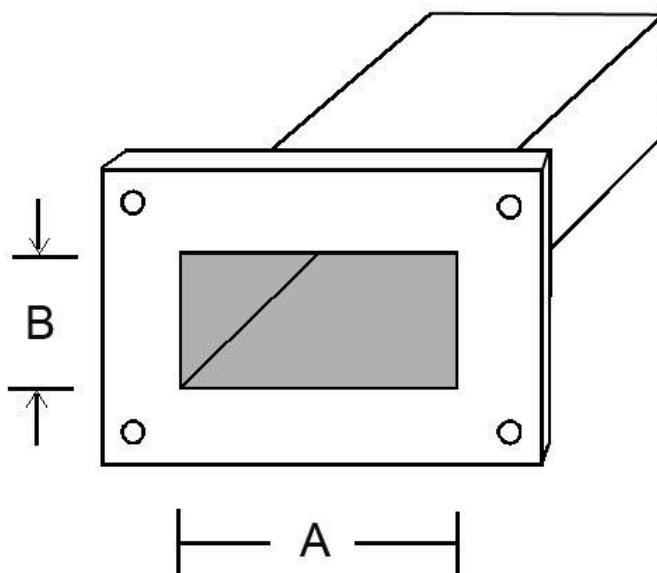


Waveguide Sizes



A waveguide is an electromagnetic feed line that is used for high frequency signals. Waveguides conduct microwave energy at lower loss than coaxial cables and are used in microwave communications, radars and other high frequency applications.

The waveguide must have a certain minimum cross section, relative to the wavelength of the signal to function properly. If wavelength of the signal is too long (Frequency is too low) when compared to the cross section of the waveguide, the electromagnetic fields cannot propagate. The lowest frequency range at which a waveguide will operate is where the cross section is large enough to fit one complete wavelength of the signal.

Geometrically speaking there are three types of waveguides – Rectangular Waveguides, Double Rigid Waveguides and Circular Waveguides. The tables below will give you details on the various waveguide sizes and their properties.

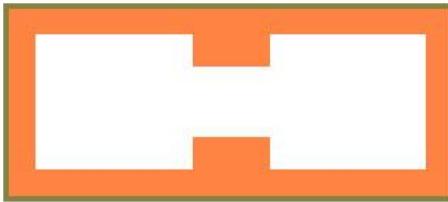
Rectangular Waveguide Sizes

Waveguide name			Recommended frequency	Cutoff frequency lowest order mode	Cutoff frequency next mode	Inner dimensions of waveguide opening	
EIA	RCSC *	IEC				A inch[mm]	B inch[mm]
WR2300	WG0.0	R3	0.32 to 0.45 GHz	0.257 GHz	0.513 GHz	23 [584.2]	11.5 [292.1]
WR2100	WG0	R4	0.35 to 0.50 GHz	0.281 GHz	0.562 GHz	21 [533.4]	10.5 [266.7]
WR1800	WG1	R5	0.45 to 0.63 GHz	0.328 GHz	0.656 GHz	18 [457.2]	9 [228.6]
WR1500	WG2	R6	0.50 to 0.75 GHz	0.393 GHz	0.787 GHz	15 [381]	7.5 [190.5]
WR1150	WG3	R8	0.63 to 0.97 GHz	0.513 GHz	1.026 GHz	11.5 [292.1]	5.75 [146.05]
WR975	WG4	R9	0.75 to 1.15 GHz	0.605 GHz	1.211 GHz	9.75 [247.65]	4.875 [123.825]
WR770	WG5	R12	0.97 to 1.45 GHz	0.766 GHz	1.533 GHz	7.7 [195.58]	3.85 [97.79]
WR650	WG6	R14	1.15 to 1.72 GHz	0.908 GHz	1.816 GHz	6.5 [165.1]	3.25 [82.55]
WR510	WG7	R18	1.45 to 2.20 GHz	1.157 GHz	2.314 GHz	5.1 [129.54]	2.55 [64.77]
WR430	WG8	R22	1.72 to 2.60 GHz	1.372 GHz	2.745 GHz	4.3 [109.22]	2.15 [54.61]
	WG9		2.20 to 3.30 GHz	1.686 GHz	3.372 GHz	3.5 [88.9]	1.75 [44.45]
WR340	WG9A	R26	2.20 to 3.30 GHz	1.736 GHz	3.471 GHz	3.4 [86.36]	1.7 [43.18]
WR284	WG10	R32	2.60 to 3.95 GHz	2.078 GHz	4.156 GHz	2.84 [72.136]	1.34 [34.036]
	WG11		3.30 to 4.90 GHz	2.488 GHz	4.976 GHz	2.372 [60.2488]	1.122 [28.4988]
WR229	WG11A	R40	3.30 to 4.90 GHz	2.577 GHz	5.154 GHz	2.29 [58.166]	1.145 [29.083]
WR187	WG12	R48	3.95 to 5.85 GHz	3.153 GHz	6.305 GHz	1.872 [47.5488]	0.872 [22.1488]
WR159	WG13	R58	4.90 to 7.05 GHz	3.712 GHz	7.423 GHz	1.59 [40.386]	0.795 [20.193]
WR137	WG14	R70	5.85 to 8.20 GHz	4.301 GHz	8.603 GHz	1.372 [34.8488]	0.622 [15.7988]

Waveguide name			Recommended frequency	Cutoff frequency lowest order mode	Cutoff frequency next mode	Inner dimensions of waveguide opening	
EIA	RCSC *	IEC					
WR112	WG15	R84	7.05 to 10 GHz	5.26 GHz	10.52 GHz		
WR102			7.00 to 11 GHz	5.786 GHz	11.571 GHz		
WR90	WG16	R100	8.20 to 12.40 GHz	6.557 GHz	13.114 GHz		
WR75	WG17	R120	10.00 to 15 GHz	7.869 GHz	15.737 GHz		
WR62	WG18	R140	12.40 to 18 GHz	9.488 GHz	18.976 GHz		
WR51	WG19	R180	15.00 to 22 GHz	11.572 GHz	23.143 GHz		
WR42	WG20	R220	18.00 to 26.50 GHz	14.051 GHz	28.102 GHz		
WR34	WG21	R260	22.00 to 33 GHz	17.357 GHz	34.715 GHz		
WR28	WG22	R320	26.50 to 40 GHz	21.077 GHz	42.154 GHz		
WR22	WG23	R400	33.00 to 50 GHz	26.346 GHz	52.692 GHz		
WR19	WG24	R500	40.00 to 60 GHz	31.391 GHz	62.782 GHz		
WR15	WG25	R620	50.00 to 75 GHz	39.875 GHz	79.75 GHz		
WR12	WG26	R740	60 to 90 GHz	48.373 GHz	96.746 GHz		
WR10	WG27	R900	75 to 110 GHz	59.015 GHz	118.03 GHz		
WR8	WG28	R1200	90 to 140 GHz	73.768 GHz	147.536 GHz		
WR6	WG29	R1400	110 to 170 GHz	90.791 GHz	181.583 GHz		
WR7	WG29	R1400	110 to 170 GHz	90.791 GHz	181.583 GHz		
WR5	WG30	R1800	140 to 220 GHz	115.714 GHz	231.429 GHz		
WR4	WG31	R2200	172 to 260 GHz	137.243 GHz	274.485 GHz	0.043 [1.0922]	0.0215 [0.5461]
WR3	WG32	R2600	220 to 330 GHz	173.571 GHz	347.143 GHz	0.034 [0.8636]	0.017 [0.4318]
WR2	-	-	325-500 GHz	-	-	0.020 [0.508]	0.010 [0.254]
WR1	-	-	750-1100 GHz	-	-	0.010 [0.254]	0.0050 [0.127]

Note:

- The "WR" designation stands for Rectangular Waveguides
- The Number that follows "WR" is the width of the waveguide opening in mils, divided by 10. For Example WR-650 means a waveguide whose cross section width is 6500 mils.
- The waveguide width determines the lower cutoff frequency and is equal (ideally) to $\frac{1}{2}$ wavelength of the lower cutoff frequency.



Double-ridge waveguides are rectangular waveguides with two ridges protruding parallel to the short wall. This increases the E-Field in the waveguide improving performance.

Double Ridge Waveguide Sizes

WR	Designation (a)=aluminum, (b)=brass, (c)=copper, (s)=silver			$f_L \cdot f_U^*$ (GHz)	f_{CO}^{**} (GHz)	Inside Width (in)	Inside Height (in)
	U.S. Mil. —/U	British Mil.	IEC				
WR975	RG204 (a)			0.75-1.12	0.605	9.750	4.875
WR770	RG205 (a)			0.96-1.45	0.766	7.700	3.850
WR650	RG69 (b) RG103 (a)	WG6		1.12-1.70	0.908	6.500	3.250
WR510				1.45-2.20	1.157	5.100	2.550
WR430	RG104 (b) RG105 (a)	WG8		1.70-2.60	1.372	4.300	2.150
WR340	RG112 (b) RG113 (a)	WG9A		2.20-3.30	1.736	3.400	1.700
WR284	RG48 (b) RG75 (a)	WG10		2.60-3.95	2.078	2.840	1.340

Designation (a)=aluminum, (b)=brass, (c)=copper, (s)=silver				f_L, f_U^* (GHz)			
WR	U.S. Mil. — /U	British Mil.	IEC				
WR229	RG340 (c) RG341 (a)	WG11A	R40	3.30-4.90			
WR187	RG49 (b) RG95 (a)	WG12	R48	3.95-5.85-			
WR159	RG343 (c) RG344 (a)	WG13	R58	4.90-7.05			
WR137	RG50 (b) RG106 (a)	WG14	R70	5.850-8.200			
WR112	RG51 (b) RG68 (a)	WG15	R84	7.050-10.000			
WR90	RG52 (b) RG67 (a)	WG16	R100	8.20-12.40			
WR75	RG346 (c) RG347 (a)	WG17		10.0-15.0			
WR62	RG91 (b) RG349 (a)	WG18		12.40-18.00			
WR51	RG352 (c) RG351 (a)	WG19		15.00-22.00			
WR42	RG53 (b) RG121 (a)	WG20		18.00-26.5			
WR34	RG354 (c)			20.0-33.0			
WR28	RG96 (s) RG271 (c)	WG22		26.50-40.00	21.1	0.280	0.140
WR22	RG97 (s)	WG23		33.00-50.00	26.4	0.224	0.112
WR19		WG24		40.00-60.00	31.4	0.188	0.0940
WR15	RG98 (s)	WG25		50.00-75.00	39.9	0.148	0.0740
WR12	RG99 (s)	WG26		60.00-90.00	48.4	0.122	0.0610
WR10		WG27		75.00-110.0	59.0	0.100	0.0500
WR8	RG138 (s)	WG28		90.00-140.0	73.8	0.0800	0.0400
WR7	RG136 (s)			110.0-170.0	90.8	0.0650	0.0325
WR4	RG137			170.0-260.0	137	0.0430	0.0215
WR3	RG139 (s)			220.0-325.0	174	0.0340	0.0170

Circular Waveguide Sizes

Frequency Band	Frequency Range		Circular Waveguide Diameter, Inches (mm)	Cover Flange (Brass) MIL-F-3922 UG	Flange Type
X	LOW	8.2-9.97	1.094 (27.79)	53-001 UG-39/U	Square
	MID	8.5-11.6	0.938 (23.83)		
	HIGH	9.97-12.4	0.797 (20.24)		
Ku	LOW	12.4-15.9	0.688 (17.48)	53-005 UG-1666/U	Square
	MID	13.4-18.0	0.594 (15.08)		
	HIGH	15.9-18.0	0.500 (12.70)		
K	LOW	17.5-20.5	0.455 (11.56)	54-001 UG-595/U	Square
	MID	20-24.5	0.396 (10.06)		
	HIGH	24-26.5	0.328 (8.33)		
Ka	LOW	26.5-33	0.315 (8.00)	54-003 UG-595/U	Square
	MID	33-38.5	0.250 (6.35)		
	HIGH	38.5-40	0.219 (5.56)		
Q	LOW	33-38.5	0.250 (6.35)	67B-006 UG-383/U	Round
	MID	38.5-43	0.219 (5.56)		
	HIGH	43-50	0.188 (4.78)		
U	LOW	40-43	0.210 (5.33)	67B-007 UG-383/U-M	Round
	MID	43-50	0.188 (4.78)		
	HIGH	50-60	0.165 (4.19)		

Frequency Band	Frequency Range		Circular Waveguide Diameter, Inches (mm)	Cover Flange (Brass) MIL-F-3922 UG	Flange Type
V	LOW	50-58	0.165 (4.19)		
	MID	58-68	0.141 (3.58)		
	HIGH	68-75	0.125 (3.18)		
E	LOW	60-66	0.136 (3.45)		
	MID	66-82	0.125 (3.18)		
	HIGH	82-90	0.094 (2.39)		
W	LOW	75-88	0.112 (2.84)		
	HIGH	88-110	0.094 (2.39)		
F	LOW	90-115	0.089 (2.26)		
	HIGH	115-140	0.075 (1.91)		
D	LOW	110-140	0.073 (1.85)		
	HIGH	140-160	0.059 (1.50)		
G	LOW	140-180	0.058 (1.47)		
	HIGH	180-220	0.045 (1.14)		
---	---	170-260	0.049 (1.25)		
---	---	220-325	0.039 (0.99)		

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