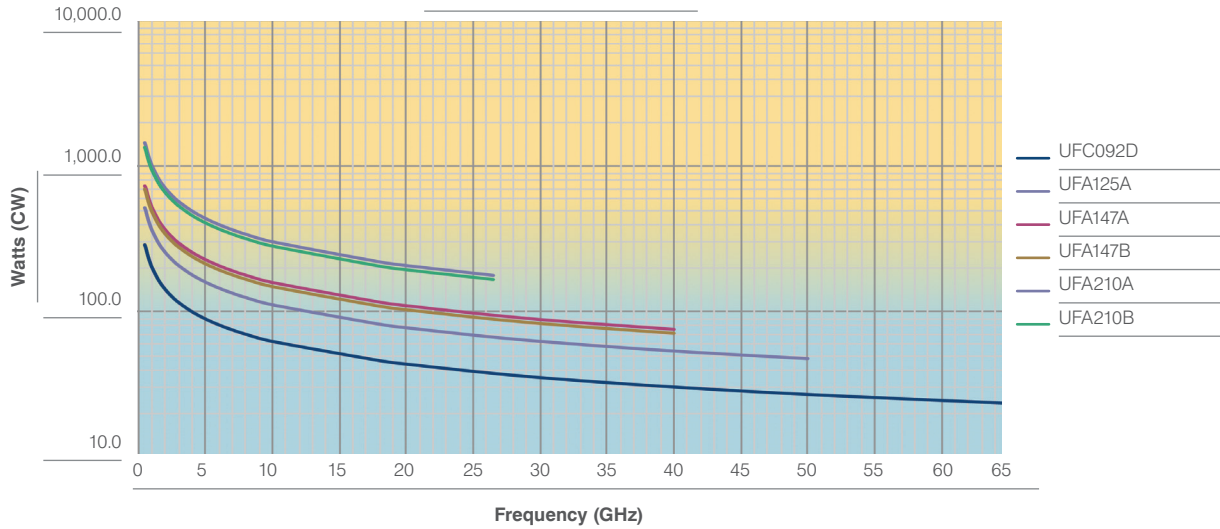
We are constantly improving products. Please contact us for the latest detailed specification sheet for any individual cable.

# Performance

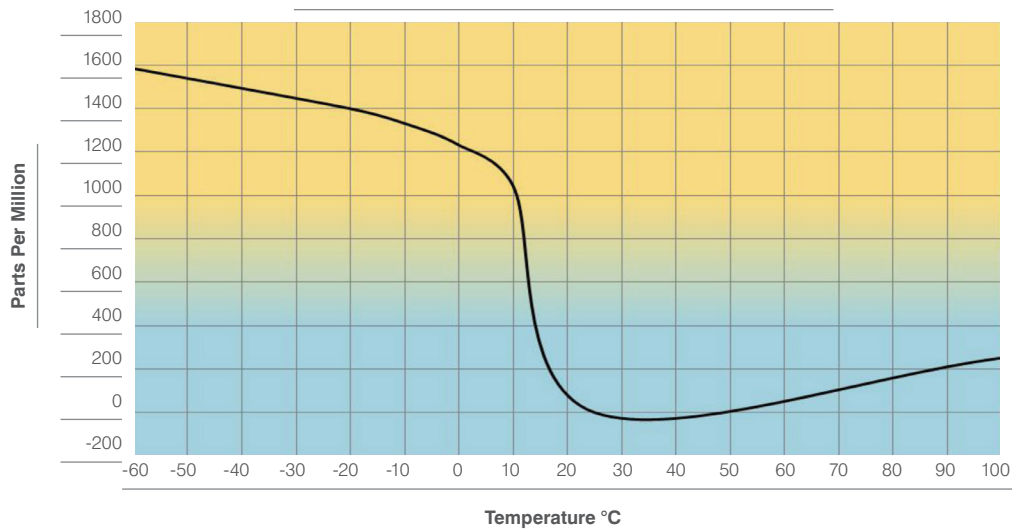
### MAXIMUM INSERTION LOSS



### POWER HANDLING



### TYPICAL PHASE CHANGE VS. TEMPERATURE





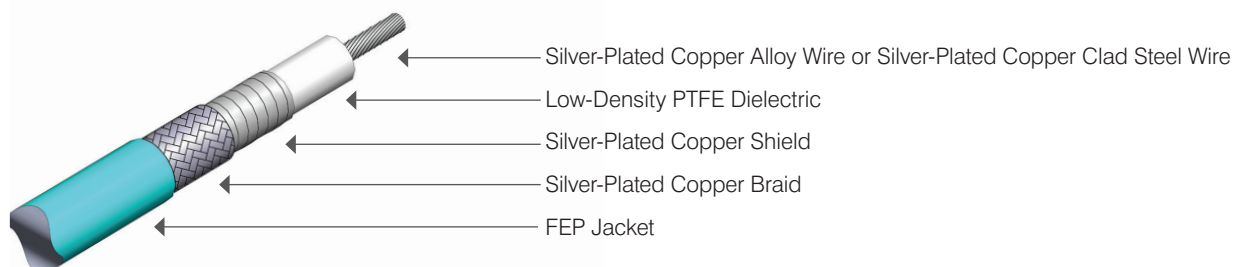
# UTiFLEX® Ultra-Low-Loss Cable Assemblies

UTiFLEX Ultra-Low-Loss Cable Assemblies are optimized to provide the lowest insertion loss available in a flexible cable construction up to 18, 26.5, and 40 GHz. The cables utilize an ultra-low-density PTFE dielectric that lowers weight and insertion loss, improves electrical stability, and provides greater resilience and flexibility when compared to standard microwave cables.

Mechanical Characteristics	UFB088D	UFB142C	UFB142A	UFC185A	UFB197C	UFB205A	UFB293C	UFB311A
Outer Diameter <i>in (mm)</i>	0.088 (2.235)	0.142 (3.61)	0.142 (3.61)	0.185 (4.699)	0.197 (5.00)	0.205 (5.21)	0.293 (7.44)	0.311 (7.90)
Center Conductor Type	Solid	Stranded	Solid	Solid	Stranded	Solid	Stranded	Solid
Max. Weight <i>g/ft (g/m)</i>	4.2 (13.78)	9.9 (32.5)	10.1 (33.1)	17.6 (57.74)	19.8 (65.0)	20.0 (65.6)	42 (137.8)	44.5 (146.0)
Min. Bend Radius <i>in (mm)</i>	0.25 (6.35)	0.38 (9.65)	0.38 (9.65)	0.375 (9.525)	0.50 (12.70)	0.50 (12.70)	0.75 (19.05)	1.25 (31.75)
Cable Flex Life	25,000 *	75,000 *	75,000 *	10,000 *	150,000 *	25,000 *	50,000 *	15,000 *
Electrical Characteristics	UFB088D	UFB142C	UFB142A	UFC185A	UFB197C	UFB205A	UFB293C	UFB311A
Impedance	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω
Frequency Range	DC to 18 GHz	DC to 40 GHz	DC to 40 GHz	DC to 32 GHz	DC to 26.5 GHz	DC to 26.5 GHz	DC to 18 GHz	DC to 18 GHz
Velocity of Propagation	80%	83%	83%	83%	81%	83.5%	81.5%	84%
Capacitance <i>pF/ft (pF/m)</i>	25.6 (84)	24.5 (80.4)	25.1 (82.4)	25.3 (83.0)	24.8 (81.4)	24.8 (81.4)	24.5 (80.4)	24.2 (79.4)
Shielding Effectiveness	@ 1 GHz > 100 dB	> 100 dB	> 100 dB	> 100 dB	> 100 dB	> 100 dB	> 100 dB	> 100 dB
Max. Insertion Loss <i>dB/ft (dB/M)</i>	@ 1 GHz	0.20 (0.66)	0.11 (0.36)	0.10 (0.33)	0.08 (0.26)	0.09 (0.28)	0.07 (0.23)	0.06 (0.20)
	@ 10 GHz	0.66 (2.17)	0.36 (1.18)	0.33 (1.08)	0.27 (0.89)	0.28 (0.93)	0.23 (0.75)	0.18 (0.59)
	@ 18 GHz	0.89 (2.92)	0.49 (1.61)	0.44 (1.44)	0.36 (1.18)	0.38 (1.26)	0.32 (1.05)	0.25 (0.82)
	@ 26.5 GHz	-	0.59 (1.94)	0.54 (1.77)	0.44 (1.44)	0.47 (1.55)	0.39 (1.28)	-
	@ 32 GHz	-	0.66 (2.16)	0.60 (1.97)	0.49 (1.61)	-	-	-
Phase Stability vs. Flexure	@ 10 GHz	2° †	3° †	2° †	3° †	2° †	4° †	2° †
	@ 18 GHz	3° †	5° †	5° †	6° †	3° †	7° †	3° †
Phase Stability vs. Temp.	See figure on next page							
Power Handling	See figure on next page							
VSWR	See connector selection guide							
Environmental Characteristics	UFB088D	UFB142C	UFB142A	UFC185A	UFB197C	UFB205A	UFB293C	UFB311A
Temperature Range	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C	-65 °C to 165 °C
	See Page 22 for applicable environmental test							

\* Cable shall withstand specified number of unrestrained flexures (snake test)

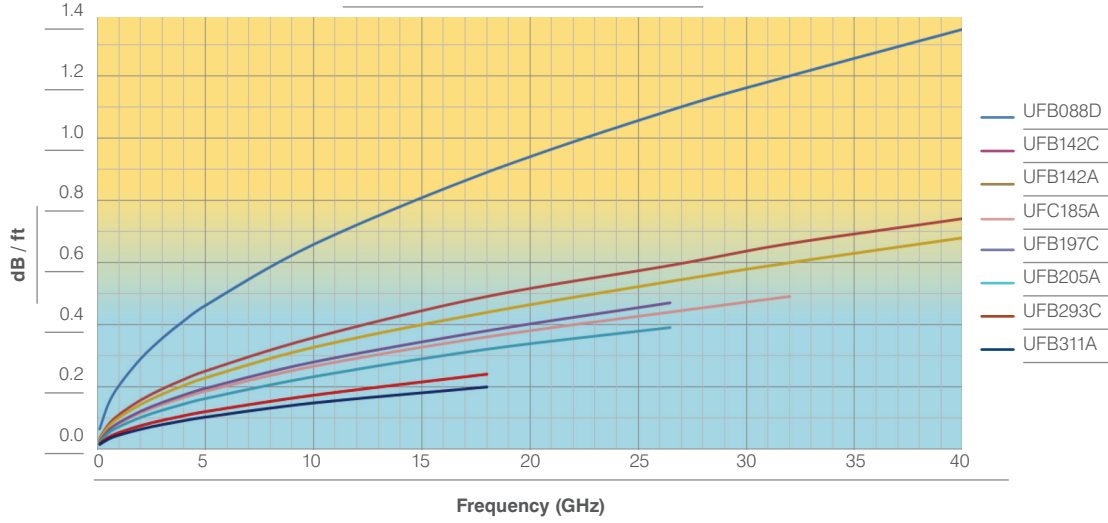
† Cable wrapped once around a 3 in diameter mandrel



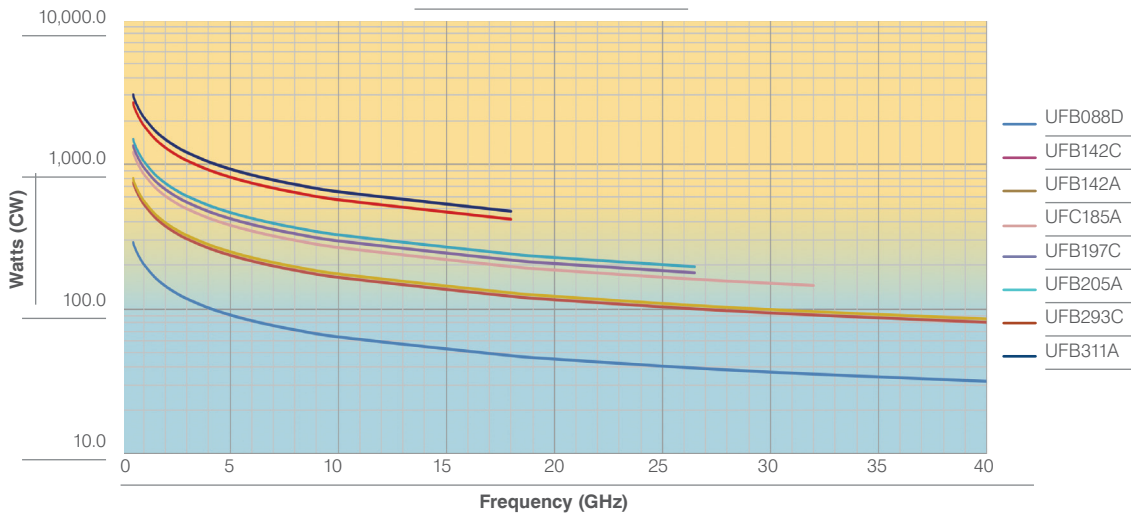
We are constantly improving products. Please contact us for the latest detailed specification sheet for any individual cable.

# Performance

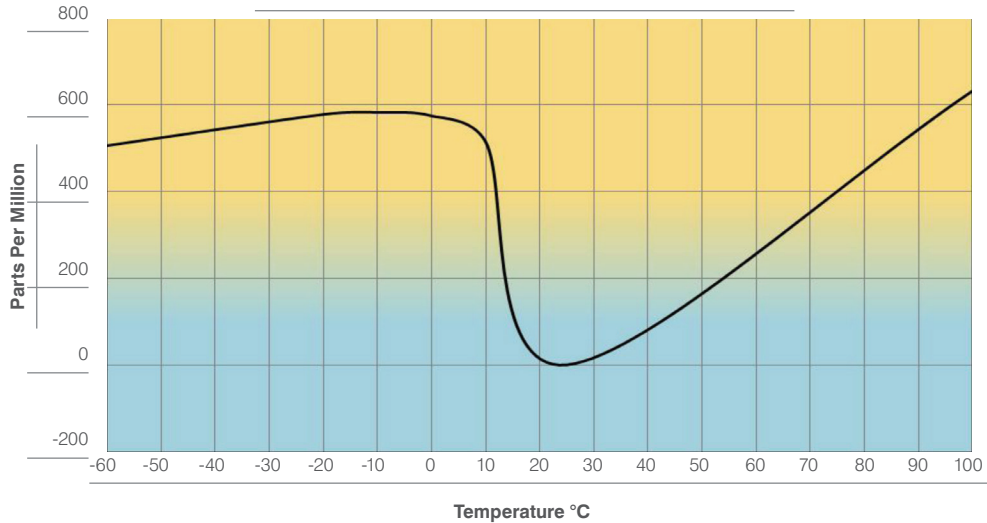
**MAXIMUM INSERTION LOSS**



**POWER HANDLING**



**TYPICAL PHASE CHANGE VS. TEMPERATURE**

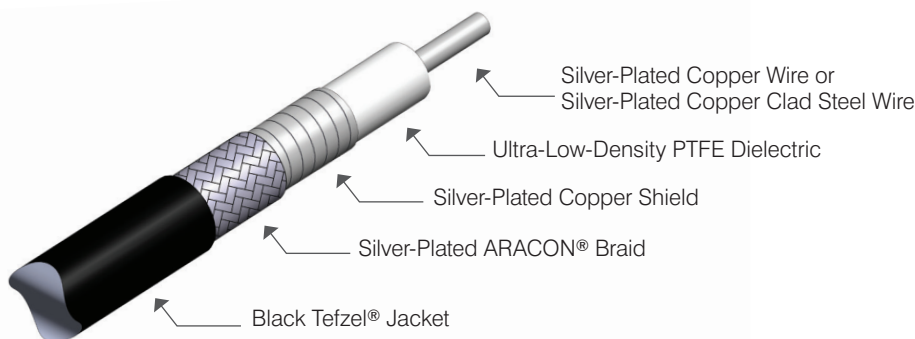


# UTiFLEX® Ultra-Light Cable Assemblies

UTiFLEX Ultra-Light Cable Assemblies are optimized for spaceflight applications. They provide the lightest weight, lowest insertion loss, and best radiation resistance in a flexible cable construction. The cables utilize CarlisleIT's ARACON® for the outer shield, an ultra-low-density PTFE for the dielectric, and a DuPont Tefzel® jacket. If required, cable assemblies are manufactured in a Class 10,000 clean-room by certified solder technicians.

Mechanical Characteristics	MCJ088D	MCJ142A	MCJ185A	MCJ205A	MCJ311A	
Outer Diameter <i>in (mm)</i>	0.088 (2.24)	0.142 (3.61)	0.185 (4.70)	0.205 (5.21)	0.310 (7.87)	
Center Conductor Type	Solid	Solid	Solid	Solid	Solid	
Max. Weight <i>g/ft (g/m)</i>	3.6 (11.8)	8.8 (28.9)	12.4 (40.7)	16.0 (52.5)	35 (114.8)	
Min. Bend Radius <i>in (mm)</i>	0.25 (6.35)	0.38 (9.65)	0.38 (9.65)	0.50 (12.70)	1.25 (31.75)	
Electrical Characteristics	MCJ088D	MCJ142A	MCJ185A	MCJ205A	MCJ311A	
Impedance	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	
Frequency Range	DC to 18 GHz	DC to 40 GHz	DC to 32 GHz	DC to 26.5 GHz	DC to 18 GHz	
Velocity of Propagation	80%	83%	83%	84%	83%	
Capacitance <i>pF/ft (pF/m)</i>	25.5 (83.7)	24.5 (80.4)	24.5 (80.4)	24.2 (79.4)	24.5 (80.4)	
Shielding Effectiveness	@ 1 GHz > 100 dB	> 100 dB	> 100 dB	> 100 dB	> 100 dB	
Max. Insertion Loss <i>db/ft (dB/M)</i>	See figure on next page					
	@ 1 GHz	0.20 (0.66)	0.10 (0.33)	0.08 (0.26)	0.07 (0.23)	0.05 (0.16)
	@ 10 GHz	0.66 (2.17)	0.33 (1.08)	0.27 (0.89)	0.23 (0.75)	0.15 (0.49)
	@ 18 GHz	0.89 (2.92)	0.44 (1.44)	0.36 (1.18)	0.32 (1.05)	0.21 (0.66)
	@ 26.5 GHz	-	0.54 (1.77)	0.44 (1.44)	0.39 (1.28)	-
	@ 32 GHz	-	0.60 (1.97)	0.49 (1.61)	-	-
Phase Stability vs. Flexure	@ 10 GHz	2° †	2° †	2° †	1° †	3° †
	@ 18 GHz	2° †	3° †	6° †	2° †	5° †
Phase Stability vs. Temp.	See figure on next page					
Power Handling	See figure on next page					
VSWR	See connector selection guide					
Environmental Characteristics	MCJ088D	MCJ142A	MCJ185A	MCJ205A	MCJ311A	
Temperature Range	-150 °C to 165 °C	-150 °C to 165 °C	-150 °C to 165 °C	-150 °C to 165 °C	-150 °C to 165 °C	
See Page 22 for applicable environmental test						

† Cable wrapped once around a 3 in diameter mandrel



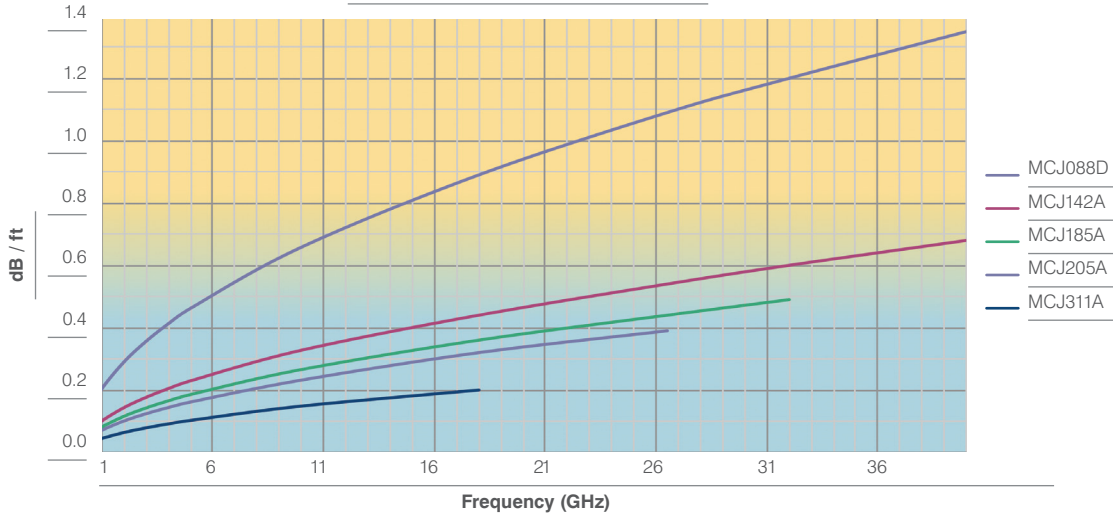
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We are constantly improving products. Please contact us for the latest detailed specification sheet for any individual cable.

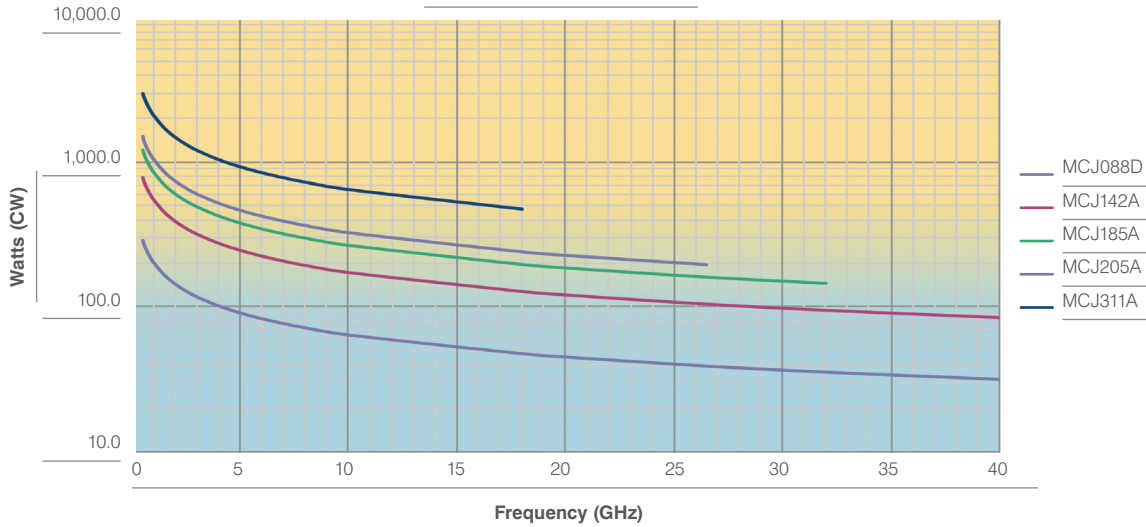


# Performance

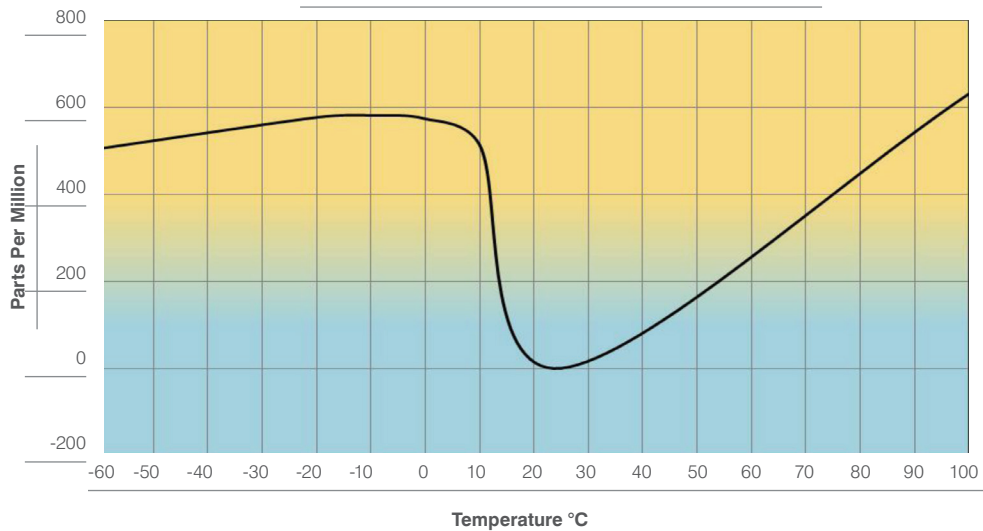
**MAXIMUM INSERTION LOSS**



**POWER HANDLING**



**TYPICAL PHASE CHANGE VS. TEMPERATURE**



# UTIFLEX® MKR Test Cable Assemblies

Our MKR rest cable assemblies represent the best in CarlisleIT technology. Using our industry-leading UTIFLEX microwave cable as a base, we fit MKR with an additional highly flexible and abrasive-resistant ruggedization.

The resulting integrated product becomes an ideal choice for test labs or any testing environment requiring excellent mechanical strength and long-term reliability in a compact package. Our MKR test cable assemblies have passed strenuous lifetime qualification testing to ensure long-term reliability. Though extremely flexible, they also feature excellent crush, torque, and kink resistance, ideally suited to the demanding requirements of today's test environments. MKR test cables are available in the 26.5-GHz MKR300C series which are capable of withstanding 150,000 unrestrained flexes with minimal degradation.

## MKR300C

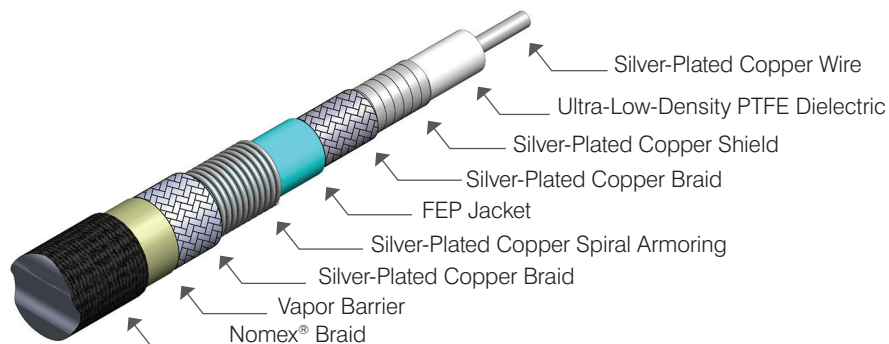
Materials	
Center Conductor Material	7 Strand SPC Alloy
Dielectric Material	ULD PTFE
Inner Shield Material	SPC
Outer Shield Material	SPC
Jacket Material	FEP
Internal Armor	SPC
Outer Armor	SPC BRAID
Vapor Barrier	Proprietary
Outer Abrasion Resistant Braid	NOMEX®

Mechanical Characteristics	
Outer Diameter <i>in (mm)</i>	0.300 (7.62)
Center Conductor Type	Stranded
Max. Weight <i>g/ft (g/m)</i>	51 (167.3)
Min. Bend Radius <i>in (mm)</i>	1.50 (38.10)

Environmental Characteristics	
Temperature Range	-65 °C to 165 °C

Electrical Characteristics		
Impedance	50 Ω	
Frequency Range	DC to 26.5 GHz	
Velocity of Propagation	81%	
Capacitance <i>pF/ft (pF/m)</i>	25.1 (82.4)	
Shielding Effectiveness	@ 1 GHz	>100 dB
	@ 10 GHz	0.08 (0.25)
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.08 (0.25)
	@ 10 GHz	0.27 (0.89)
	@ 18 GHz	0.36 (1.18)
	@ 26.5 GHz	0.44 (1.44)
Phase Stability vs Flexure*	@ 10 GHz	2°
	@ 18 GHz	3°

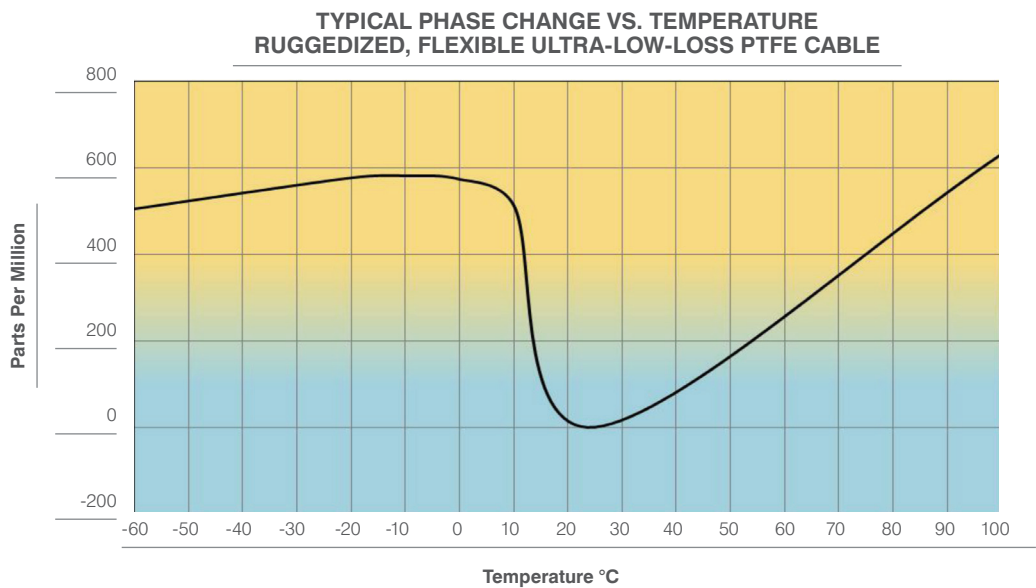
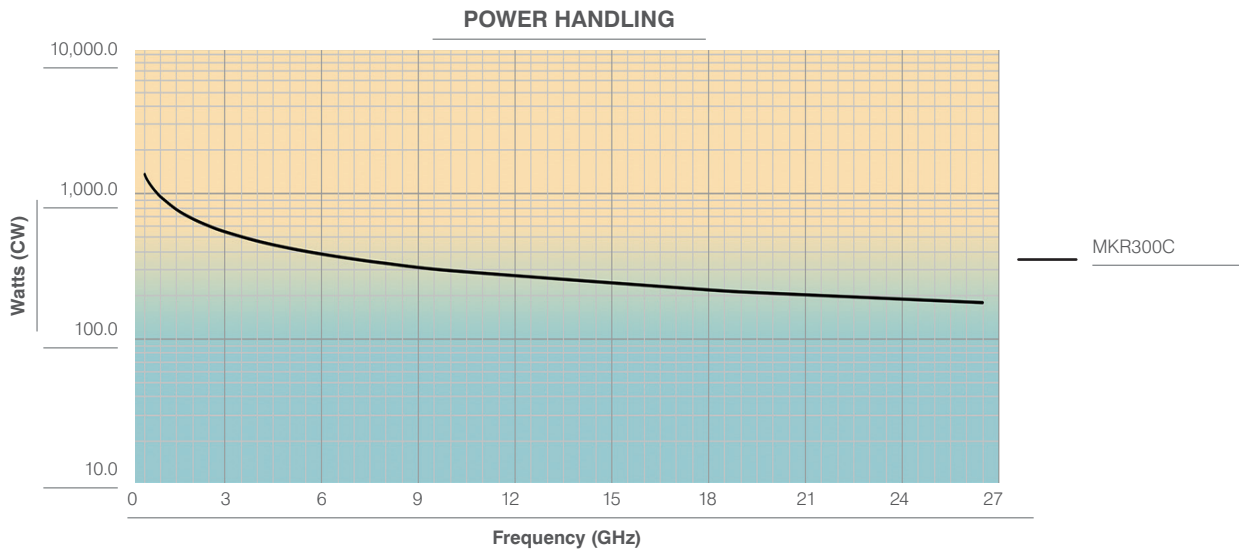
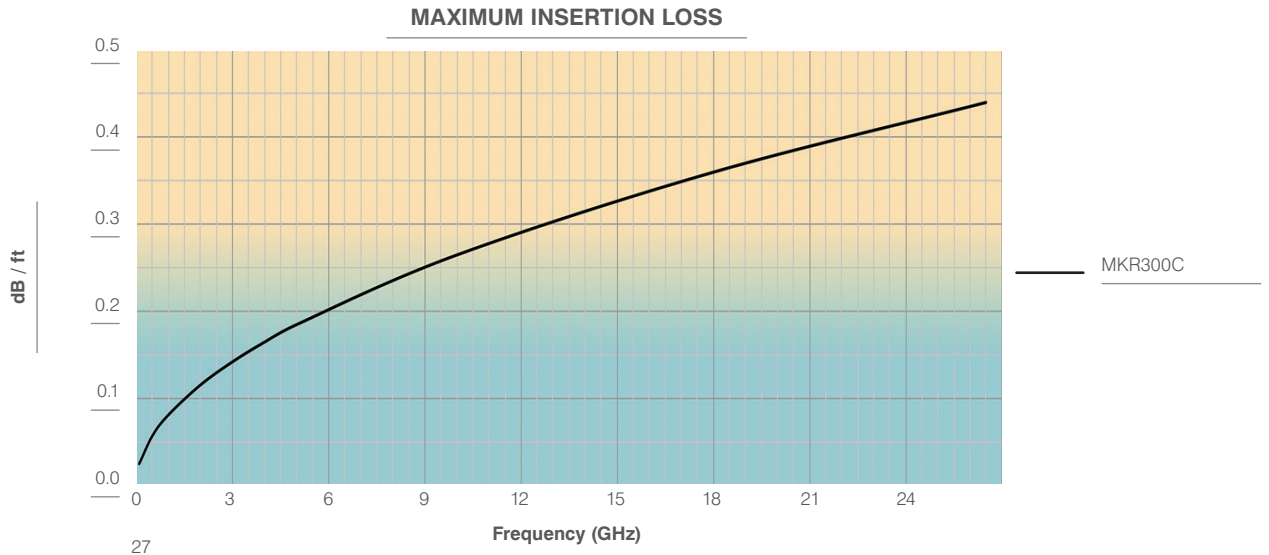
\* Cable wrapped once around a 3 in diameter mandrel



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# Performance



# UTiFLEX® Thermal Vacuum Test Cable Assemblies

Thermal vacuum testing is a risk mitigation strategy utilized in some hi-rel applications, notably space equipment such as satellites. Our TVAC Test Assemblies are thermal vacuum compatible for use in TVAC chambers. These assemblies utilize high-performance, Ultra-Low-Loss UTiFLEX Cable, and are produced to exacting space-grade standards utilizing low-outgassing materials and vented connectors.

## Key Characteristics

- » Low outgassing per ASTM E-595 (<1%TML and <0.1% CVCM) temperature range: -65 °C to 165 °C (Typical, consult factory for individual types)
- » Ideal phase performance due to ultra-low-loss dielectric materials
- » Superior cable mechanical stability and connector captivation techniques to address increasing thermal extremes of the space market
- » Clean-room manufacturing and real-time X-ray upon request
- » High-power configurations available. All high-power TVAC Assemblies are manufactured in a clean-room environment to full space-grade standards. Consult CarlisleIT for specific power/frequency requirements
- » Individually bagged to prevent post-assembly contamination
- » Vented connectors



*We are constantly improving products. Please contact us for the latest detailed specification sheet for any individual cable.*



Mechanical Characteristics		UFB142A	UFC185A	UFB197C	UFB205A	UFB293C	UFB311A
Nom. Outer Diameter <i>in (mm)</i>		0.142 (3.61)	0.185 (4.70)	0.197 (5.00)	0.205 (5.21)	0.293 (7.44)	0.311 (7.90)
Center Conductor Type		Solid	Solid	Stranded	Solid	Stranded	Solid
Max Weight <i>g/ft (g/m)</i>		10.1 (33.1)	17.6 (57.7)	19.8 (65.0)	20 (65.6)	42 (137.8)	44.5 (146.0)
Static Bend Radius <i>in (mm)</i>		0.38 (9.65)	0.38 (9.65)	0.50 (12.70)	0.50 (12.70)	0.75 (19.05)	1.25 (31.75)
Electrical Characteristics		UFB142A	UFC185A	UFB197C	UFB205A	UFB293C	UFB311A
Impedance		50 Ω	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω
Max. Frequency		40 GHz	32 GHz	26.5 GHz	26.5 GHz	18 GHz	18 GHz
Max. Insertion Loss <i>db/ft (dB/M)</i>	@ 1 GHz	0.10 (0.33)	0.08 (0.26)	0.09 (0.28)	0.07 (0.23)	0.06 (0.20)	0.05 (0.16)
	@ 10 GHz	0.33 (1.08)	0.27 (0.89)	0.28 (0.93)	0.23 (0.75)	0.18 (0.59)	0.15 (0.49)
	@ 18 GHz	0.44 (1.44)	0.36 (1.18)	0.38 (1.26)	0.32 (1.05)	0.25 (0.82)	0.21 (0.69)
	@ 26.5 GHz	0.54 (1.77)	0.44 (1.44)	0.47 (1.55)	0.39 (1.28)	—	—
	@ 32 GHz	0.60 (1.97)	0.49 (1.61)	—	—	—	—
	@ 40 GHz	0.68 (2.23)	—	—	—	—	—
Power Handling <i>Watts (CW)</i>	@ 10 GHz	175	267	296	326	570	648

## Connector Options

Description	Connector P/N	TVAC CABLE P/Ns	Frequency	Max SWR (Per Connector)
SMK PLUG	20V	142	DC – 40 GHz	1.16:1 – 18 GHz, 1.22:1 – 40 GHz
SMK PLUG	20V	185	DC – 32 GHz	1.16:1 – 18 GHz, 1.22:1 – 32 GHz
SMK PLUG	20V	205	DC – 26.5 GHz	1.16:1 – 18 GHz, 1.20:1 – 26.5 GHz
PC3.5MM PLUG	00V	205	DC – 26.5 GHz	1.16:1 – 18 GHz, 1.20:1 – 26.5 GHz
SMA PLUG	30V	142, 197, 205, 293, 311	DC – 18 GHz	1.16:1 – 18 GHz
Precision N PLUG	50V	142, 197, 205, 293, 311	DC – 18 GHz	1.16:1 – 18 GHz
Precision TNC PLUG	60V	142, 197, 205, 293, 311	DC – 18 GHz	1.20:1 – 18 GHz

## Part Number Designation (Example)

Base Part Number	Phase Matching (Optional)
UFB142A-0-XXXX-20V20V TV	AM
Where	<p>XXXX is cable assembly length in 0.1 inch increment.            Length Tolerance = -0 / +0.5 inches (XXXX ≤ 100 inches)            Length Tolerance = -0 / + 0.5% (XXXX ≥ 100 inches)</p> <p>If absolute phase matching is required, then add "AM" code. For phase-matched assemblies, length tolerance is not applicable.</p>



# Environmental Characteristics

UTiFLEX Cable Assemblies are designed to survive the harshest and most stringent environments, including:

- » Spaceflight
- » Airframe
- » Laboratory
- » Arctic/Desert
- » Battlefield

UTiFLEX Cable Assemblies have tested successfully for numerous environmental requirements, some of which are listed below. After exposure to these conditions, the cable assembly did not show visible damage and the insertion loss, SWR, and connector interface dimensions remained within specified limits.

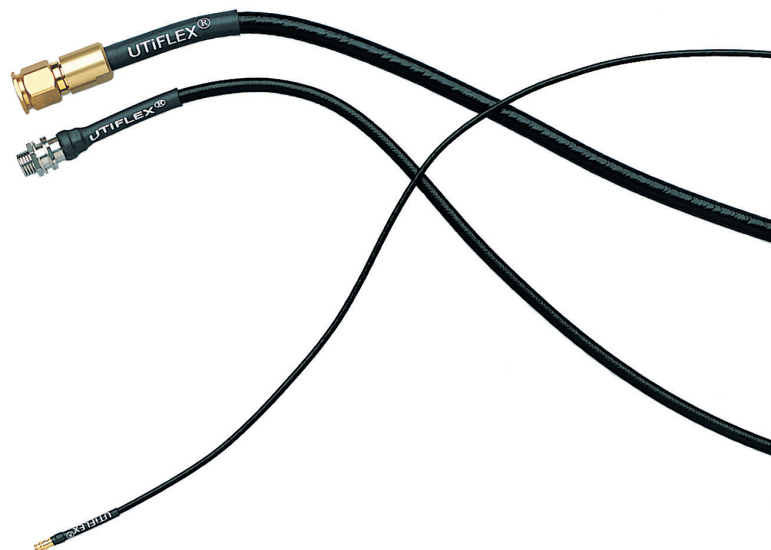
- » Thermal Shock per MIL-STD-202, Method 107, 20 cycles, -65 °C – 165 °C, or MIL-STD-810, Method 503
- » Vibration per MIL-STD-202, Method 204, Test Condition B
- » Humidity per MIL-STD-810, Method 108
- » Salt Fog per MIL-STD-810, Method 509
- » Sand and Dust per MIL-STD-810, Method 510
- » Stress Crack Resistance per MIL-DTL-17, Paragraph 4.8.17
- » Cold Bend per MIL-DTL-17, Paragraph 4.8.19
- » Chemical Resistance
  - JP-4 and JP-5 fuels
  - Hydraulic fluid
  - Lubricating oil
  - Coolants of fluorocarbon, silicon, silicate ester, and glycol families
- » Flammability per 14 CFR Part 25

Carlisle Interconnect Technologies' in-house test capabilities include:

- » Mechanical
- » Visual
- » Temperature
- » Thermal Shock
- » Humidity
- » Real-time X-ray
- » RF shielding
- » Dynamic Flexing
- » Vacuum
- » Fully Equipped Microwave Test Lab for Frequencies up to 67 GHz



Mode stir RF-Shielding testing per IEC Standard 61000-4-21 Annex F



# Care & Handling

## General Instructions

UTiFLEX Microwave Cable Assemblies are precision components that require proper use, routine inspection, and periodic cleaning of the connectors to maintain their reliable performance. Such care will increase the life of the assembly and all associated test equipment, as well as ensure more accurate and reliable measurements. Failure to observe these guidelines can result in inaccurate test data or permanent damage to both the assembly and other equipment. In addition to these instructions, an excellent resource for proper care and handling is the archived Hewlett Packard Application Note 326, “Coaxial Systems: Principles of Microwave Connector Care.”

## Cable Accessory Handling

- » Always observe specified cable minimum bend radius, especially at the ends of the connector strain-reliefs where excessive stress may not be obvious. Failure to do so may result in permanent cable performance degradation.
- » CarlisleIT cables are designed to withstand heavy use, but avoid pinching or crushing the cable, and do not drop heavy objects on the cable.
- » Never pull the cable when connected, or use it to support any additional weight.
- » Maintain a clean and dry test environment whenever possible. Foreign particles or chemicals can damage interconnects and should be avoided/prevented whenever possible.

## Connector Handling

- » Periodically (ideally before every critical test), inspect all connector interfaces. If necessary, clean out the connector interface by first blowing with compressed air. If contamination remains, use a cotton swab slightly moistened with isopropyl alcohol to remove impurities, then allow to dry before testing. If any part of a connector interface becomes damaged, the connector should be replaced to prevent permanent damage to other components.
- » Mechanically inspect all connector interfaces using a calibrated gage to ensure that the interface is in compliance with its controlling standard.
- » Always align connector centerlines before attempting to mate. Take care to perform this step properly as any required play in the coupling nut may allow the threads to mate without proper center contact insertion. This could damage or destroy critical connector components.
- » When threading male coupling nuts, ensure that the female component remains stationary while threading the male coupling nut onto the threads of the mating interface. Otherwise, unnecessary wear will occur on both connectors causing degradation of measurements.
- » Always tighten connectors to the required torque using only the correct and properly calibrated torque wrench. Make sure the wrench is held perpendicular to the connector centerline, as tilting tools or connector components will cause damage. Tighten slowly to ensure that the ratchet mechanism on the wrench engages at the true torque value. For knurled nuts, finger-tighten only.
- » When nearing full mate, apply a backing wrench to the connector's wrench flat to prevent any twisting or turning of the connector and/or cable.



# Service & Ordering Information

## Applications Engineering

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Our applications engineering staff is available for technical support in the design, utilization, testing, and production of any UTIFLEX Cable Assembly.

## Prototype Capability

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Samples can be manufactured for specific applications and supplied to you promptly. If new connector or cable designs are required, our experienced staff can offer a quick turnaround.

## Qualification Testing

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We can economically perform all qualification testing and document required testing procedures.

## Program Management

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We have participated in many large military and commercial programs. We maintain complete program management capability necessary to successfully complete development and production of projects of any size.

## Warranty

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All UTIFLEX cable assemblies have a limited one-year warranty subject to CarlisleIT review.

## How to Order

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Please order by UTIFLEX part number (see page 25) and/or drawing number, adding any special requirements. Your order should include the length required, connector type, and frequency range. The CarlisleIT webstore is the quickest way to order and receive custom configured test cables.

## Where to Order

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Carlisle Interconnect Technologies  
206 Jones Boulevard  
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Web: [CarlisleIT.com](http://CarlisleIT.com)

## Terms

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Formal price quotations remain in effect for 30 days unless otherwise specified on quotation. Terms of payment are Net 30 days and subject to credit approval.

## Shipments

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Unless specific instructions accompany the order, shipment is made FOB Pottstown, PA. We will use our judgment as to the best method of shipment. We reserve the right to ship COD or upon receipt of advance payment. All claims of shortages must be made within 10 days of receipt of material.

## Return Policy

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Please contact us for an RMA number before returning product. The RMA should be referenced on the packing container and all associated paperwork.

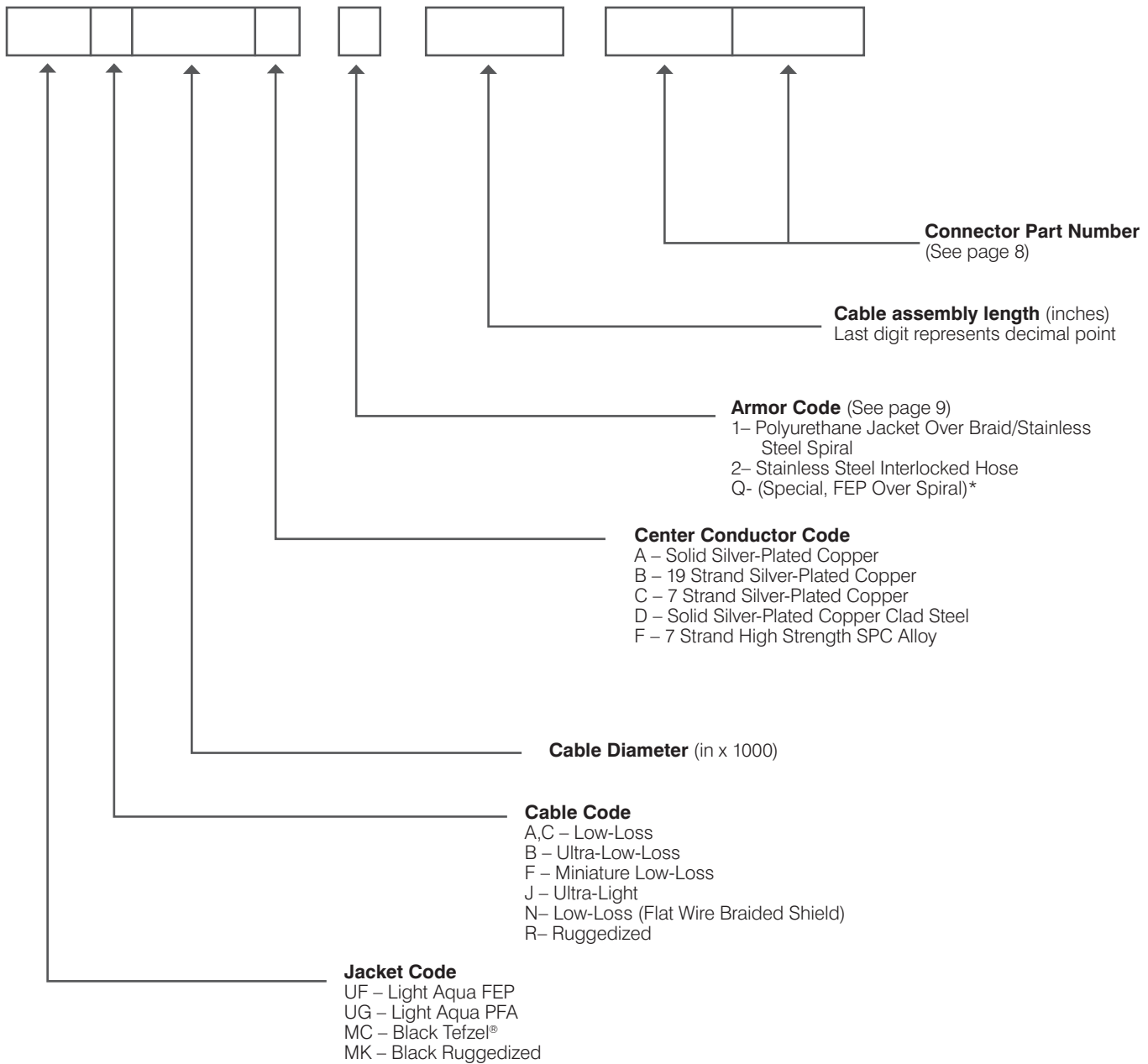
## Additional Information

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Please visit our website at [CarlisleIT.com](http://CarlisleIT.com).



# UTiFLEX® Cable Assemblies Part Number



## Examples

### UFA210A-0-0360-300300

FEP jacketed, low-loss, 0.210 in diameter cable, solid silver-plated copper center conductor, no armor, 36-in long, SMA plug connectors on each end.

### UFB293C-2-0105-504310

FEP jacketed, ultra-low-loss, 0.293 in diameter cable, 7 strand silver-plated copper center conductor, stainless steel interlocked hose armor, 10.5-in long, precision N plug by SMA jack connectors.

DuPont™ and Tefzel® are trademarks or registered trademarks of E.I. du Pont de Nemours and Company.

\*Contact us for more information.

# We Are Interconnect.

At Carlisle Interconnect Technologies, we do more than make interconnect technologies for a spectrum of industries. We deliver the critical connections and products that make amazing performances possible.

## Carlisle Operating System (COS)

### Driving the Industry Forward

We're leading the way with our Carlisle Operating System (COS). COS is our standardized methodology using the tools of Lean Manufacturing and Six Sigma to drive continuous improvement for our customers and our business. It promotes the systems and culture of safety, employee involvement, quality, and on-time delivery — all of this with our customers in mind.

The COS methodology is woven into our leadership fabric and everything we do. This thought process is both supported and driven by our top leadership and ensures the sustainability of our successes with our customers and our business. Every CarlisleIT location participates with the goal of continuous improvement at all facilities.

With COS, companies working with CarlisleIT know they're partnering with a world-class interconnect manufacturer dedicated to providing comprehensive, next-level solutions they can't get anywhere else.

### Nine Key Metrics

- » MDI - Managing for Daily Improvement
- » TPM - Total Preventative Maintenance
- » Culture
- » Supply Chain
- » Environment
- » Safety
- » Quality
- » Delivery
- » Cost

The COS Operational Excellence program recognizes and rewards facility performance with a specific and defined level of achievement, providing each facility a road map for continuous success. The program allows CarlisleIT to monitor and track performance to ensure we're achieving our performance goals.



**People. Process. Productivity.**

# Global Manufacturing. **Local Support.**

Wherever you are, so are we. With manufacturing centers around the globe, our highly qualified team of engineers is up to any challenge. Our extensive worldwide manufacturing capabilities, coupled with end-to-end local project management and engineering support, allow us to design, build, test, and certify your product in-house, saving you the time and hassle of managing multiple vendors.



## **HEADQUARTERS**

100 Tensolite Drive  
St. Augustine, FL 32092  
United States

## **FACILITIES CERTIFICATIONS**

- » AS9100
- » ISO 9001
- » ISO 13485
- » ISO 14001
- » FDA
- » ITAR registration
- » MIL-SPEC/SAE
- » RoHS compliance
- » UL



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