

Rectangular Waveguide Attenuation in English and Metric Units

Waveguide Size	Frequency GHz	Loss, dB/100-ft.	Loss, dB/100m
WR-229		3.30-4.90 GHz	
	3.300	.093	3.06
	3.700	.079	2.60
	4.100	0.72	2.37
	4.500	0.68	2.24
	4.900	0.66	2.17
WR-187		3.95-5.85 GHz	
	3.950	1.37	4.50
	4.200	1.23	4.05
	4.600	1.11	3.63
	5.000	1.03	3.38
	5.400	0.98	3.23
	5.850	0.95	3.13
WR-159		4.900-7.050 GHz	
	4.900	1.53	5.02
	5.300	1.38	4.52
	5.700	1.28	4.21
	6.100	1.22	4.01
	6.500	1.18	3.87
	7.050	1.14	3.75
WR-137		5.850-8.200 GHz	
	5.850	1.95	6.39
	6.300	1.79	5.87
	6.700	1.70	5.57
	7.100	1.63	5.36
	7.500	1.59	5.22
	7.900	1.56	5.11
	8.200	1.54	5.05
WR-112		7.05-10.0 GHz	
	7.050	2.73	8.95
	7.500	2.53	8.29
	8.000	2.38	7.81
	8.500	2.28	7.47
	9.000	2.21	7.24
	9.500	2.16	7.08
	10.000	2.12	6.96

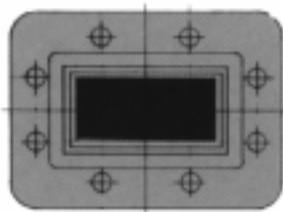
Waveguide Size	Frequency GHz	Loss, dB/100-ft.	Loss, dB/100m
WR-90		8.2-12.4 GHz	
	8.200	4.26	13.98
	8.500	3.99	13.09
	9.000	3.67	12.05
	9.500	3.45	11.33
	10.000	3.30	10.82
	10.500	3.18	10.44
	11.000	3.10	10.16
	11.500	3.03	9.94
	12.000	2.98	9.78
	12.400	2.95	9.68
WR-75		10.0-15.0 GHz	
	10.000	5.04	16.54
	11.000	4.36	14.30
	12.000	3.99	13.08
	13.000	3.76	12.34
	14.000	3.62	11.87
	15.000	3.52	11.56
WR-62		12.4-18.0 GHz	
	12.400	6.35	20.83
	13.000	5.92	19.42
	14.000	5.44	17.84
	15.000	5.13	16.82
	16.000	4.92	16.14
	17.000	4.77	15.66
	18.000	4.67	15.33
WR-42		18.00-26.50 GHz	
	18.000	13.58	44.55
	20.000	11.78	38.66
	22.000	10.86	35.65
	24.000	10.34	33.94
	26.500	9.99	32.77

Attenuations based on 1.0 VSWR.
Ambient Temperature 24°C (75°F).
High Conductivity Copper.

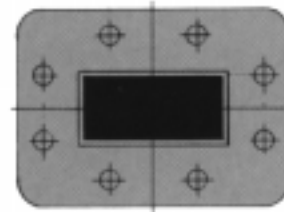
Reference values accurate to + 5%.

Gabriel Electronics parabolic antennas and transmission lines which employ rectangular waveguide connectors are equipped with flanges based on EIA (Electronic Industry Association) and MIL (UG) (U.S. Military) specifications. All rectangular waveguide flanges are supplied with the required hardware and gaskets. The tables that follow identify various flange types including the IEC (International Electrotechnical Commission) versions.

Pressurizable Contact Flanges



CPR(G) Flange (Grooved)



CPR(F) Flange (Flat)

CPR Contact Flange ("G" Grooved Type)

CPR Grooved G-type pressurizable contact flange mates with nuts and bolts. A single full gasket or two one-half thickness gaskets are used when mating a CPR G-type flange to a CPR G-type flange. When mating a CPR G-type flange to a CPR F(Flat)-type flange, a one-half thickness gasket is required. A single one-half is also used when mating a CPR G-type flange with a wafer type pressure window.

CPR Contact Flange ("F" Flat Type)

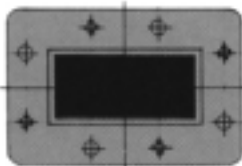
CPR flat F-type pressurizable contact flanges mate with nuts and bolts plus a special conductive gasket. When mating a CPR F-type flange with a CPR G-type flange, a one-half thickness gasket is required.

PDR Contact Flanges

PDR (IEC) contact flanges require different gaskets because of deeper gasket grooves. There are also small tolerance and hardware differences but CPR and PDR flanges can be mated.

Recommended Frequency Operating Range	Waveguide Type EIA	EIA Flange Designation (Grooved)	MIL Type Flange (Grooved)	IEC Flange	EIA Flange (Flat)	MIL Type Flange (w/o Groove)	Flange Outside Dimension inches (mm)	
10.00-15.00	WR-75	n/a	n/a	PDR120	n/a	n/a	1.94 x 1.57	(49.3 x 39.9)
8.20-12.40	WR-90	CPR90G	UG-1360/U	PDR100**	CPR90F	UG-1736/U	2.09 x 1.59	(53.1 x 40.4)
7.05-10.00	WR-112	CPR112G	UG-1358/U	PDR84*	CPR112F	UG-1734/U	2.50 x 1.75	(63.5 x 44.5)
5.85-8.20	WR-137	CPR137G	UG-1356/U	PDR70**	CPR137F	UG-1732/U	2.59 x 1.94	(65.8 x 49.3)
4.90-7.05	WR-159	CPR159G	UG-1354/U	PDR58	CPR159F	UG-1730/U	3.19 x 2.44	(81.0 x 62.0)
3.95-5.85	WR-187	CPR187G	UG-1352/U	PDR48	CPR187F	UG-1728/U	3.50 x 2.50	(88.9 x 63.5)
3.30-4.90	WR-229	CPR229G	UG-1350/U	PDR40	CPR229F	UG-1726/U	3.88 x 2.75	(98.6 x 69.9)
2.60-3.95	WR-284	CPR284G	UG-1348/U	PDR32	CPR284F	UG-1724/U	4.50 x 3.00	(114.3 x 76.2)

* IEC flange mates to CPR flange with 4 mm hardware only.
** IEC flange mates to CPR flange with US #10 hardware only.



CMR Flange

CMR Unpressurizable Contact Flange

CMR unpressurizable contact flanges are available with three different types of attachment hole patterns (all tapped holes, alternate tapped/clearance holes and all clearance holes), and they do not require gaskets. The appropriate hardware bolts only or bolts, nuts and lockwashers, as required, are supplied. IEC (International Electrotechnical Commission) versions (UER) have all clearance holes and are attached with bolts, nuts and lockwashers.

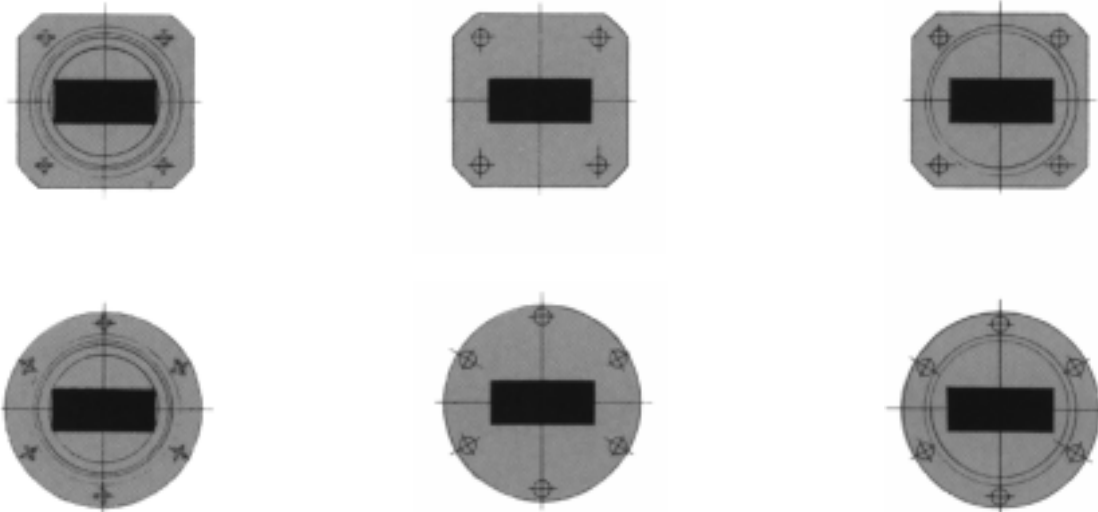
Unpressurizable Contact Flange

W/G Type EIA	Flange Series Equivalents EIA IEC		Dimensions inches (mm)	
WR-90	CMR90	UER100	1.77 x 1.27	(45.0 x 32.3)
WR-112	CMR112	UER84	2.02 x 1.38	(51.3 x 35.1)
WR-137	CMR137	UER70	2.28 x 1.53	(57.9 x 38.9)
WR-159	CMR159	UER58	2.50 x 1.75	(63.5 x 44.5)
WR-187	CMR187	UER48	2.78 x 1.78	(70.6 x 45.2)
WR-229	CMR229	UER40	3.16 x 2.00	(80.3 x 50.8)
WR-284	CMR284	UER32	3.84 x 2.34	(97.5 x 59.4)

CPR Gaskets (Full & Half)

Flange	Half Gasket	Full Gasket
CPR90G	GASKET90H	GASKET90
CPR112G	GASKET112H	GASKET112
CPR137G	GASKET137H	GASKET137
CPR159G	GASKET159H	GASKET159
CPR187G	GASKET187H	GASKET187
CPR229G	GASKET229H	GASKET229

Choke / Cover Flanges



Choke Flanges

Cover Flanges

Cover / Gasket Flanges

Choke Flanges

UG (MIL) Choke Flanges and CBR/ CAR (IEC) Choke Flanges contain a gasket groove, choke groove and tapped holes to mate with the applicable cover flange. A single O-ring is used when a choke and cover flange are mated. When a choke flange is mated with a cover / gasket flange, an O-ring gasket and a half gasket are required. Choke flanges are not intended to mate with choke flanges.

Cover Flanges

UG (MIL) Cover Flanges and UBR / UAR (IEC) Cover Flanges have flat faces and clearance holes. Choke and cover flange connections are described above. When two cover flanges are mated a special conductive gasket is required.

Cover / Gasket Flanges

PBR and PAR cover / gasket flanges are faced with gasket groove. Cover / gasket flanges contain clearance holes and can be mated with choke, cover or cover / gasket flanges. One gasket is required to mate a cover/ gasket flange with a cover flange. Two gaskets are required when mating two cover / gasket flanges or when mating a cover / gasket flange with a choke flange. Special attention must be given to the gasket cross sections.

Recmd. Operating Frequency Range, GHz	Flange Shape	W/G EIA Size	U.S. MIL Type Choke Flange	IEC Type Choke Flange	U.S. MIL Type Cover Flange	IEC Type Cover Flange	IEC Type Cov./Gasket Flange	Outside Dimensions inches (mm)
26.50-40.00	square	WR-28	UG-600A/U	n/a	UG-599/U	n/a	n/a	0.75 (19.0)
18.00-26.50	square	WR-42	UG-596A/U	CBR220	UG-595/U	UBR220	PBR220	0.88 (22.4)
12.40-18.00	square	WR-62	UG-541 A/U	CBR140	UG-419/U	UBR140	PBR140	1.31 (33.3)
10.00-15.00	square	WR-75	WRBC-75*	CBR120	WRBU-75*	UBR120	PBR120	1.50 (38.1)
8.200-12.40	square	WR-90	UG-40B/U	CBR100	UG-39/U	UBR100	PBR100	1.63 (41.4)
7.050-10.00	square	WR-112	UG-52B/U	CBR84	UG-51/U	UBR84	PAR84	1.88 (47.8)
5.850-8.200	round	WR-137	UG-343B/U	CAR70	UG-344/U	UAR70	PAR70	3.13 (79.5)
4.900-7.050	round	WR-159	n/a	CAR58	n/a	UAR58	PAR58	3.38 (85.9)
3.950-5.850	round	WR-187	UG-148C/U	CAR48	UG-149A/U	UAR48	PAR48	3.63 (92.2)
2.600-3.950	round	WR-284	UG-54B/U	CAR32	UG-53/U	UAR32	PAR32	5.31 (134.9)

*Gabriel model number for WR-75 flange - design is similar to UG Series Military Standards.

Rectangular Waveguide and Flanges

EIA WG WR () MDL Band	JAN WG RG ()	Recommended Operating Range for TE ₁₀ Mode		Cut-off for TE ₁₀ Mode		Range in λ g	Theoretical cw power rating lowest to highest frequency (meg. watt)	Theoretical Attenuation lowest to highest frequency (dB/100 ft.)	Material Alloy	JAN FLANGE	DIMENSIONS (Inches)				
		Frequency GHz	Wavelength (cm)	Frequency GHz	Wavelength (cm)						Choke UG ()/U Cover UG ()/U	Inside	Tol. ±	Outside	Tol. ±
2300	290	0.32-0.49	93.68-61.18	0.256	116.84	1.68-1.17	153.0-212.0	.051-.031	Alum.	—	23.125-11.625	0.020	23.250-11.750	.020	0.125
2100	291	0.35-0.53	85.56-56.56	0.281	106.68	1.68-1.18	120.0-173.0	.054-.034	Alum.	—	21.125-10.625	0.020	21.250-10.750	.020	0.125
1800	201	0.41-0.625	73.11-47.96	0.328	91.44	1.67-1.18	93.4-131.9	.056-.038	Alum.	—	18.000- 9.000	0.020	18.250- 9.250	.020	0.125
1500	202	0.49-0.75	61.18-39.97	0.393	76.20	1.62-1.17	67.6- 93.3	.069-.050	Alum.	—	15.000- 7.500	0.015	15.250- 7.750	.015	0.125
1150	203	0.64-0.96	46.84-31.23	0.513	58.42	1.82-1.18	35.0- 53.8	.128-.075	Alum.	—	11.500- 5.750	0.015	11.750- 6.000	.015	0.125
975	204	0.75-1.12	39.95-26.76	0.605	49.53	1.70-1.19	27.0- 38.5	.137-.095	Alum.	—	9.750- 4.875	0.010	10.000- 5.125	.010	0.125
770	205	0.96-1.45	31.23-20.67	0.766	39.12	1.66-1.18	17.2- 24.1	.201-.136	Alum.	—	7.700- 3.850	0.010	7.950- 4.100	.010	0.125
650 L	69	1.12-1.70	26.76-17.63	0.908	33.02	1.70-1.18	11.9- 17.2	.317-.312	Brass	417A	6.500- 3.250	0.010	6.660- 3.410	.010	0.080
510	103	1.45-2.20	20.67-13.62	1.157	25.91	1.67-1.18	7.5- 10.7	—	—	—	5.100- 2.550	0.010	5.260- 2.710	.010	0.080
430 W	104	1.70-2.60	17.63-11.53	1.372	21.84	1.70-1.18	5.2- 7.5	.588-.385	Brass	435A	4.300- 2.150	0.008	4.460- 2.310	.008	0.080
340	105	2.20-3.30	13.63- 9.08	1.736	17.27	1.78-1.22	3.1- 4.5	.501-.330	Alum.	437A	3.400- 1.700	0.005	3.560- 1.860	.005	0.080
284 S	112	2.60-3.95	11.53- 7.59	2.078	14.43	1.67-1.17	2.2- 3.2	.877-.572	Brass	553	2.840- 1.340	0.005	3.000- 1.500	.005	0.080
229	48	3.30-4.90	9.08- 6.12	2.577	11.63	1.62-1.17	1.6- 2.2	.751-.492	Alum.	554	2.480- 1.240	0.005	2.640- 1.320	.005	0.080
187 C	75	4.90-7.05	6.12- 4.25	3.711	8.078	1.52-1.19	0.79- 1.0	1.102-.752	Brass	54B 53	2.290- 1.145	0.005	2.418- 1.273	.005	0.064
159	49	3.95-5.85	7.59- 5.12	3.152	9.510	1.67-1.19	1.4- 2.0	.940-.641	Alum.	585A 584	1.872- 0.872	0.005	2.000- 1.000	.005	0.064
137	95	4.90-7.05	6.12- 4.25	3.711	8.078	1.52-1.19	0.79- 1.0	—	—	—	1.590- 0.795	0.004	1.718- 0.923	.004	0.064
112 X _L	50	5.85-8.20	5.12- 3.66	4.301	6.970	1.48-1.17	0.56-0.71	2.08-.144	Brass	148C 149A	1.372- 0.622	0.004	1.500- 0.750	.004	0.064
90 X	106	7.05-10.0	4.25- 2.99	5.259	5.700	1.51-1.17	0.35-0.46	2.45-1.94	Alum.	440B 441	1.122- 0.497	0.004	1.250- 0.625	.004	0.064
75	54	8.20-12.40	3.66- 2.42	6.557	4.572	1.68-1.18	0.20-0.29	2.12-3.21	Brass	52B 51	0.900- 0.400	0.003	1.000- 0.500	0.003	0.050
62 Ku	68	10.00-15.00	2.99- 2.00	7.868	3.810	1.64-1.17	0.17-0.23	2.50-2.74	Alum.	137B 138	0.750- 0.375	0.003	0.850- 0.475	0.003	0.050
51	52	12.4 -18.0	2.42- 1.66	9.486	3.160	1.55-1.18	0.12-0.16	6.45-4.48	Brass	40B 39	0.622- 0.311	0.002	0.702- 0.391	0.003	0.040
42 K	107	15.00-22.00	2.00- 1.36	11.574	2.590	1.58-1.18	0.080-0.107	5.49-3.83	Alum.	136B 135	0.510- 0.255	0.0025	0.590- 0.335	0.003	0.040
34	53	18.00-26.50	1.66- 1.13	14.047	2.134	1.60-1.18	0.043-0.058	—	—	—	0.420- 0.170	0.0020	0.500- 0.250	0.003	0.040
28 K _A	12	22.00-33.00	1.36- 0.91	17.328	1.730	1.62-1.18	0.034-0.048	17.6-12.6	Brass	596A 595	0.340- 0.170	0.0020	0.420- 0.250	0.003	0.040
22 Q	66	26.50-40.00	1.13- 0.75	21.081	1.422	1.65-1.17	0.022-0.031	13.3- 9.5	Alum.	598 597	0.280- 0.140	0.0015	0.360- 0.220	0.002	0.040
19	96	33.00-50.00	0.91- 0.60	26.342	1.138	1.67-1.17	0.014-0.020	—	Silver	600A 599	0.224- 0.112	0.0010	0.304- 0.192	0.002	0.040
15 V	97	40.00-60.00	0.75- 0.50	31.357	0.956	1.63-1.16	0.011-0.015	31.0-20.9	—	—	0.188- 0.094	0.0010	0.268- 0.174	0.002	0.040
12	98	50.00-75.00	0.60- 0.40	39.863	0.752	1.67-1.17	0.0063-0.0090	—	Brass	1529	0.148- 0.074	0.0010	0.228- 0.154	0.002	0.040
10	99	60.00-90.00	0.50- 0.33	48.350	0.620	1.68-1.18	0.0042-0.0060	52.9-39.1	Silver	385	0.122- 0.061	0.0005	0.202- 0.141	0.002	0.040
10	—	75.00-110.0	0.40- 0.27	59.010	0.508	1.61-1.18	0.0030-0.0041	93.3-52.2	—	—	0.100- 0.050	0.0005	0.180- 0.130	0.002	0.040
									Silver	1528					

Rectangular Reference

Rectangular Waveguide and Flanges

Waveguides		Flanges																																					
IEC 153 IEC-R ()	Amer. EIA WR-()	IEC 154 IEC-()		American JAN UG-() U						Great Britain Joint Service Catalog Number 5985-99-()																													
				Plain			Choke			Plain			Choke																										
		Brass	Aluminum	Precision	Brass	Aluminum	Choke	Brass	Aluminum	Precision	Brass	Aluminum	Precision	Brass	Aluminum																								
		3	2300	PDR3															CPR2300																				
4	2100	PDR4																								CPR2100													
5	1800	PDR5																									CPR1800												
6	1500	PDR6																									CPR1500												
8	1150	PDR8																									CPR1150												
9	975	PDR9																									CPR975												
12	770	PDR12																									CPR770												
14	650	PDR14				417B	418A																				CPR650	083-1573											
18	510	PDR18																																					
22	430	PDR22				435A	437A																				CPR430	083-1578											
26	340	PDR26				553	554																				CPR340	011-9656											
32	284	UER32 PDR32 PAR32 UAR32				53	584				54B	585A															CPR284	083-0010 083-1560 083-0058	012-2939							083-0009 083-1558			
40	229	UER40 PDR40																									CMR229 CPR229	011-9657											
48	187	PAR48 UAR48	PDR48 UER48	CAR48	149A	407					148C	406B															CMR187 CPR187	083-0042								083-0041			
58	159	PAR58 UAR58	PDR58 UER58	CAR58																							CMR159 CPR159	083-1602	083-0129										
70	137	PAR70 UAR70	PDR70 UER70	CAR70	344	441					343B	440B															CMR137 CPR137	083-0038	083-0132							083-0037	083-0131		
84	112	PBR84 UBR84	PDR84 UER84	CBR84	51	138					52B	137B															CMR112 CPR112	011-9660 083-0034	012-0892 011-9112							011-9661 083-0033	012-0893 083-0134		
100	90	PBR100 UBR100	PDR100 UER100	CBR100	39	135					40B	136B															CMR90 CPR90	083-0004 083-0052	083-0151 083-0148							083-0003 083-0051 083-1611	083-0150 011-9114 012-0891		
120	75	PDR120	UER120																																				
140	62	PBR140 UBR140	PDR140 UER140	CBR140	419																								083-0030 011-9662								083-0029 011-9663		
180	51	UER180	PDR180																										011-9664								011-9665		
220	42	PBR220 UBR220 PCR220		CBR220	595	597																							011-9666 011-9658								011-9667 011-9659		
260	34	PCR260																																					
320	28	PBR320 UBR320	PCR320	CBR320	599																								083-0018 012-4834								038-1553	012-4835	
400	22	PCR400																											011-9668								083-1553		
500	19	PCR500 PAR500																																				083-1554	
620	15	PCR620 PFR620																																					083-1554
740	12	PCR740 PFR740																																					083-1554
900	10	PCR900 PFR900																																					083-1554

Rectangular Reference