

# High Power RF Cable, Connectors & Assemblies



- Semi-Conductor Manufacturing Equipment
- Flat Panel Manufacturing Equipment
- Solar Panel Manufacturing Equipment
- High Power Lasers
- High Power Radars
- TV/FM Broadcast
- Magnetic Resonance Imaging
- Other High Power RF Applications

 **TIMES**  
MICROWAVE SYSTEMS  
An Amphenol Company

## High Power Coaxial Cable, Connectors & Assemblies

Times offers a broad range of cables, connectors and assemblies for high power RF transmission. Applications such as magnetic resonance imaging (MRI), semi-conductor manufacturing equipment, flat panel manufacturing equipment, broadcast and high power lasers and radar each have their own electrical and mechanical requirements. With our broad range of solutions and capability of producing custom cables and connectors, Times is uniquely positioned to help with all of your high power RF transmission applications.

Although Times Microwave Systems is known for providing precision cable assemblies for microwave applications up to 100 GHz, we are also the leading provider of cables and assemblies for high power, low frequency applications. Our broad range of manufacturing capabilities enables us to offer rugged, flexible cables and cable assemblies, that can operate in high ambient temperatures and provide environmental resistance, while handling both high average and peak powers. Constructions are available to meet requirements for low loss, high RF shielding, and low VSWR.

Since each application requires a different set of performance characteristics, having a wide range of cables to choose from allows the trade-offs to be considered and the best cable for the application to be chosen. We produce cables with dielectrics of solid PE and PTFE, SiO<sub>2</sub>, foam PE and expanded PTFE; outer conductors of round wire, flat wire and composite constructions; and jackets of PE, FEP, PVC, Urethane, Nomex®, Kapton® and other materials.

## Connector Selection

At the relatively low frequencies and high powers typically encountered in these applications, considerations for the best interface selection are very different than in microwave applications. Impedance uniformity through the interface is not as critical, but high contact forces, low contact resistance and a large interface diameter are very important. From a performance point of view, EIA flange connectors are the ideal choice with their bolt-together outer contacts and inside spring finger center-contacts. Their disadvantages include large size, high cost and time-consuming installation. Other good choices include LC's and 7/16 DIN's. Frequently, the equipment being connected to dictates the interface. Some interfaces that Times Microwave Systems provide include:

- C
- N
- HN
- 7-16 DIN
- 1-5/8" EIA
- 13-30
- SC
- QDS
- LC
- 7/8" EIA
- 3-1/8" EIA
- Proprietary LC quick disconnect interface

## Cable Assemblies

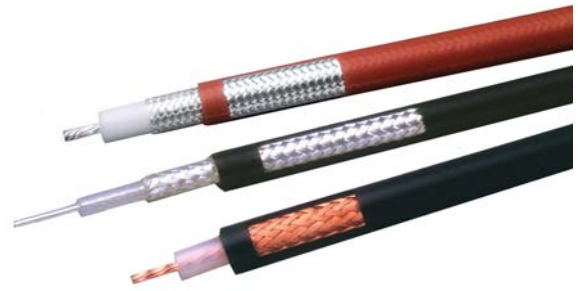
Our capability to manufacture cables and connectors and our expertise in assembling and testing them enable us to design custom cable assemblies for your application. Built to exacting standards, we design our cable assemblies for reliability in the most extreme operating conditions. Assemblies can be matched in phase length or supplied in specific electrical lengths with customer required markings added. Complete test data on VSWR, insertion loss, corona and other parameters can be provided as required.



# HP Cables

## Cable Feature:

Flexibility	Very Good
Attenuation	Medium
Power Handling	Very High
Temperature	High
Connector Availability	Good



	HP-393	HP-226	HP-600A	HP-218	HP-900	HP-1200						
<b>AA Drawing Number</b>	AA-9963	AA-9021	AA-11441	AA-9290	AA-11229	AA-11419						
<b>Stock Code</b>	510-0019	51848	510-0070	51928	54262	54359						
<b>Physical Specifications</b>												
Description	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)						
Center Conductor	Stranded SC	Stranded SC	Stranded SC	Stranded SC	BC Tube	BC Tube						
	0.094 (2.39)	0.126 (3.20)	0.152 (3.86)	0.230 (5.84)	0.227 (5.77)	0.308 (7.82)						
Dielectric	Solid PTFE Tape	Solid PTFE Tape	Solid PTFE Tape	Expanded PTFE Tape	Expanded PTFE Tape	Expanded PTFE Tape						
	0.285 (7.24)	0.370 (9.40)	0.455 (11.56)	0.680 (17.27)	0.680 (17.27)	0.920 (23.27)						
Inner Shield	TC	TC	TC	TC	MT	MT						
	0.314 (7.98)	0.400 (10.13)	0.488 (12.40)	0.710 (18.11)	0.686 (17.42)	0.932 (23.67)						
Outer Shield	TC Braid	TC Braid	TC Braid	TC Braid	TC Braid	TC Braid						
	0.343 (8.71)	0.430 (10.87)	0.520 (13.23)	0.740 (18.95)	0.732 (18.59)	0.980 (24.89)						
Jacket	FEP	FEP	FEP	Nomex/PTFE	Nomex/Kapton	PTFE						
	0.390 (9.91)	0.490 (12.32)	0.590 (14.99)	0.790 (19.94)	0.775 (19.69)	1.050 (26.67)						
<b>Mechanical Specifications</b>												
Bend Radius	2.0 (50.8)	5.0 (127.0)	2.8 (69.9)	8.0 (203.0)	4.0 (101.6)	8.0 (203.2)						
Weight	0.175 lb/ft	0.240 lb/ft	0.325 lb/ft	0.375 lb/ft	0.475 lb/ft	0.740 lb/ft						
Operating Temperature Range	-55/+200C	-55/+200C	-55/+200C	-55/+200C	-55/+200C	-40/+125C						
<b>Electrical Specifications</b>												
Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms						
Shielding Effectiveness	60 dB	60 dB	60 dB	60 dB	90 dB	60 dB						
Dielectric Constant	1.98	1.98	1.98	1.73	1.73	1.73						
Velocity of Propagation	0.71	0.71	0.71	0.76	0.76	0.76						
Capacitance	28.6pF/ft	28.6pF/ft	29.0pF/ft	26.7pF/ft	26.7pF/ft	26.7pF/ft						
Voltage Withstand (kV DC)	5	6.9	8.3	9.45	9.45	12.5						
Attenuation: dB/100ft (100m) +25°C Ambient; Sea Level												
13.56 MHz	0.76	2.48	0.61	1.99	0.50	1.63	0.34	1.11	0.21	0.70	0.16	0.51
50 MHz	1.48	4.87	1.18	3.88	0.98	3.23	0.66	2.15	0.41	1.36	0.31	1.00
100 MHz	2.14	7.01	1.70	5.56	1.43	4.68	0.93	3.06	0.59	1.94	0.44	1.43
1000 MHz	7.64	25.07	5.90	19.34	5.31	17.43	3.07	10.08	1.99	6.54	1.50	4.94
1500 MHz	9.72	31.88	7.44	24.39	6.83	22.40	3.81	12.51	2.49	8.17	1.89	6.21
2000 MHz	11.57	37.95	8.80	28.86	8.20	26.89	4.45	14.61	2.92	9.59	2.23	7.33
2500 MHz	13.28	43.56	10.04	32.94	9.48	31.08	5.03	16.49	3.32	10.88	2.55	8.35
3000 MHz	14.89	48.83	11.21	36.75	10.69	35.05	5.55	18.22	3.68	12.08	2.83	9.30
K1	0.200595		0.161700		0.131000		0.091400		0.057220		0.041900	
K2	0.001300		0.000783		0.001170		0.000183		0.000183		0.000180	
<b>Power (kW)</b>												
+25°C ambient, sea level	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket
13.56 MHz	18.25	4.88	27.00	7.00	32.75	9.93	66.00	17.50	80.00	28.50	125.00	48.25
50 MHz	9.38	2.48	13.75	3.60	16.50	5.03	34.00	9.05	41.00	14.50	65.00	24.75
100 MHz	6.53	1.73	9.70	2.50	11.50	3.45	24.00	9.68	28.75	10.25	45.00	17.25
1000 MHz	1.83	0.48	2.80	0.73	3.10	0.92	7.30	1.93	8.58	3.05	13.00	5.03
1500 MHz	1.43	0.38	2.23	0.58	2.40	0.73	5.85	1.55	6.85	2.45	10.50	4.00
2000 MHz	1.20	0.32	1.88	0.49	2.00	0.60	5.00	1.33	5.85	2.08	8.90	3.40
2500 MHz	1.05	0.28	1.65	0.43	1.75	0.52	4.45	1.18	5.15	1.83	7.80	2.98
3000 MHz	0.95	0.25	1.48	0.38	1.55	0.46	4.00	1.08	4.65	1.65	7.00	2.68

\* SC = Silver Plated Copper  
 \* BC = Bare Copper  
 \* TC = Tinned Copper

\* MT = Metallized Composite Tapes  
 Note: HP-393 is marked RG-393-NPP-SN

# HPL Cables

## Cable Feature:



Flexibility	Very Good
Attenuation	Medium
Power Handling	High
Temperature	Medium
Connector Availability	Good

	HPL-393	HPL-226	HPL-600	HPL-218	HPL-1200					
<b>AA Drawing Number</b>	AA-11461	AA-11460	AA-11458	AA-11459	AA-11475					
<b>Stock Code</b>	510-0079	510-0078	510-0080	510-0077	54367					
<b>Physical Specifications</b>										
Description	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)					
Center Conductor	Stranded BC	Stranded BC	Stranded BC	Stranded BC	Stranded BC					
	0.094 (2.39)	0.117 (2.97)	0.152 (3.86)	0.235 (5.97)	0.314 (7.98)					
Dielectric	PTFE	PTFE	PTFE	PTFE	PTFE					
	0.285 (7.24)	0.370 (9.40)	0.455 (11.56)	0.68 (17.27)	0.920 (23.37)					
Inner Shield	TC	TC	TC	TC	TC					
	0.314 (7.98)	0.400 (10.16)	0.488 (12.40)	0.714 (18.14)	0.966 (24.54)					
Outer Shield	TC	TC	TC	TC	TC					
	0.340 (8.64)	0.427 (10.85)	0.520 (13.21)	0.745 (18.92)	1.012 (25.70)					
Jacket	TPV	TPV	TPV	TPV	TPV					
	0.430 (10.92)	0.515 (13.08)	0.610 (15.49)	0.845 (21.46)	1.200 (30.48)					
<b>Mechanical Specifications</b>										
Bend Radius	2.3 (57.2)	2.8 (69.9)	3.0 (76.2)	4.3 (108.0)	9.0 (228.6)					
Weight	0.185 lb/ft	0.240 lb/ft	0.310 lb/ft	0.610 lb/ft	1.188 lb/ft					
Operating Temperature Range	-55/+125C	-55/+125C	-55/+125C	-55/+125C	-55/+125C					
<b>Electrical Specifications</b>										
Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms					
Shielding Effectiveness	60 dB	60 dB	60 dB	60 dB	60 dB					
Dielectric Constant	1.98	1.98	1.98	1.73	1.73					
Velocity of Propagation	0.71	0.71	0.71	0.76	0.76					
Capacitance	28.8pF/ft	28.8pF/ft	28.9pF/ft	26.8pF/ft	29.0pF/ft					
Voltage Withstand (kV DC)	5	6.4	8.3	9.45	12.5					
Attenuation: dB/100ft (100m) +25C Ambient; Sea Level										
13.56 MHz	0.84	2.74	0.59	1.94	0.51	1.66	0.29	0.96	0.25	0.82
50 MHz	1.62	5.33	1.15	3.79	1.00	3.27	0.56	1.85	0.48	1.59
100 MHz	2.32	7.61	1.65	5.43	1.45	4.74	0.80	2.63	0.69	2.26
1000 MHz	7.87	25.82	5.77	18.92	5.37	17.62	2.63	8.63	2.30	7.56
1500 MHz	9.86	32.33	7.28	23.88	6.90	22.64	3.26	10.70	2.87	9.42
2000 MHz	11.59	38.01	8.62	28.26	8.28	27.17	3.81	12.49	3.37	11.04
2500 MHz	13.16	43.18	9.84	32.28	9.57	31.39	4.30	14.09	3.81	12.51
3000 MHz	14.63	47.97	10.98	36.03	10.79	35.39	4.74	15.56	4.22	13.86
K1	0.224140		0.157660		0.132920		0.078590		0.067100	
K2	0.000783		0.000783		0.001170		0.000146		0.000183	
<b>Power (kW)</b>										
+25 C ambient, sea level	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket
13.56 MHz	13.50	4.73	22.25	7.58	29.25	9.78	65.00	21.75	87.50	33.50
50 MHz	7.03	2.43	11.25	3.88	14.75	4.95	33.50	11.25	45.00	17.25
100 MHz	4.93	1.70	7.95	2.70	10.25	3.40	23.50	8.00	31.50	12.00
1000 MHz	1.45	0.50	2.28	0.78	2.78	0.92	7.23	2.43	9.53	3.65
1500 MHz	1.15	0.40	1.80	0.62	2.15	0.72	5.43	1.95	7.65	2.93
2000 MHz	0.99	0.34	1.53	0.52	1.80	0.60	5.00	1.68	6.53	2.50
2500 MHz	0.87	0.30	1.35	0.46	1.55	0.52	4.43	1.50	5.78	2.20
3000 MHz	0.79	0.27	1.20	0.41	1.38	0.46	4.00	1.35	5.20	2.00

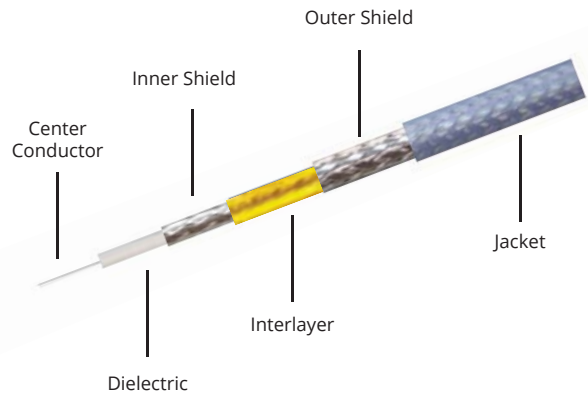
\* MT = Metallized Composite Tapes

\* TPV = Thermoplastic Vulcanizate

# SFT Cables

## Cable Feature:

Flexibility	Good/Very Good
Attenuation	Low
Power Handling	Very High
Temperature	High
Connector Availability	Good



	SFT-393	SFT-226	SFT-500	SFT-600	SFT-900					
<b>AA Drawing Number</b>	AA-8653	AA-8654	AA-11168	AA-9649	AA-60053					
<b>Stock Code</b>	51800	51803	510-0037	51963	510-0153					
<b>Physical Specifications</b>										
Description	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)					
Center Conductor	Solid SC 0.096 (2.44)	Solid SC 0.131 (3.33)	Stranded SC 0.145 (3.68)	Stranded SC 0.160 (4.06)	BC Tube 0.227 (5.77)					
Dielectric	Expanded PTFE Tape 0.285 (7.24)	Expanded PTFE Tape 0.370 (9.40)	Expanded PTFE Tape 0.408 (10.36)	Expanded PTFE Tape 0.455 (11.56)	Expanded PTFE Tape 0.680 (17.27)					
Inner Shield	SC Flat Braid 0.295 (7.49)	SC Flat Braid 0.380 (9.65)	SC Flat Braid 0.420 (10.67)	SC Flat Braid 0.465 (11.81)	SC Flat Braid 0.695 (17.65)					
Interlayer	MT 0.301 (7.65)	MT 0.385 (9.78)	/	MT 0.471 (11.96)	APT 0.703 (17.86)					
Outer Shield	SC 0.330 (8.38)	SC 0.399 (10.14)	SC 0.448 (11.38)	SC 0.500 (12.70)	TC 0.748 (18.99)					
Jacket	FEP 0.390 (9.91)	FEP 0.485 (12.32)	FEP 0.490 (12.45)	FEP 0.555 (14.10)	FEP 0.815 (20.70)					
<b>Mechanical Specifications</b>										
Bend Radius	2.0 (50.8)	2.5 (63.5)	2.5 (63.5)	2.75 (69.9)	4.25 (107.9)					
Weight	0.126 lb/ft	0.235 lb/ft	0.230 lb/ft	0.240 lb/ft	0.535 lb/ft					
Operating Temperature Range	-55/+200 C	-55/+200 C	-55/+200 C	-55/+200 C	-55/+200 C					
<b>Electrical Specifications</b>										
Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms					
Shielding Effectiveness	100 dB	100 dB	80 dB	100 dB	100 dB					
Dielectric Constant	1.73	1.73	1.73	1.73	1.73					
Velocity of Propagation	0.76	0.76	0.76	0.76	0.76					
Capacitance	26.7pF/ft	26.7pF/ft	26.7pF/ft	26.7pF/ft	26.7pF/ft					
Voltage Withstand (kV DC)	5	6	7	8	9.45					
Attenuation: dB/100ft (100m) +25C Ambient; Sea Level										
13.56 MHz	0.50	1.65	0.45	1.49	0.43	1.43	0.37	1.21	0.21	0.69
50 MHz	0.97	3.18	0.87	2.87	0.84	2.75	0.71	2.34	0.41	1.34
100 MHz	1.38	4.52	1.24	4.07	1.19	3.91	1.01	3.32	0.58	1.90
1000 MHz	4.48	14.69	4.04	13.24	3.90	12.78	3.30	10.84	1.95	6.40
1500 MHz	5.53	18.15	4.99	16.37	4.82	15.82	4.09	13.40	2.44	8.00
2000 MHz	6.44	21.12	5.81	19.04	5.62	18.43	4.76	15.61	2.87	9.41
2500 MHz	7.25	23.77	6.54	21.43	6.33	20.76	5.36	17.58	3.26	10.69
3000 MHz	7.99	26.19	7.20	23.62	6.98	22.90	5.91	19.38	3.61	11.84
K1	0.135930		0.122500		0.117433		0.099850		0.051038	
K2	0.000180		0.000164		0.000183		0.000146		0.000366	
<b>Power (Watts)</b>										
+25 C ambient, sea level	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket
13.56 MHz	27.50	7.33	37.00	9.45	42.00	9.98	51.50	12.75	95.00	28.00
50 MHz	14.25	3.80	19.00	4.90	21.75	5.18	26.75	6.70	50.00	14.00
100 MHz	10.00	2.68	13.50	3.45	15.25	3.63	18.75	4.73	35.00	10.00
1000 MHz	3.10	0.82	4.18	1.05	4.70	1.10	5.80	1.45	10.00	3.00
1500 MHz	2.50	0.67	3.38	0.86	3.80	0.90	4.68	1.18	8.30	2.40
2000 MHz	2.15	0.57	2.90	0.74	3.28	0.77	4.03	1.00	7.10	2.10
2500 MHz	1.93	0.51	2.58	0.66	2.90	0.69	3.58	0.89	6.20	1.80
3000 MHz	1.75	0.46	2.35	0.59	2.63	0.62	3.25	0.81	5.60	1.60

\* MT = Metallized Composite Tapes

# RG Cables

## Cable Feature:

Flexibility	Good/Very Good
Attenuation	Medium
Power Handling	Medium/High
Temperature	Medium
Connector Availability	Medium



	M17/74-RG213	M17/75-RG214	M17/127-RG393	M17/78-RG217	M17/79-RG218					
<b>AA Drawing Number</b>	AA-3408	AA-3409	AA-3420	AA-3410	AA-3411					
<b>Stock Code</b>	41508	41510	51509	41511	41512					
<b>Physical Specifications</b>										
Description	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)					
Center Conductor	Stranded BC	Stranded SC	Stranded SC	Solid BC	Solid BC					
	0.0888 (2.26)	0.0888 (2.26)	0.094 (2.39)	0.106 (2.69)	0.195 (4.95)					
Dielectric	PE	PE	PTFE	PE	PE					
	0.285 (7.24)	0.285 (7.24)	0.285 (7.24)	0.370 (9.40)	0.680 (17.27)					
Inner Shield	BC	SC	SC	BC	BC					
	0.318 (8.08)	0.316 (8.02)	0.295 (7.49)	0.403 (10.24)	0.726 (18.44)					
Outer Shield	/	SC	SC	BC	/					
		0.343 (8.71)	0.330 (8.38)	0.436 (11.07)						
Jacket	Type 2 PVC	Type 2 PVC	FEP	Type 2 PVC	Type 2 PVC					
	0.405 (10.29)	0.425 (10.8)	0.390 (9.91)	0.545 (13.84)	0.870 (22.10)					
<b>Mechanical Specifications</b>										
Bend Radius	2.0 (50.8)	2.0 (50.8)	2.0 (50.8)	5.5 (139.7)	9.0 (228.6)					
Weight	0.111 lb/ft	0.130 lb/ft	0.175 lb/ft	0.230 lb/ft	0.460 lb/ft					
Operating Temperature Range	-40/+85C	-40/+85C	-55/+200C	-40/+80C	-40/+80C					
<b>Electrical Specifications</b>										
Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms					
Shielding Effectiveness	40 dB	60 dB	60 dB	60 dB	40 dB					
Dielectric Constant	2.1	2.1	1.98	2.3	2.3					
Velocity of Propagation	0.69	0.69	0.71	0.659	0.659					
Capacitance	30.8pF/ft	30.8pF/ft	28.6pF/ft	30.8pF/ft	30.8pF/ft					
Voltage Withstand (kV DC)	5	5	5	5.8	8					
Attenuation: dB/100ft (100m) +25 C Ambient; Sea Level										
13.56 MHz	0.69	2.27	0.79	2.59	0.76	2.48	0.61	2.00	0.35	1.14
50 MHz	1.36	4.45	1.55	5.08	1.48	4.86	1.19	3.90	0.71	2.31
100 MHz	1.96	6.42	2.23	7.30	2.13	7.00	1.71	5.60	1.05	3.43
1000 MHz	7.05	23.11	7.90	25.91	7.64	25.05	5.97	19.59	4.46	14.63
1500 MHz	8.98	29.45	10.02	32.88	9.71	31.85	7.55	24.75	5.93	19.44
2000 MHz	10.70	35.11	11.91	39.07	11.56	37.92	8.94	29.32	7.30	23.93
2500 MHz	12.30	40.34	13.65	44.77	13.27	43.53	10.22	33.51	8.60	28.22
3000 MHz	13.80	45.27	15.28	50.13	14.88	48.80	11.41	37.43	9.86	32.35
K1	0.183000		0.210000		0.200407		0.162200		0.087800	
K2	0.001260		0.001260		0.001300		0.000842		0.001685	
Power (kW)										
+25 C ambient, sea level	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	50°C jacket	max rating	50°C jacket
13.56 MHz	4.40	4.12	5.13	4.13	19.75	5.95	7.23	5.40	16.75	13.25
50 MHz	2.20	2.12	2.63	2.13	10.00	3.03	3.70	2.78	8.28	6.55
100 MHz	1.60	1.48	1.85	1.48	7.05	2.10	2.58	0.12	5.58	4.43
1000 MHz	0.47	0.44	0.55	0.44	1.98	0.59	0.74	0.55	1.30	1.03
1500 MHz	0.38	0.35	0.44	0.35	1.55	0.46	0.58	0.44	0.99	0.78
2000 MHz	0.32	0.30	0.37	0.30	1.30	0.39	0.49	0.37	0.80	0.63
2500 MHz	0.28	0.26	0.33	0.26	1.13	0.34	0.43	0.32	0.68	0.54
3000 MHz	0.26	0.24	0.30	0.24	1.03	0.30	0.39	0.29	0.59	0.47

# Other Cables

	AA-11222		AA-11223		AA-9193		SFT-600-BCCAL		SFT-600-BCCAL-PUR	
<b>AA Drawing Number</b>	AA-11222		AA-11223		AA-9193		AA-8980		AA-9593	
<b>Stock Code</b>	510-0042		510-0043		51887		51839		51956	
<b>Physical Specifications</b>										
Description	in (mm)		in (mm)		in (mm)		in (mm)		in (mm)	
Center Conductor	RSC		RSC		RSC		BC		BCCAI	
	0.160 (4.06)		0.160 (4.06)		0.160 (4.06)		0.150 (3.81)		0.150 (3.81)	
Dielectric	PTFE		PTFE		PTFE		PTFE		PTFE	
	0.455 (11.56)		0.455 (11.56)		0.455 (11.56)		0.455 (11.56)		0.455 (11.45)	
Inner Shield	FSC		SC		SC		SC		FSC	
	0.465 (11.81)		0.478 (12.14)		0.478 (12.14)		0.465 (11.81)		0.465 (11.81)	
Interlayer	MT		/		/		APT		MT	
	0.469 (11.91)						0.469 (11.91)		0.469 (11.91)	
Outer Shield	TC		SC		SC		TC		TC	
	0.508 (12.90)		0.501 (12.73)		0.501 (12.73)		0.508 (12.90)		0.508 (12.90)	
Jacket	PUR		PUR		FEP		FEP		PUR	
	0.560 (14.22)		0.560 (14.22)		0.555 (14.10)		0.560 (14.22)		0.560 (14.22)	
<b>Mechanical Specifications</b>										
Bend Radius	2.5 (63.5)		2.5 (63.5)		2.5 (63.5)		2.5 (63.5)		2.5 (63.5)	
Weight	0.300 lb/ft		0.285 lb/ft		0.260 lb/ft		0.235 lb/ft		0.220 lb/ft	
Operating Temperature Range	-55/+105C		-55/+105C		-55/+200C		-55/+200C		-55/+90C	
<b>Electrical Specifications</b>										
Impedance	50 ohms		50 ohms		50 ohms		50 ohms		50 ohms	
Shielding Effectiveness	100 dB		60 dB		60 dB		100 dB		100 dB	
Dielectric Constant	1.73		1.73		1.73		1.73		1.73	
Velocity of Propagation	0.76		0.76		0.76		0.76		0.76	
Capacitance	26.7pF/ft		26.7pF/ft		26.7pF/ft		26.7pF/ft		26.7pF/ft	
Voltage Withstand (kV DC)	8		8		8		6		7.5	
Attenuation: dB/100ft (100m) +25 C Ambient; Sea Level										
13.56 MHz	0.38	1.24	0.46	1.51	0.46	1.51	0.32	1.06	0.32	1.06
50 MHz	0.73	2.39	0.89	2.91	0.89	2.91	0.62	2.05	0.62	2.05
100 MHz	1.04	3.40	1.26	4.14	1.26	4.14	0.89	2.91	0.89	2.91
1000 MHz	3.40	11.17	4.11	13.49	4.11	13.49	2.93	9.62	2.93	9.62
1500 MHz	4.22	13.84	5.09	16.69	5.09	16.69	3.64	11.95	3.64	11.95
2000 MHz	4.92	16.14	5.93	19.44	5.93	19.44	4.26	13.96	4.26	13.96
2500 MHz	5.55	18.21	6.67	21.89	6.67	21.89	4.81	15.76	4.81	15.76
3000 MHz	6.13	20.10	7.36	24.13	7.36	24.13	5.31	17.43	5.31	17.43
K1	0.101875		0.124310		0.124310		0.086948		0.086948	
K2	0.000183		0.000183		0.000183		0.000183		0.000183	
<b>Power (kW)</b>										
+25 C ambient, sea level	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket
13.56 MHz	26.00	12.50	21.75	10.25	46.75	10.25	49.00	11.75	24.50	14.75
50 MHz	13.50	6.53	11.25	5.38	24.00	5.33	25.25	6.13	12.50	7.63
100 MHz	9.55	4.58	8.03	3.78	17.00	3.75	17.75	4.30	8.90	5.35
1000 MHz	2.90	1.40	2.45	1.15	5.25	1.15	5.40	1.30	2.70	1.63
1500 MHz	2.35	1.13	1.98	0.94	4.25	0.93	4.35	1.05	2.18	1.30
2000 MHz	2.00	0.97	1.70	0.81	3.65	0.80	3.73	0.90	1.85	1.10
2500 MHz	1.78	0.86	1.53	0.72	3.23	0.71	3.30	0.80	1.65	0.99
3000 MHz	1.63	0.78	1.38	0.65	2.93	0.65	3.00	0.72	1.48	0.90

\* RSC = Rope Stranded Silver Plated Copper  
\* FSC = Silver Plated Copper Flat Strip Braid

\* BCCAI = Bare Copper Clad Aluminum

# Other Cables

	HFlex-142		AA-11406		QEAM-810		HP-1200-PUR		LMR-1700-DB-TPV	
<b>AA Drawing Number</b>	AA-9406		AA-11406		AA-8848		AA-11470		AA-11629	
<b>Stock Code</b>	51929		510-0063		51816		54365		54376	
<b>Physical Specifications</b>										
Description	in (mm)		in (mm)		in (mm)		in (mm)		in (mm)	
Center Conductor	SC		SC		SC		BC Tube		BC Tube	
	0.038 (0.01)		0.097 (2.46)		0.228 (5.79)		0.308 (7.82)		0.516 (13.11)	
Dielectric	PTFE		PTFE		PTFE		PTFE		PE	
	0.105 (2.67)		0.285 (7.24)		0.620 (15.75)		0.920 (23.37)		1.35 (34.29)	
Inner Shield	SC		SC		FSC		MT		APA	
	0.123 (3.12)		0.306 (7.77)		0.630 (16.00)		0.932 (23.67)		1.356 (34.44)	
Interlayer	/		/		MT		/		/	
	/		/		0.636 (16.15)		/		/	
Outer Shield	SC		SC		TC		TC		TC	
	0.141 (3.58)		0.328 (8.33)		0.665 (16.89)		0.980 (24.89)		1.402 (35.61)	
Jacket	FEP		PUR		PUR		PUR		TPV	
	0.170 (4.32)		0.400 (10.16)		0.810 (20.57)		1.200 (30.48)		1.600 (40.64)	
<b>Mechanical Specifications</b>										
Bend Radius	1.5 (38.1)		2.0 (50.8)		8.0 (203.2)		7.0 (177.8)		13.5 (342.9)	
Weight	0.030 lb/ft		0.135 lb/ft		0.400 lb/ft		0.950 lb/ft		0.68 lb/ft	
Operating Temperature Range	-55/+200C		-55/+105C		-55/+80C		-40/+105C		-50/+105C	
<b>Electrical Specifications</b>										
Impedance	50 ohms		50 ohms		50 ohms		50 ohms		50 ohms	
Shielding Effectiveness	60 dB		60 dB		100 dB		90 dB		90 dB	
Dielectric Constant	1.73		1.73		1.56		1.73		1.26	
Velocity of Propagation	0.76		0.76		0.8		0.76		0.89	
Capacitance	26.8pF/ft		26.9pF/ft		25.4pF/ft		26.7pF/ft		22.8pF/ft	
Voltage Withstand (kV DC)	2		5		9.2		12.5		9	
Attenuation: dB/100ft (100m) +25 C Ambient; Sea Level										
13.56 MHz	1.59	5.23	0.71	2.34	0.27	0.89	0.16	0.51	0.10	0.33
50 MHz	3.08	10.12	1.38	4.51	0.53	1.73	0.30	0.99	0.20	0.64
100 MHz	4.39	14.40	1.95	6.39	0.75	2.46	0.43	1.42	0.28	0.93
1000 MHz	14.56	47.76	6.25	20.51	2.47	8.09	1.50	4.92	1.00	3.27
1500 MHz	18.10	59.38	7.69	25.23	3.06	10.03	1.89	6.19	1.26	4.14
2000 MHz	21.17	69.43	8.92	29.25	3.57	11.71	2.23	7.31	1.50	4.91
2500 MHz	23.93	78.48	10.00	32.81	4.03	13.21	2.54	8.34	1.71	5.62
3000 MHz	26.47	86.82	10.99	36.05	4.45	14.59	2.83	9.29	1.91	6.28
K1	0.429235		0.193622		0.073588		0.041586		0.026741	
K2	0.000986		0.000129		0.000139		0.000185		0.000150	
Power (kW)										
+25 C ambient, sea level	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	60°C jacket	max rating	50°C jacket
13.56 MHz	6.05	1.35	11.00	5.25	28.75	22.75	98.75	53.50	81.75	75.25
50 MHz	3.13	0.70	5.78	2.73	14.75	11.75	50.50	27.25	41.75	38.50
100 MHz	2.20	0.49	4.08	1.93	10.50	8.28	35.25	19.00	29.00	26.75
1000 MHz	0.67	0.15	1.28	0.60	3.20	2.50	10.25	5.55	8.28	7.63
1500 MHz	0.54	0.12	1.03	0.49	2.58	2.03	8.15	4.43	6.55	6.03
2000 MHz	0.46	0.10	0.89	0.42	2.20	1.73	6.90	3.75	5.53	5.08
2500 MHz	0.41	0.09	0.80	0.37	1.95	1.53	6.08	3.28	4.83	4.43
3000 MHz	0.37	0.08	0.73	0.34	1.78	1.40	5.45	2.95	4.30	3.98



## Threaded EIA connectors

EIA Flange connectors are rugged and are often the optimal choice when working with very high power levels. If there is a disadvantage to the EIA flange, it's the large outer diameter of the flange which may result in a routing challenge when installing a finished assembly. In the case of the 1 5/8" EIA, we've addressed this issue by developing both a threaded 1 5/8" connector as well as a separate 1 5/8" flange adapter. The combined assembly will handle the power of 1 5/8" connector and will allow the assembly to be routed through a bulkhead hole/knockout having a diameter which is only a fraction of that required by the standard 1 5/8" connector. This new 1 5/8" EIA connector combination is currently available for our HP-1200-PUR cable.



3191-6001  
Adaptor Threaded 1-5/8" EIA Male  
to 1-5/8" EIA



3190-6069  
Connector Threaded 1-5/8" EIA Female  
for HP-1200-PUR

## Quick Disconnect - QDLC & QDS

Times Microwave Systems provides a few types of quick disconnect connectors including QDLC and QDS.

The interface is a proprietary Times developed specifically for high power applications. Based on LC interface, it includes an overlapping dielectric and a quick disconnect mechanism to allow quick installation and removal. We also supply mating female connectors.



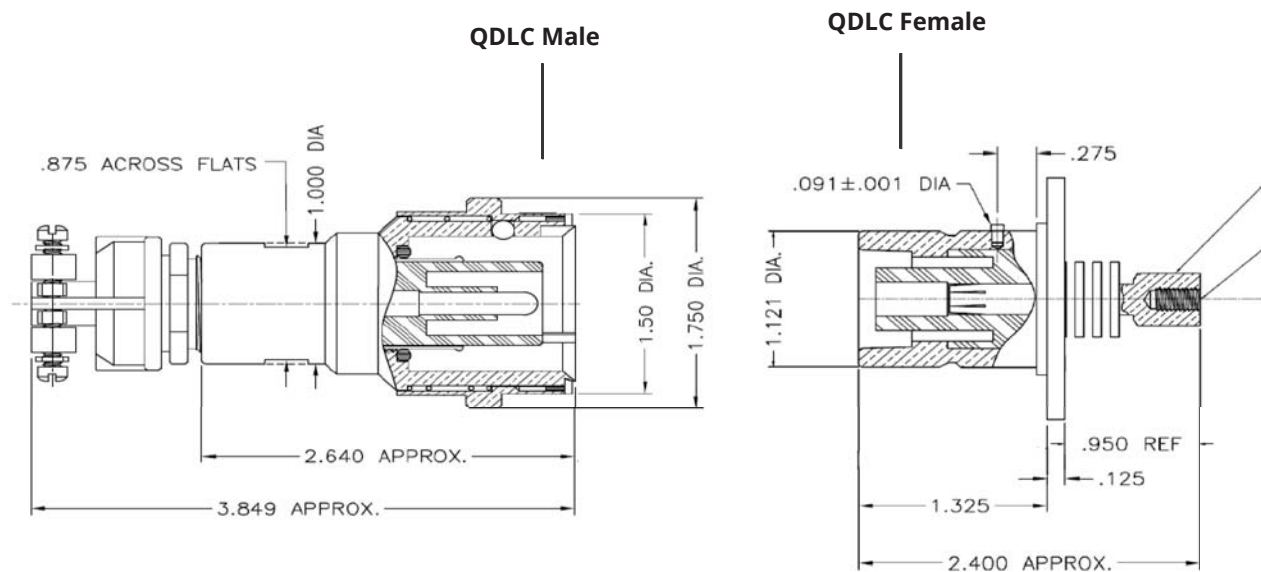
TC-400-QDSM



TC-600-QDSM-RA

## Clam Shell Clamp Strain Relief

Many high power applications in semi-conductor and flat panel manufacturing require periodically moving cables for maintenance and cleaning operations. This places a great deal of strain on the cable to connector interface. The use of a secondary clam-shell style clamp to secure the connector to the cable is an effective way to provide strain relief and prevent cable to connector failures. Although there may be some distortion of the cable shape, at frequencies below 100 MHz or so, this does not cause a performance issue.



# Connectors

We offer a broad range of high power connectors. Below are some of them for reference. Please consult our factory for more details.

Cable Category	Series	Stock Code	Part Number	Cable Attachment
RG-393 HP-393 RG-213 RG-214 HPL-393	716M	3190-2692	TC-393-716M-CL	C-S-C
	716MRA	3190-2693	TC-393-716M-RA-CL	C-S-C
	HNM	3190-2663	TC-393-HNM-CL	C-S-C
	HNMRA	3190-2559	TC-393-HNM-RA-CL	C-S-C
	LCM	3190-2565	TC-393-LCM-CL	C-S-C
	LCMRA	3190-2561	TC-393-LCM-RA-CL	C-S-C
	NM	3190-2745	TC-393-NM-CL	C-S-C
	NMRA	3190-2754	TC-393-NM-RA-CL	C-S-C
	SCM	3190-2569	TC-393-SCM-CL	C-S-C
SCMRA	3190-2570	TC-393-SCM-RA-CL	C-S-C	
HP-226	716M	3190-2624	TC-226-716M-CL	C-S-C
	716MRA	3190-2625	TC-226-716M-RA-CL	C-S-C
	LCM	3190-2665	TC-226-LCM-CL	C-S-C
	LCMRA	3190-2666	TC-226-LCM-RA-CL	C-S-C
SFT-500	716M	3190-2730	TC-500T-716MC	Clamp
	716MRA	3190-2729	TC-500T-716MC-RA	Clamp
	HNM	3190-2732	TC-500T-HNMC	Clamp
	HNMRA	3190-2731	TC-500T-HNMC-RA	Clamp
SFT-600 HP-600	158EIA	3190-2485	EZ-600T-158EIA-CL	C-S-C
	716M	3190-2636	TC-600T-716MC	Clamp
	716MCL	3190-2595	TC-600T-716M-CL	C-S-C
	716MRA	3190-2637	TC-600T-716MC-RA	Clamp
	716MRA	3190-2594	TC-600T-716M-RA-CL	C-S-C
	78EIA	3190-2755	EZ-600T-78EIA-CL	C-S-C
	78EIA	3190-6163	TC-600T-78EIA-RA-CL	C-S-C
	158EIA	3190-2568	EZ-600T-158EIA-CL (.59")	C-S-C
	158EIA	3190-6229	TC-600T-158EIA-RA-CL	C-S-C
	HNM	3190-2564	TC-600T-HNM-CL	C-S-C
	HNMRA	3190-2560	TC-600T-HNM-RA-CL	C-S-C
	LCM	3190-2566	TC-600T-LCM-CL	C-S-C
	LCMRA	3190-2562	TC-600T-LCM-RA-CL	C-S-C
	NM	3190-2583	TC-600T-NM-CL	C-S-C
	SCM	3190-2971	TC-600T-SCM-CL	C-S-C
	NMRA	3190-2757	TC-600T-NM-RA-CL	C-S-C
	13-30M	3190-6333	TC-600T-1330M-CL	C-S-C
	QDLCMRA	3190-6129	TC-AMAT-QDLCM-RA-CL	C-S-C
QDLCM	3190-2383	TC-600T-QDLCM-CL	C-S-C	

\* "C-S-C"=Clam Shell Clamp

# Connectors

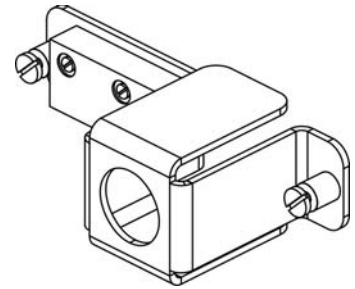
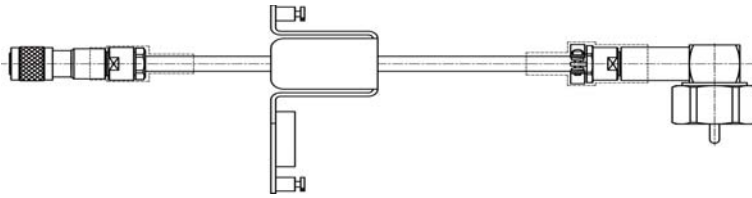
We offer a broad range of high power connectors. Below are some of them for reference. Please consult our factory for more details.

Cable Category	Series	Stock Code	Part Number	Cable Attachment	
RG-217	HNM	3190-6358	TC-217-HNMC	Clamp	
	HNMRA	3190-6359	TC-217-HNMC-RA	Clamp	
RG-218	LCMRA	3190-2587	TC-218-LCM-RA-CL	C-S-C	
	LCM	3190-1447	TC-218-LCMC	Clamp	
HP-218 HPL-218	LCMRA	3190-2587	TC-218-LCM-RA-CL	C-S-C	
	LCM	3190-2482	TC-218-LCM-CL	C-S-C	
	716M	3190-6194	TC-218-716M-CL	C-S-C	
	78EIA	3190-6118	TC-218-78EIA-CL	C-S-C	
	158EIA	3190-6415	TC-218-158EIA-RA-CL	C-S-C	
	318EIA	3190-6256	TC-218-318EIA-RA	Clamp	
	318EIA	3190-6262	TC-218-318EIA-CL	Clamp	
HP-900 LMR-900-LLPX	NF	3190-1586	EZ-900-NFC-PL-2	Clamp	
	NM	3190-1585	EZ-900-NMC-PL-2	Clamp	
	716M	3190-1549	EZ-900-716MC-PL-2	Clamp	
QEAM-810	LCM	3190-2631	LC Male for QEAM-810	C-S-C	
	NTRM	3190-2553	TC-Q810-NTRMC-RA	Clamp	
	LCM	3190-2631	TC-Q810-LCMC-CL	C-S-C	
	LCM	3190-2796	TC-Q810-LCMC-LW-RA-CL	C-S-C	
HP-1200 LMR-1200-LLPX	158EIA	3190-2724	EZ-HP1200-158EIA	Clamp	
	318EIA	3190-2915	EZ-HP1200-318EIA	Clamp	
	NF	3190-912	EZ-1200-NFC-PL	Clamp	
	NM	3190-911	EZ-1200-NMC-PL	Clamp	
	NM	3190-6021	EZ-1200-NMC-PL-2	Clamp	
Receptacle	QDSF	3191-296	QDSF-PM w/threaded pin		
	QDLCF		3191-274	QDLCF-RA-PM w/threaded pin	
			3191-293	QDLCF-PM(1.25SQ) w/threaded pin	
			3191-294	QDLCF-RA-PM w/spring pin	
			3191-295	QDLCF-PM w/spring pin	
			3191-297	QDLCF-PM(2SQ) w/threaded pin	
			3191-300	QDLCF-PM w/solder cup pim	
Adapter	HNF-HNF	3191-360	HN Female to HN Female		
	716M-716F	3191-361	7-16 DIN Male to n Female		
	QDLCF-LCM	3191-302	QDLC Female to LC male		
	QDLCM-LCF	3191-303	QDLC Male to LC Female		
	158EIA	3191-6001	Threaded 1-5/8" EIA Male to 1-5/8" EIA		
	NF-1330F	3191-6029	Type N Female to 13-30 Female		

\* "C-S-C"=Clam Shell Clamp

# Custom Interlock Bracket

Times Microwave Systems offers the customized brackets to allow mounting of interlock switches.



# Selection of RF Coaxial Cable by Power Handling

Electrical losses in a coaxial cable result in the generation of heat in the center and outer conductors, as well as in the Selection of RF Coaxial Cable by Power Handling dielectric core. The power handling capability of a cable is related to the ability of the cable to dissipate this heat. The ultimate limiting factor in power handling is the maximum allowable operating temperature of the materials used in the cable, especially the dielectric. This is because most of the heat is generated at the center conductor of the cable. In general, the power handling capability of a given cable is inversely proportional to its attenuation, and directly related to its size. The other factor is the heat transfer properties of the cable, especially the dielectric.

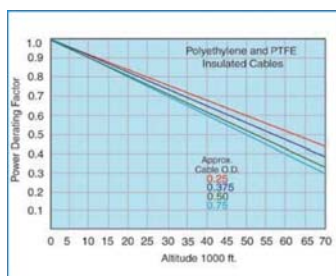
Cable power ratings must be derated by correction factors for the ambient temperature, altitude and VSWR encountered in a particular application. High ambient temperature and high altitude reduce the power rating of a cable by impeding heat transfer out of the cable, VSWR reduces power rating by causing localized hot spots in the cable.

To select the cable construction for a particular requirement, determine the average input power at the highest frequency from system requirements. Then determine the effective average input power as follows:

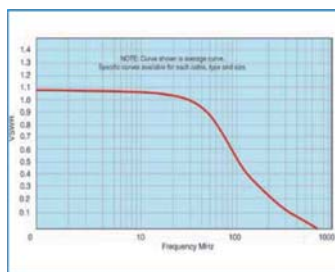
$$\text{Effective Power} = \frac{\text{Average Power} \times (\text{VSWR correction})}{(\text{Temp. correction}) \times (\text{Alt. correction})}$$

Temperature and altitude corrections are shown as:

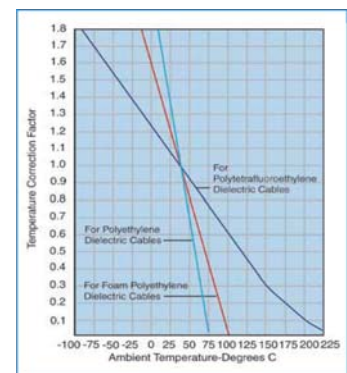
Power Altitude Correction Factor:



VSWR Correction Factor Multiplier K



Power Temperature Correction Factor:



VSWR correction factor =

$$1/2 (\text{VSWR} + \frac{1}{\text{VSWR}}) + 1/2 k (\text{VSWR} - \frac{1}{\text{VSWR}})$$

Where k, is shown in the second Figure. Select a cable from the Attenuation and Power charts rated at this effective power level. Note that the peak power handling capability of a cable is related to the maximum operating voltage rating.

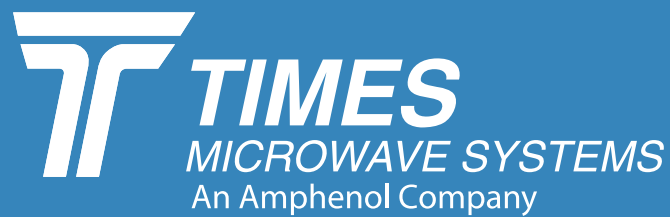
**Notes:**

## MISSION

TIMES MICROWAVE SYSTEMS designs and manufactures high performance RF and microwave transmission lines. These products consist of coaxial cables, connectors, accessories and cable assemblies.

We are committed to understanding the needs and requirements of our customers and providing highly engineered, cost effective products.

TIMES MICROWAVE SYSTEMS is dedicated to total customer satisfaction and superior results for our shareholders in all we do.



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