INSULATED WIRE
INCORPORATED

IW MICROWAVE HIGH POWER PRODUCTS 2025

Innovative specialists in manufacture of microwave cable & cable assemblies

www.insulatedwire.com

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INSULATED WIRE INCORPORATED

WELCOME

INSULATED WIRE TODAY

Founded in 1970, IW developed a unique PTFE lamination process and applied it to manufacturing wire and cable. This process allowed IW to manufacture products of unprecedented reliability along with smaller diameters. Combining the new lamination process along with a patented shield design allowed IW to become one of the leaders in low loss microwave transmission lines, utilizing both solid and expanded PTFE dielectrics. In 1988, IW expanded its operations and created a Microwave Products Division.

Today, IW Bayport designs and manufactures a wide range of cables to support demanding customer application specific requirements for high performance cable assemblies operating at frequencies up to 110GHz, across a range of diameters from 0.034" to 0.750" diameter. IW also offers a broad selection of connectors in order to provide our customers the proper cable assembly for specific applications.

IW operates in two facilities. Headquarters and cable manufacturing are located in Bayport, NY, with the cable assembly facility located close by in Ronkonkoma, NY. Both factories are AS9100 and ISO9001.

HIGH POWER PRODUCTS

Our unique lamination process for EPTFE to create extremely low loss/phase stable cable also provides coax that is capable of high levels of RF power handling.

Four main products provide solutions for high RF signal transmission, with a wide range of industry standard interconnect options to ensure reliability in laboratory and harsh environments. IW high power cables are supplied to customers worldwide for use in commercial and military applications where repeatable performance is paramount.

- 2801: broadband performance to Ku-band, with 450W power handling capability at 18 GHz
- 4806: rated to 3kW at 1 GHz, operates to X-band
- 7506SP: flexible ¾" diameter cable, extremely high power and ease of handling, applications to 6.5 GHz
- RF250: RG401 line size hand formable/double shielded cable, eliminates the need for pre-formed semi-rigid cable

Connector types include N, C, SC, 7/16 DIN, LC, 1 5/8 EIA and 3 1/8 EIA flange, different styles are available.

Armoring options and alternate jacket materials are also available, please consult the factory with requirements.

INSULATED WIRE
INCORPORATED

MARKETS SERVED

IW serves a broad range of both military and commercial markets. These include telecommunications, data links, satellite systems, airborne electronic warfare and counter measures, missile systems, UAV applications, avionics and instrumentation, fire control systems, medical electronics, and geophysical exploration.

IW's experience across our worldwide customer base has aided in developing our capability in the high power segment with ultra low loss and commensurate high rated coaxial cable and cable assembly products.

We support applications where high RF power levels need to be reliably transmitted including EMC/EMI testing, rapid microwave de-frosting, communications, semiconductor manufacturing and defense systems.

CABLE CONSTRUCTION - AN OVERVIEW

Upon request we have the ability to accommodate custom assembly configurations, and can extrude a broad range of jacketing materials.

Our jacketing capabilities allow us to produce assemblies that have extra flexibility, extended flex life, low and high temperature ranges, and resistance to oils and corrosive materials. Our standard assemblies are extruded with FEP.

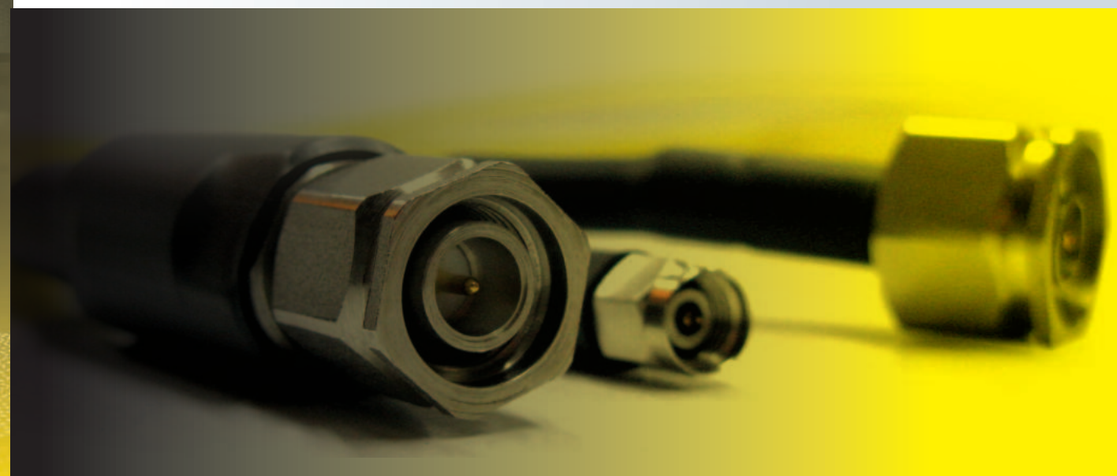
Here is a list of other materials that are available:

- FEP
- PFA
- ETFE - Max temp range 200° C
- Low Smoke/Zero Halogen TPU
  Max. Temp 90° C
- Santoprene - Max temp range 135° C

Below is an overview of our standard product selection, but as you peruse our catalog you can see we can offer you and your company a vast amount of options.

CABLE SPECIFICATIONS

P/N	Cut Off Frequency (GHz)	Attenuation (max) @ cut off (dB/ft.)	RF power (max) @ cut off (W)	VP (%)	Static Bend Radius (Inches)	Dynamic Bend Radius (Inches)	Weight (lb/100 ft)	Capacitance (pF/ft)	Time Delay (nS/ft)
2801	18.5	0.20	450.0	83	1.000	1.750	8.30	24.5	1.22
2803	18.5	0.20	450.0	83	1.375	2.500	15.70	24.5	1.22
2806	18.5	0.26	340.0	83	1.000	2.000	7.90	24.5	1.22
2808	18.5	0.26	340.0	83	1.375	2.500	15.40	24.5	1.22
4806	11.3	0.12	900.0	83	3.000	5.000	18.30	24.5	1.22
7506	06.5	0.06	175.0	83	5.000	8.000	36.00	24.5	1.22
RF250	18.0	0.44	161.0	70	0.750	1.500	6.50	29.0	1.45



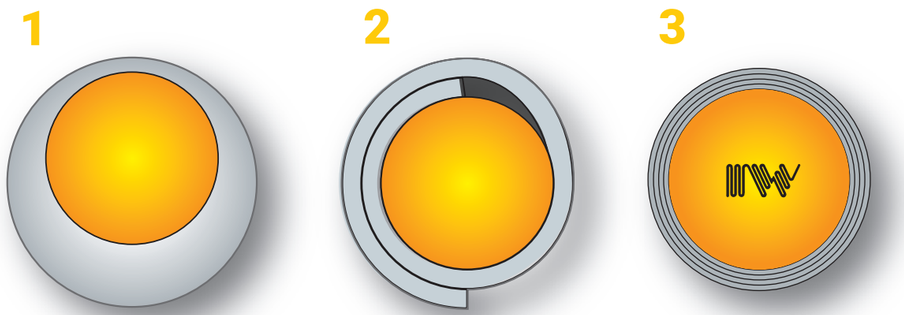
CABLE CONSTRUCTION

TAILORED TO YOUR SPECIFICATIONS

IW is ready to work with you to provide the exact cable specifications you need for your extreme condition application. We start at square one, from initial specifications and requirements analysis; through the design phase using CAD, working with your systems and applications personnel; then through development, manufacturing and delivery; right up to hands on guidance for installation andmaintenance.

The needs of each of our microwave customers are diverse and demanding and can change on a moment's notice. That's why we never rest on our laurels.

We are constantly working to develop the next new innovative machine, or to design the newest process for delivering state of the art microwave cables and assemblies.

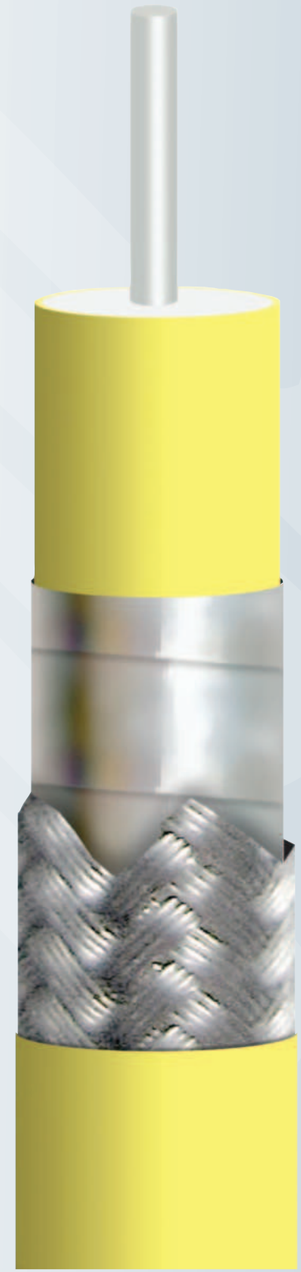


These scale drawings (approximately 50X actual size) illustrate IW's unique Multi-Ply Laminate insulation that eliminates the problems which occur with other forms of construction.

1 **Extruded Insulation** requires a thicker insulating wall to compensate for the possibility of conductor eccentricity within the insulation.

2 **Lap Wrap Tape Insulation** creates an irregular surface which precludes use with "O" ring seals at high pressures; contamination on the tape surface creates a low resistance path; and a corona site forms in the triangular voids created where the tape overlaps.

3 **IW's Multi-Ply Laminate Insulation**, by contrast, delivers greater reliability with maximum space and weight savings.



CENTER CONDUCTOR
Silver plated per ASTM B-298

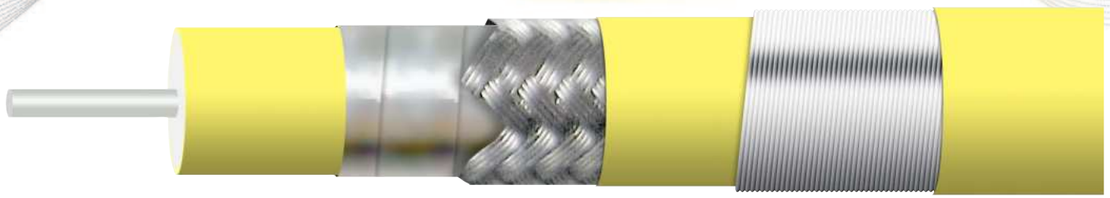
DIELECTRIC
Multi-ply laminate
Per Mil-C-17
Expanded PTFE Type F-6
Solid PTFE Type F-2
All materials per ASTM D 4894

SHIELD
Helically wrapped silver or silver plated copper foil
ASTM-B-298

BRAID
Silver plated copper per ASTM B-298.
Braid coverage is greater than 98%
*Reflex per ASTM-B-33

JACKET
FEP per ASTM D-2116
FAA Flammability Test UL94-VØ

280 SERIES



Center Conductor	Dielectric	Foil	Braid	Inner Jacket	Serving	Outer Jacket
Silver Plated Copper 2801/2803 Solid 2806/2808 Stranded	EPTFE	Silver Plated Copper	Silver Plated Copper	FEP (0.303", 7.82mm)	SCCS Armor	FEP (0.382", 9.70mm)

CABLE SPECIFICATIONS

	2801	2806	2803	2808
ELECTRICAL CHARACTERISTICS				
Impedance	50 +/– 2Ω	50 +/– 2Ω	50 +/– 2Ω	50 +/– 2Ω
Cut Off Frequency (cable only, max)	18.5 GHz	18.5 GHz	18.5 GHz	18.5 GHz
GHzCapacitance	24.5 pF/ft.	24.5 pF/ft.	24.5 pF/ft.	24.5 pF/ft.
Velocity of Propagation	83%	83%	83%	83%
Time Delay	1.22 ns/ft.	1.22 ns/ft.	1.22 ns/ft.	1.22 ns/ft
Shielding Effectiveness up to 18GHz	>100 dB	>100 dB	>100 dB	>90 dB
Cable Attenuation Factors (K1, K2) *	4.3, 0.100	5.4, 0.174	4.3, 0.100	5.4, 0.174
Power Handling	See Chart	See Chart	See Chart	See Chart
MECHANICAL CHARACTERISTICS				
Weight	1.33 oz/ft (123 g/m)	1.26 oz/ft (117 g/m)	2.56 oz/ft (238 g/m)	2.46 oz/ft (229 g/m)
Static Bend Radius	1.0" (25.4 mm)	1.0" (25.4 mm)	1.375" (35mm)	1.375" (35mm)
Dynamic Bend Radius	1.75" (44.5mm)	2.0" (50.8mm)	2.5" (63.5mm)	2.5" (63.5mm)
ENVIRONMENTAL CHARACTERISTICS				
Operating Temperature Range [1]	-65°C to +200°C	-65°C to +200°C	-65°C to +200°C	-65°C to +200°C
RoHS 3 (EU 2015/863)	Yes	Yes	Yes	Yes

[1] Standard cable assembly temperature range is -55°C to +165°C, -65°C to +200°C available for select configurations

VSWR for assemblies with two straight connectors	1.35:1 to 18 GHz	1.35:1 to 18 GHz	1.35:1 to 18 GHz	1.35:1 to 18 GHz
VSWR for assemblies with one straight and one right angle connector	1.40:1 to 18 GHz	1.40:1 to 18 GHz	1.40:1 to 18 GHz	1.40:1 to 18 GHz
VSWR for assemblies with two right angle connectors	1.45:1 to 18 GHz	1.45:1 to 18 GHz	1.45:1 to 18 GHz	1.45:1 to 18 GHz

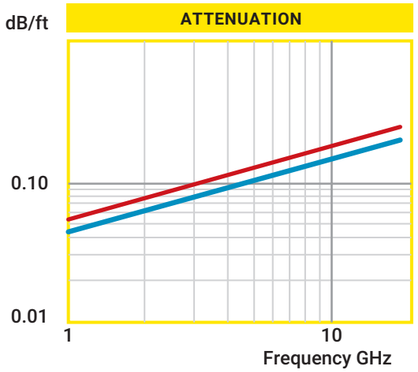
*Attenuation = $K1\sqrt{f} + K2f$ (cable only)

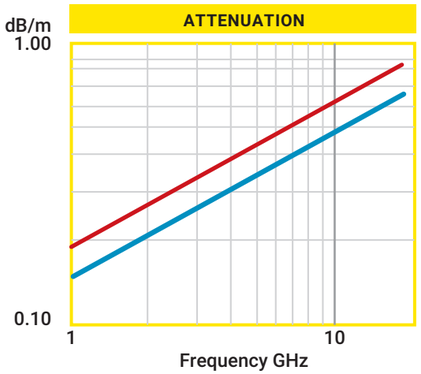
280 SERIES

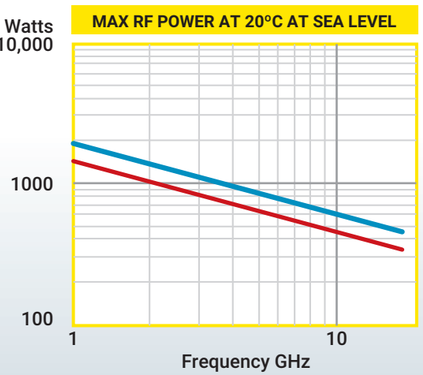
CABLE ATTENUATION

ATTENUATION (MAX)

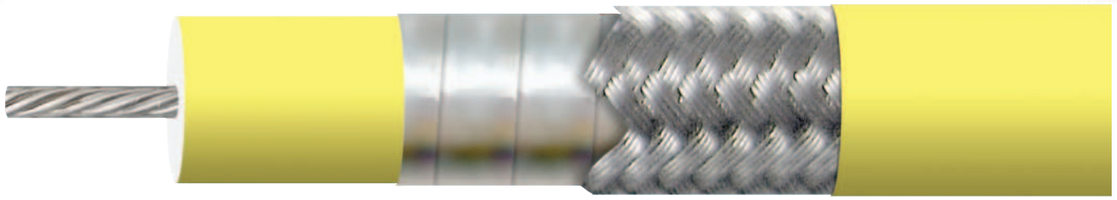
	2801/2803			2806/2808		
GHz	dB/ft.	dB/m	Power(W) @ 20°C @ Sea Level	dB/ft.	dB/m	Power(W) @ 20°C @ Sea Level
0.5	0.03	0.10	2550	0.04	0.13	2185
1	0.04	0.14	1900	0.06	0.18	1500
2	0.06	0.21	1350	0.08	0.26	1100
4	0.09	0.30	900	0.17	0.38	700
6	0.11	0.37	750	0.14	0.47	600
8	0.13	0.43	650	0.17	0.55	500
10	0.15	0.48	600	0.19	0.62	450
12	0.16	0.53	580	0.21	0.68	400
14	0.17	0.57	550	0.23	0.75	380
16	0.19	0.62	525	0.24	0.80	350
18	0.20	0.66	450	0.26	0.86	340







480 SERIES



Center Conductor
Silver Plated Copper

Dielectric
PTFE

Foil
Silver Plated Copper

Braid
Silver Plated Copper

Outer Jacket
FEP
(0.475", 12mm)

CABLE SPECIFICATIONS

	4806
ELECTRICAL CHARACTERISTICS	
Impedance	50 +/– 2Ω
Cut Off Frequency (cable only, max)	11.3 GHz
Capacitance	24.5pF/ft.
Velocity of Propagation	83%
Time Delay	1.22 ns/ft.
Shielding Effectiveness up to 18GHz	>90 dB
Cable Attenuation Factors *	K1 = 2.9, K2 = 0.179
Power Handling	See Chart
MECHANICAL CHARACTERISTICS	
Weight	2.93 oz/ft (272 g/m)
Static Bend Radius	3.0" (76mm)
Dynamic Bend Radius	5.0" (127mm)
ENVIRONMENTAL CHARACTERISTICS	
Operating Temperature Range	-65°C to +150°C
RoHS 3 (EU 2015/863)	Yes

[1] Standard cable assembly temperature range is -55°C to +165°C, -65°C to +200°C available for select configurations

VSWR for assemblies with two straight connectors 1.35:1 to 11 GHz

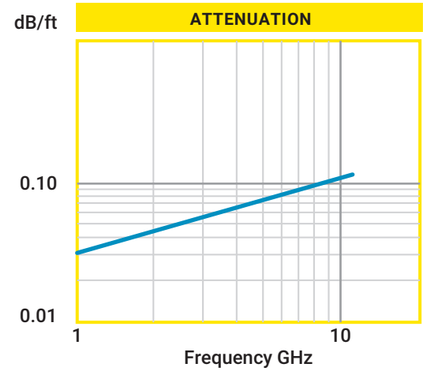
*Attenuation = $K1\sqrt{f} + K2f$ (cable only)

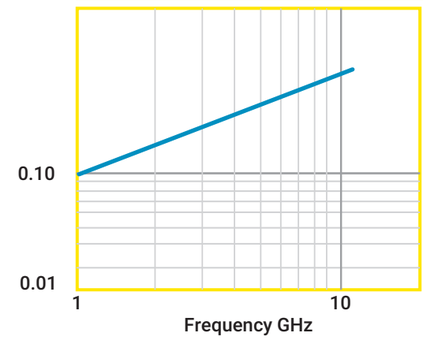
480 SERIES

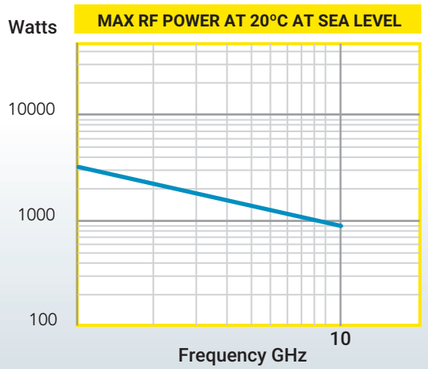
CABLE ATTENUATION

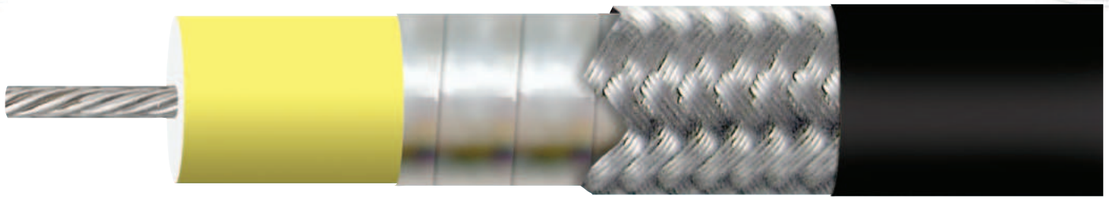
ATTENUATION (MAX)

	4806		
GHz	dB/ft.	dB/m	Power(W) @ 20°C @ Sea Level
0.1	0.01	0.03	11000
0.5	0.02	0.07	4800
1	0.03	0.10	3250
2	0.04	0.15	2260
4	0.07	0.21	1650
6	0.08	0.27	1300
8	0.10	0.32	1100
10	0.11	0.36	950
11	0.12	0.38	900









Center Conductor
Silver Plated
Copper Stranded

Dielectric
PTFE

Foil
Silver Plated
Copper

Braid
Silver Plated
Copper

Outer Jacket
Santoprene
(0.765", 19.68 mm)

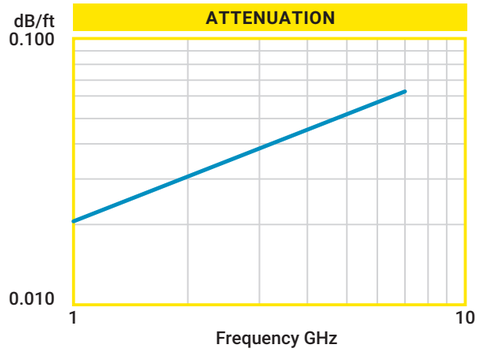
CABLE SPECIFICATIONS

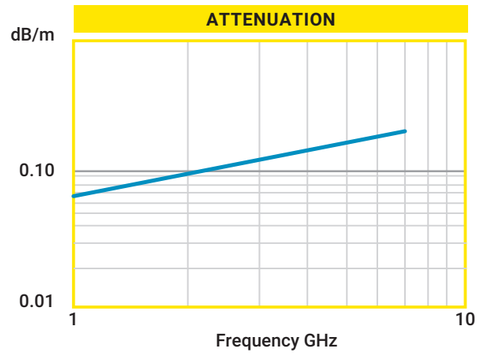
	7506-SP
ELECTRICAL CHARACTERISTICS	
Impedance	50 +/– 2Ω
Cut Off Frequency (cable only, max)	6.5 GHz
Capacitance	24.5 pF/ft.
Velocity of Propagation	83%
Time Delay	1.22 ns/ft.
Shielding Effectiveness up to 18GHz	>90 dB
Cable Attenuation Factors *	K1 = 1.9, K2 = 0.183
Power Handling	See Chart
MECHANICAL CHARACTERISTICS	
Weight	5.8 oz/ft (536 g/m)
Static Bend Radius	5" (127mm)
Dynamic Bend Radius	8.0" (203mm)
ENVIRONMENTAL CHARACTERISTICS	
Operating Temperature Range	-65ºC to +135ºC
RoHS 3 (EU 2015/863)	Yes

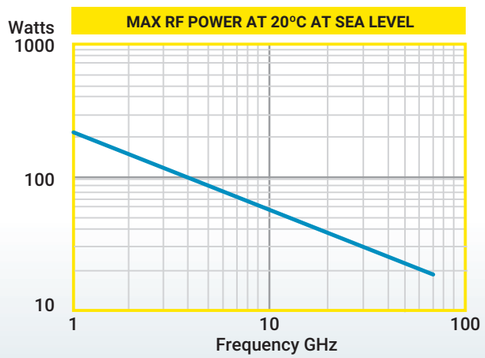
*Attenuation = $K1\sqrt{f} + K2f$ (cable only)

CABLE ATTENUATION

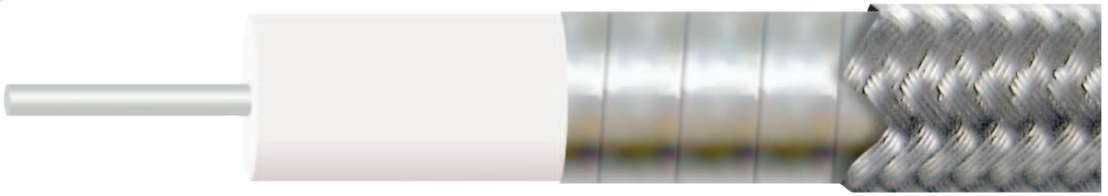
ATTENUATION (MAX)			
7506-SP			
GHz	dB/ft.	dB/m	Power(W) @ 20ºC @ Sea Level
0.1	0.006	0.020	20000
0.5	0.014	0.047	12500
1	0.021	0.069	10000
2	0.031	0.102	6690
3	0.038	0.125	5000
4	0.045	0.148	4475
5	0.051	0.167	3000
6	0.057	0.187	2500
6.5	0.060	0.198	1750







RF250 SERIES
OPERATING UP TO 18 GHz



Center Conductor
Silver Plated
Copper

Dielectric
PTFE

Foil
Silver Plated
Copper

Braid
Tin Plated Copper
RF250 - (0.230", 5.84 mm)

CABLE SPECIFICATIONS

	RF250
ELECTRICAL CHARACTERISTICS	
Impedance	50 +/– 2Ω
Cut Off Frequency (cable only, max)	18 GHz
Capacitance	28.6 pF/ft.
Velocity of Propagation	71%
Time Delay	1.43 ns/ft.
Shielding Effectiveness up to 18GHz	>90 dB
Cable Attenuation Factors (K1, K2) *	6.4, 0.95
Power Handling	See Chart
MECHANICAL CHARACTERISTICS	
Weight	1.06 oz/ft (98.2 g/m)
Static Bend Radius	0.375" (95.25mm)
Dynamic Bend Radius	1.0" (25.4mm)

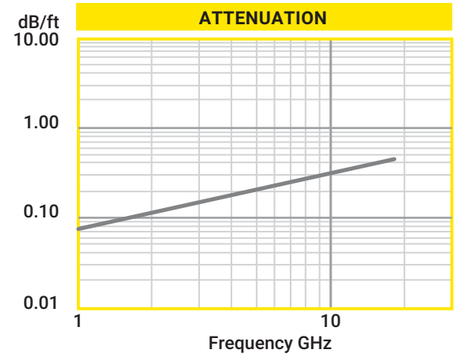
FEP Jacket available upon request

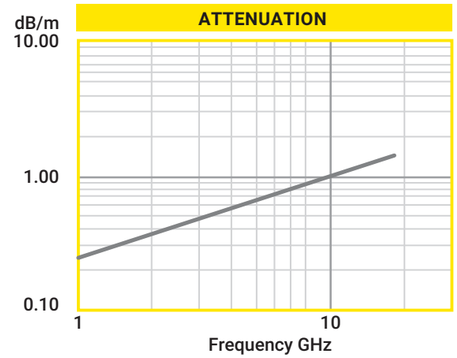
*Attenuation = $K1\sqrt{f} + K2f$ (cable only)

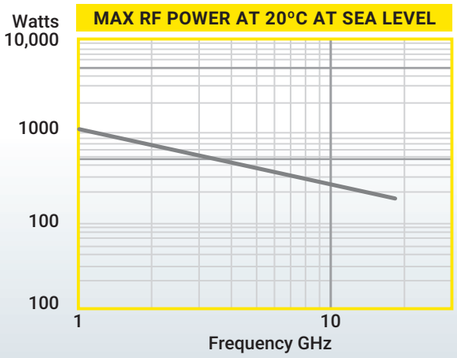
CABLE ATTENUATION

ATTENUATION (MAX)

GHz	RF250 dB/ft.	RF250 dB/m	RF250 Power(W) @ 20°C @ Sea Level
0.5	0.05	0.16	1615
1	0.07	0.23	1033
2	0.11	0.36	661
4	0.17	0.56	423
6	0.22	0.72	326
8	0.26	0.85	271
10	0.29	0.95	235
12	0.34	1.12	209
14	0.37	1.21	189
16	0.41	1.35	173
18	0.44	1.44	161

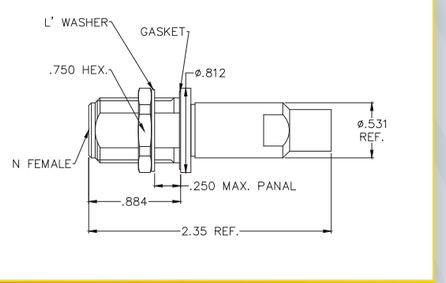




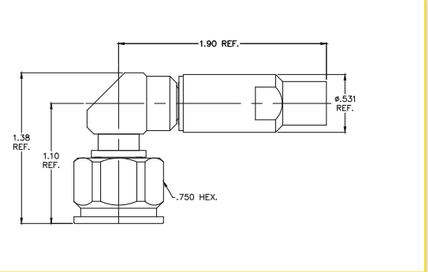


RF 250 SERIES

CONNECTORS FOR **280 SERIES**



N-TYPE FEMALE BULKHEAD (NJB-2801)

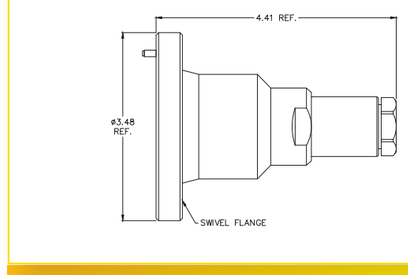


N-TYPE MALE RIGHT ANGLE (NPR-2801)

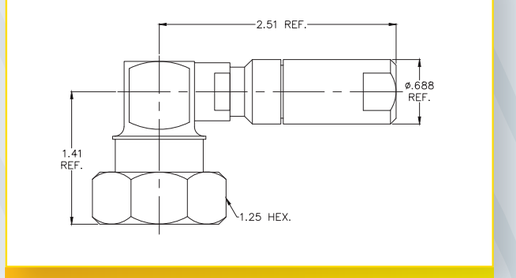
N-TYPE MALE (NPS-2801)

Other connector types and styles are available, please contact the factory

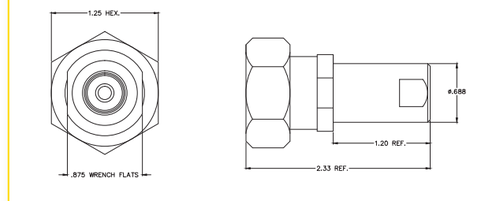
CONNECTORS FOR **480 SERIES**



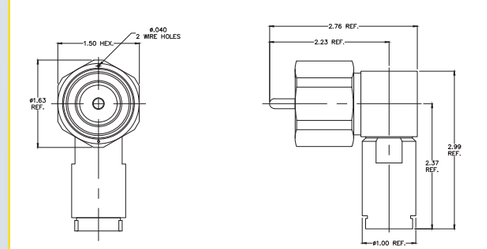
1 5/8 EIA FLANGE (158EF-4806)



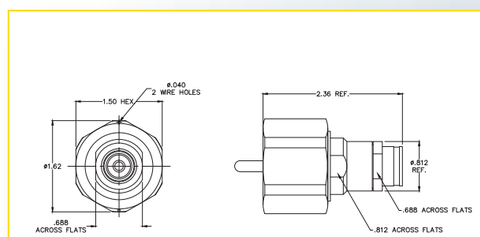
7/16 DIN MALE RIGHT ANGLE (716PR-4806)



7/16 DIN MALE (CN269)



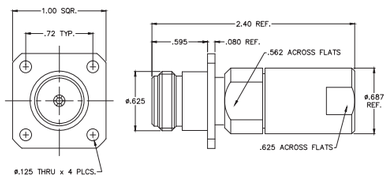
LC MALE RIGHT ANGLE W/LOCK WIRE HOLES (LCPRW-4806)



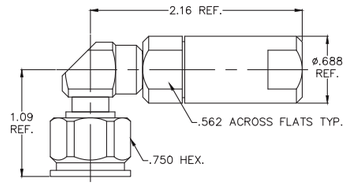
LC MALE W/LOCK WIRE HOLES (LPSW-4806)

Other connector types and styles are available, please contact the factory

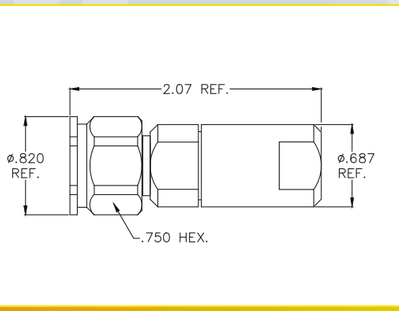
CONNECTORS FOR **480 SERIES**



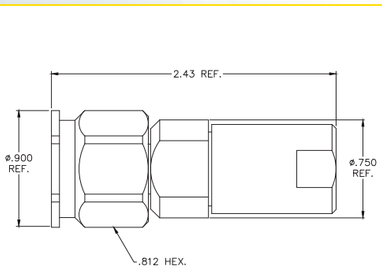
N-TYPE FEMALE FOUR HOLE FLANGE MOUNT NJP4-4806



N-TYPE MALE RIGHT ANGLE (NPR-4806)



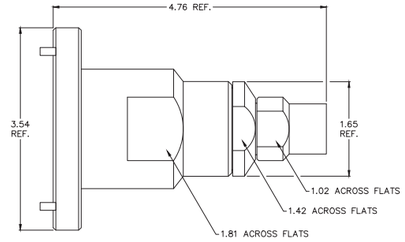
N-TYPE MALE (NPS-4806)



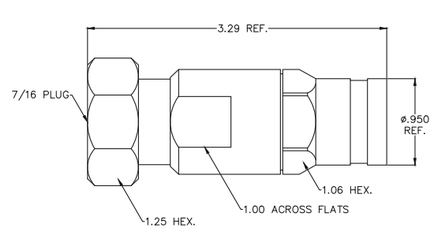
SC MALE (SCPS-4806)

Other connector types and styles are available, please contact the factory

CONNECTORS FOR **750 SERIES**

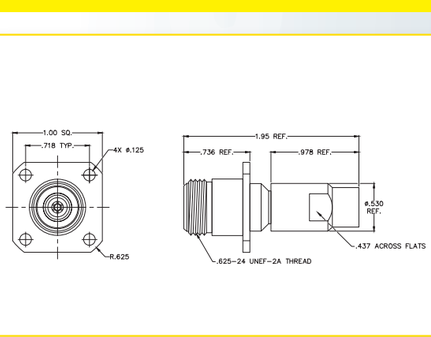


1 5/8 EIA FLANGE (158EF-7506)

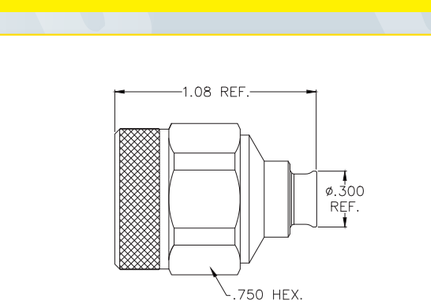


7/16 DIN MALE (716PS-7506)

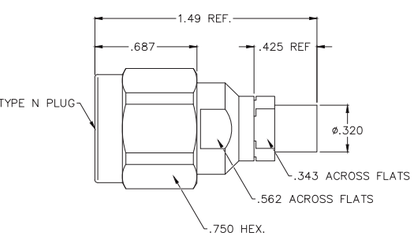
CONNECTORS FOR **RF250 SERIES**



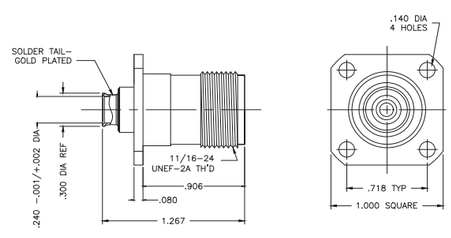
N-TYPE FEMALE 4 HOLE FLANGE MOUNT (NJP4-TPRF250)



NPSDTPRF250-SPEC_A_GEN



N-TYPE MALE (NPS-TPRF250)



SC FEMALE DIRECT SOLDER 4 HOLE FLANGE MOUNT SCJP4-TPRF250

Other connector types and styles are available, please contact the factory

CONNECTOR OPTIONS

MATERIALS & FINISHES

Component	Material Specifications	Finish Specifications
Bodies	Stainless Steel per AMS-5640 UNS-S30300, Type 1	Passivation per SAE-AMS-2700
Coupling Nut	Stainless Steel per AMS-5640 UNS-S30300, Type 1	Passivation per SAE-AMS-2700
Contacts	Beryllium Copper per ASTM-B-196 Brass per ASTM-B-16	Gold Plated per ASTM-B-488 Gold Plated per ASTM-B-488
Solder Ferrule	Brass per ASTM-B-16	Gold Plated per ASTM-B-488
Dielectric	PTFE (polytetrafluoroethylene) per ASTM-D-1710 Kel-F ASTM-D-1430-03 ULTEM* (Grade 1000) *Trademark General Electric Corporation	
Gasket	Silicone Rubber per A-A-59588 Viton ASTM-D-1418	

CHOOSE YOUR CONNECTOR

Cable Series	Frequency (GHz) 4	11	18	26.5
280	N, SMA, TNCA, SC			
480	SC, 7/16, 1 5/8EIA, N			
750	7/16, 1 5/8 EIA			
RF250	SMA, TNCA, N, SC			

Connector types listed are preferred matching for referenced cables. Additional connector types can be provided. Please consult factory.

Calculation of Cable Assembly Loss *Standard*

$$dB = \left(\frac{\text{Cable Attenuation in dB/ft}}{12} \times L(\text{in.})\right) + \text{Connector Loss}$$

Where L is Length in Inches

Calculation of Cable Assembly Loss *Metric*

$$dB = \left(dB/m \times L(m)\right) + \text{Connector Loss}$$

CONNECTOR INSERTION LOSS (PER CONNECTOR) (F IN GHZ)

Cable Series	Connector Type	Maximum Cable Frequency (GHz)	Straight (dB)	Right Angle (dB)
280	N, SMA, TNCA, SC	22	.012 x F	.017 x F
480	N, 7/16, SC & C, 15/8EIA	11	.012 x F	.017 x F
750	7/16, 1 5/8 EIA, 3 1/8 EIA	7.5	.012 x F	
RF085	Industry Standard 085 SR Connectors	60	.012 x F	.017 x F

INSULATED WIRE INCORPORATED

ASSEMBLY LENGTH DEFINITION

The outlines below show typical cable assembly configurations and reference points to determine overall length.

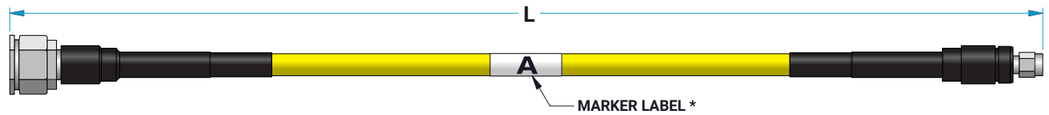


Fig. 1 – NPS-XXXX-XXX-SPS

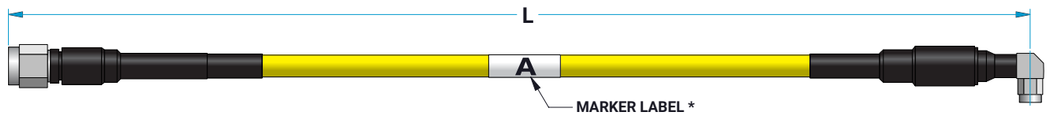


Fig. 2 – TPS-XXXX-XXX-SPRC

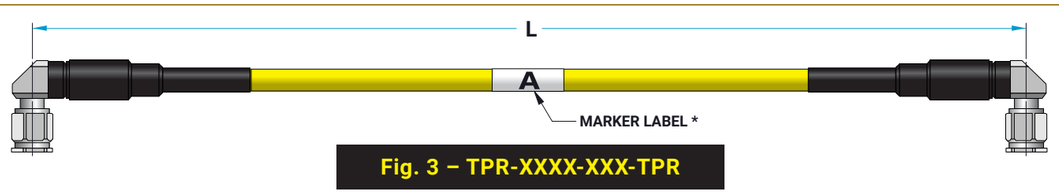


Fig. 3 – TPR-XXXX-XXX-TPR

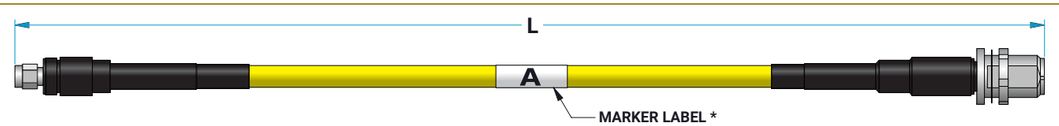


Fig. 4 – SPS-XXXX-XXX-NJB

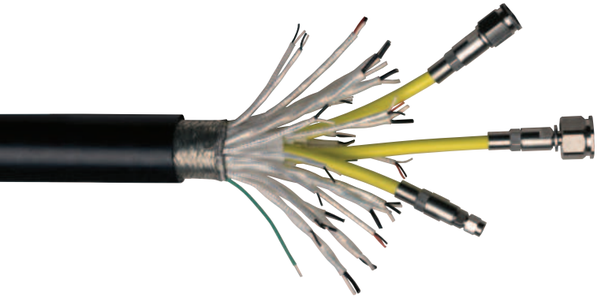
*** A center marker label is fitted to all assemblies over 6" in length; two markers located close to the cableends are fitted for asemblies greater than 10ft./120"/3m.**

Length (in.)	Tolerance (in.)	Length (cm)	Tol (cm)
6 to < 12	+0.50/-0.00	16 to < 30	+1.5/-0.00
12 to < 72	+1.00/-0.00	30 to < 180	+3/-0.00
72 < Length	+2.00/-0.00	180 < Length	+6/-0.00

Note: For Re-Flex™ assemblies with SMA direct solder or shell style connectors, the tolerances are…

2" to < 36"	±0.100"
36" to <72"	±0.250"
72" < Length	±0.500"

CABLE ASSEMBLY PART NUMBER BUILDER



CONNECTOR CODES

B	BNC
G	GPO*/SMP
GG	GPPO*/SMPM
K	2.92 mm (K™)
MB	SMB
MC	SMC
N	N
O	OSP*/BMA
S	SMA
SC	SC
SS	SSMA
T	TNCA
V	1.85 mm (V™)
Z1	ZMA-90º
Z2	ZMA-120º
Z3	ZMA-130/130/100
Z4	ZMA-110/110/140
7	7 mm
3	3.5 mm
2	2.4 mm

TYPE CODES

J	Jack
P	Plug

STYLE CODES

B	Bulkhead mount
O	Obtuse angle (135˚)
P2	2 hole panel mount
P4	4 hole panel mount
R	Right angle
RW	Right angle w/ wire holes
RX	Extended right angle
S	Straight
SD	Straight direct solder
SH	Shell type
SW	Straight w/ wire holes
RC	Right angle, cube body
RCD	Right angle, cube body, direct solder
SQ	Straight “Quik-Flex™”

OPTIONAL PROTECTION

A	Stainless steel flexible armor
N	Black neoprene jacket
NX	Nomex
LC	Low smoke / zero halogen polyurethane

† LC – LS/ZH jacket is available for 140-480 series cables, including 03/06/08; not recommended for Re Flex™. LC jacket can be combined with external armor code ‘A’ for maximum crush resistance in outdoor environments.

†† Neoprene, ‘N’ can be applied to all cable types.

Please consult the factory for custom/ application specific jacket requirements.

DIFFERENTIATOR CODES

1	Solid center conductor
3	Tuf-Flex™ solid center conductor
6	Stranded conductor
8	Tuf-Flex™ stranded center conductor

* OSP is a trademark of M/ACOM.
* GPO/GPPO is a trademark of Corning Gilbert
* K/V is a trademark of Anritsu

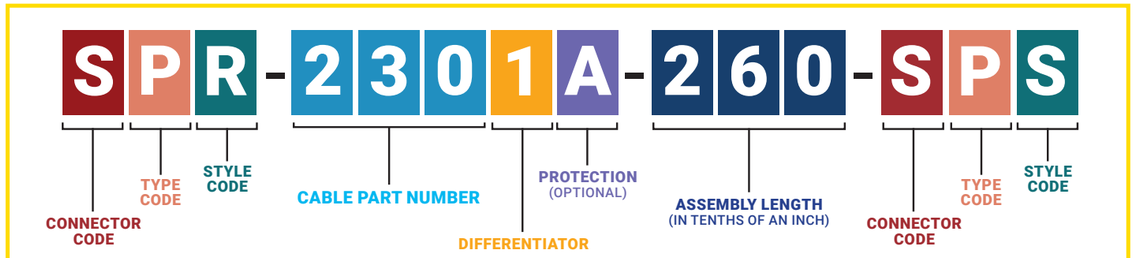
INSULATED WIRE INCORPORATED

CABLE ASSEMBLY PART NUMBER BUILDER

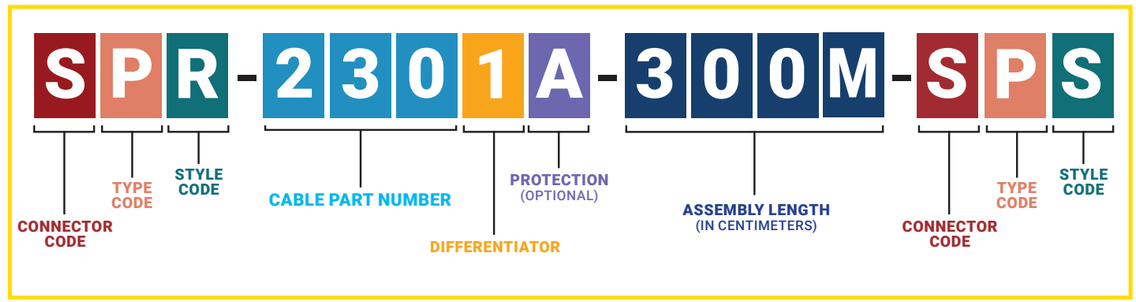
With so many variables involved in creating custom wires for multiple purposes, IW has devised an Part Number (P/N) Coding System which we use to readily identify all our microwavecables.

In the first example part number below, the cable assembly is an SMA right angle plug to a 2301 armored cable at 36” long to an SMA straight plug.

STANDARD PART NUMBER

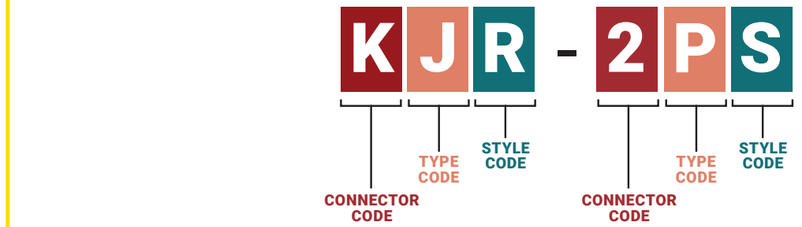


METRIC PART NUMBER



Note: Metric part number format is X.XX meters – 300M defines a 3m length assembly; a 10m assembly part number with the same connectors as shown above is SPR-2301A-1000M-SPS

ADAPTER PART NUMBER



OPTIONAL PROTECTION

BESPOKE PROTECTION

Microwave transmission lines are quite often exposed to a wide range of hostile environments. These may include extreme temperature, abrasion, comprehensive forces, high pressure fluids, solvents, chemicals, salt water, UV, vibration, and mechanical stress, just to name a few.

CUSTOM SOLUTIONS

In addition to our internally ruggedized cables, IW has a wide range of materials and processes designed to protect the integrity of our cable assemblies. These include a variety of metallic and non-metallic external sheaths to address your specific application. Please contact us for details.

ZEL	**Tefzel™ jacket** Tefzel™ is a trademark of Chemours Company FC, LLC
NX	**Fire resistant Nomex® braid** Nomex® is a registered trademark of the DuPont Corporation
A	**Interlocked stainless steel armor, crush resistant up to 400 lbs per linear inch**
N	**Neoprene weather proof jacket**
ALC	**Interlocked stainless steel armor w/extruded Polyurethane jacket**
SP	**Santoprene TPU extruded jacket**

PHASE MATCH AND TIME DELAY

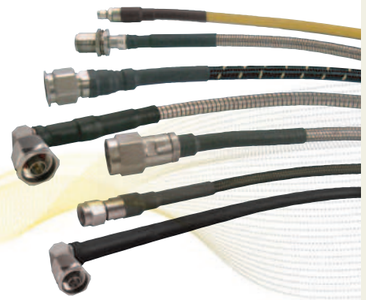
For applications where phase or electrical length is a critical performance parameter, IW can provide matched assembly sets, tested to customer specifications, typically up to 40 GHz, with both Low Loss Phase Stable and Re-Flex™ cable types.

Relative phase matching is a common requirement achieved with multiple assembly sets. Typical phase matching tolerances are shown in Table 1 below.

Tighter tolerances may be achievable; IW engineers review all matching requirements on a case by case basis. In addition, IW also provides time delay matched assemblies with tolerances in the order of 2pS being achievable with both Low Loss and Re-Flex™ cable types, and individual assemblies can also be supplied trimmed to a specific electrical length.

All matched assemblies are tested 100% for insertion loss and VSWR performance parameters in addition to phase.

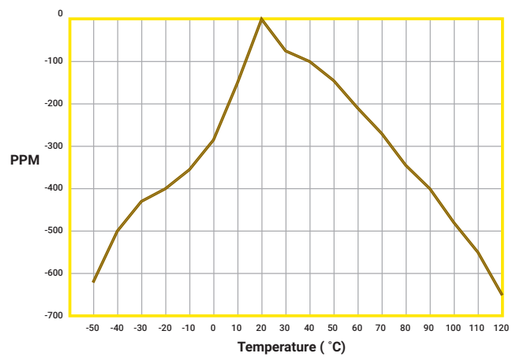
FREQUENCY (GHz)	PHASE MATCH (DEGREES)
10	± 2
18	± 3.5
26.5	± 5
40	± 8



INSULATED WIRE INCORPORATED

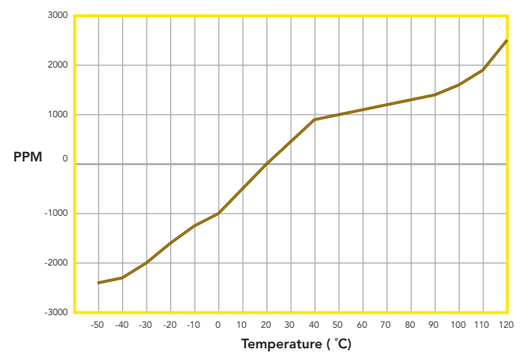
PHASE CHARACTERISTICS

MAX PHASE CHANGE



Max Phase Change for the following cable series:
140, 150, 157, 170, 180, 230, 280 & 480

TYPICAL PHASE CHANGE



Typical phase Change for the following cable series
047, 115, 125, 160, RF085, RF141 and RF250

DETERMINATION OF PHASE CHANGE OVER TEMPERATURE

The following example illustrates how to calculate the change in phase (and the tracking error) of cable assemblies over a specific temperature range. In this example, the cable is IW 2801, and the temperature range is -40˚C to +80˚C.

* determined by the charts above
** tracking error of two or more assemblies of the same type

1. CALCULATE ELECTRICAL LENGTH

2. CALCULATE CHANGE IN PHASE

3. CALCULATE TRACKING ERROR

Frequency	=	10 GHz	f
Assembly length	=	72 in	L
Start temp	=	20˚C	T
Dielectric const	=	1.4	e
Change in PPM	=	-500*	PPM
PPM tracking error	=	±100 PPM tracking	
Electrical length	=	TBD	Φ
Change in phase	=	TBD	ΔΦ
Tracking error	=	TBD**	Φ tracking

PHASE CHANGE WITH FLEXING

Phase change when flexing will be slightly different depending on the particular cable. Larger cables have more dielectric and greater internal forces, thus phase change will be greater for cables with larger diameters. When wrapped 360˚ around a 4 inch diameter mandrel, the phase change will be:

±0.30˚ • f - for cables 480, 280, 230, 180 and 170

±0.20˚ • f - for cables 157, 150 and 140

$$\Phi = \frac{L \cdot \sqrt{e} \cdot f \cdot 360}{11.808}$$

$$\Phi = \frac{72 \cdot \sqrt{1.4} \cdot 10 \cdot 360}{11.808} = 25,973^{\circ}$$

$$\Delta\Phi = \frac{\Phi \cdot PPM}{1,000,000}$$

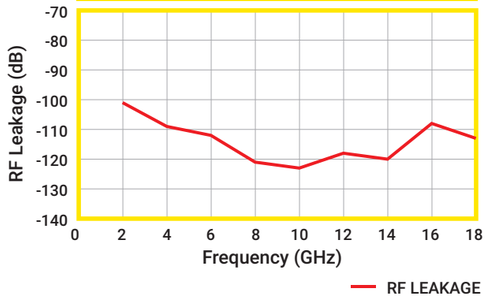
$$\Delta\Phi = \frac{25973 \cdot (-500)}{1,000,000} = -12.93^{\circ}$$

$$\Phi_{tracking} = \frac{\Phi \cdot (PPM\ tracking)}{1,000,000}$$

$$\Phi_{tracking} = \frac{25973 \cdot (\pm 100)}{1,000,000} = \pm 2.6^{\circ}$$

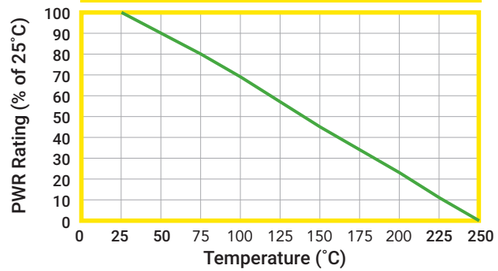
ENGINEERING DESIGN DATA

RF LEAKAGE (IW 1801)

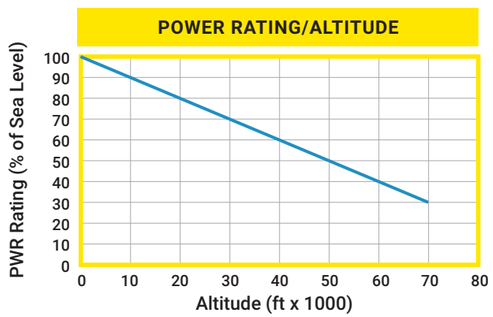


Measured values of IW 1801 cable using the test method specified in MIL-T-81490.

POWER RATING/TEMPERATURE



POWER RATING/ALTITUDE



Insertion Loss vs. Temperature

$$dB_T = \alpha 20 \sqrt{.0038\ (T-20)} + 1$$

Use this equation to determine cable loss (dBT) at any temperature (T) in degrees Celcius. $\alpha 20$ is the cable loss at 20°C

COAXIAL TRANSMISSION LINE EQUATIONS

Impedance (W)

$$Z_o = \frac{138.059}{\sqrt{\varepsilon}} \cdot \log_{10}\left(\frac{D}{d}\right)$$

Cut Off Frequency (GHz)

$$f_{co} = \frac{7.52}{\sqrt{\varepsilon} \cdot (D + d)}$$

Velocity of Propogation (%)

$$V\rho = \frac{100}{\sqrt{\varepsilon}}$$

Outer Conductor Loss (dB)

$$A_c = \frac{2.745 \cdot 10^{-4}}{Zo} \sqrt{\rho f} \left(\frac{K_o l}{D}\right)$$

Inner Conductor Loss (dB)

$$A_c = \frac{2.745 \cdot 10^{-4}}{Zo} \sqrt{\rho f} \left(\frac{K_i l}{D}\right)$$

Dielectric Loss (dB)

$$A_d = (23.15 \cdot 10^{-10}) \cdot \sqrt{\varepsilon} \cdot f \cdot \tan\delta \cdot l$$

Reflection Loss (dB)

$$A_r = 10 \log_{10}\left[\frac{(VSWR+1)^2}{4(VSWR)}\right]$$

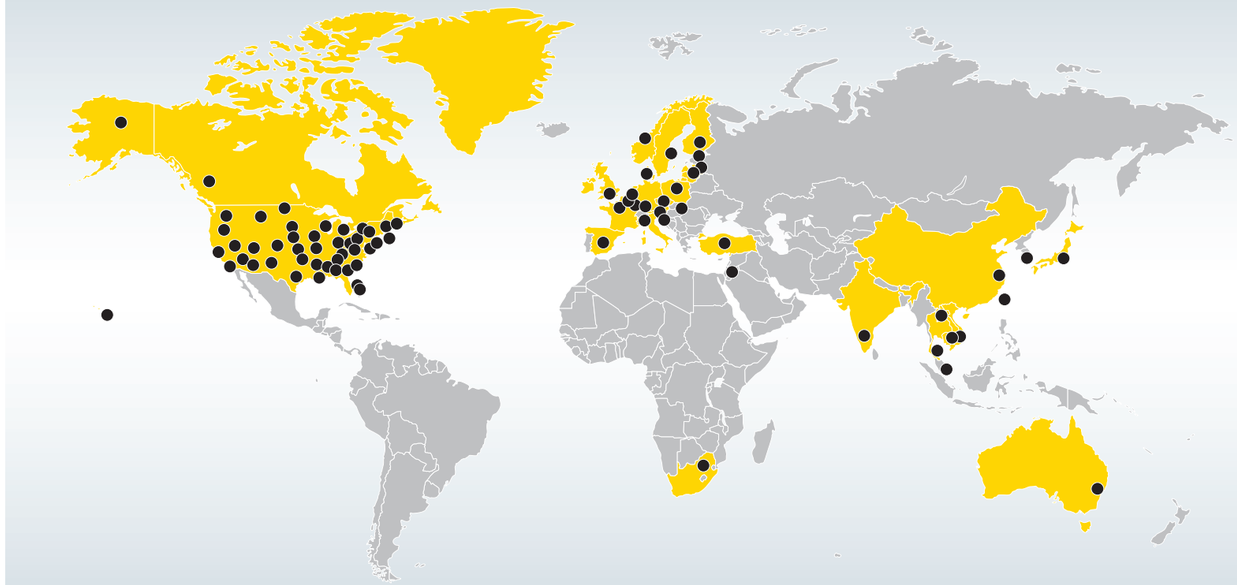
Time Delay (ns/ft)

$$TD = 1.016\sqrt{\varepsilon}$$

Capacitance (pf/ft)

$$C = \frac{1016\sqrt{\varepsilon}}{Z}$$

- D = Inner diameter of outer conductor (inches)
- d = Outer diameter of inner conductor (inches)
- ε = Dielectric constant
- ρ = Resistivity in Ohm-cm
- f = Frequency in Hertz
- l = Length in inches
- Z_o = Characteristic impedance
- K_o = Outer conductor stranding factor
- K_i = Inner conductor stranding factor
- $\tan\delta$ = Loss tangent of dielectric



Contact us to find out where your nearest local IW representative is located

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Visit our website for contact information on your local representative.

Please don't hesitate to contact IW directly if you are unable to locate a representative in your area.

AS9100 & ISO 9001 Certified