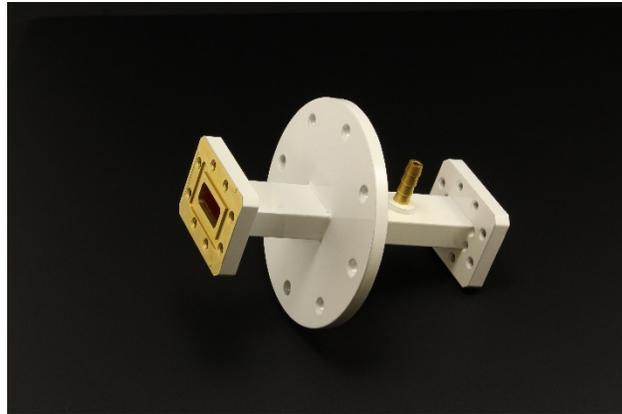




Tips for Assembling, Troubleshooting and Handling Waveguides

Though waveguide components and interconnects tend to be formed of relatively sturdy metals, some aluminum and copper waveguides, for higher frequency and aerospace applications, can easily be dinged and dented. Sometimes these dings and dents are a useful tuning technique; generally, they could dramatically change the performance of a waveguide or waveguide component. Ensuring that the proper packaging and shipping precautions are taken could prevent unwanted surprises on arrival. Also, if too much shock and vibration occur during shipping, the fittings could misalign. Some vendors will ship a waveguide assembly affixed to a keeper plate to mitigate these shipping and storing issues.



After acquiring the proper waveguide components, the assembly and care of the waveguide components and interconnects can also have an impact on performance. One area that is often an issue is the attachment of the waveguide flanges. If no gasket is used, the surface of the flanges need to be clean and flat. Any marring, dust, or plate peeling can lead to RF leakage and reduced performance from misalignment. Waveguide bends and twists may also form stress cracks from thermal cycling and mechanical stress. The higher the frequency of the waveguide, the more sensitive the system performance is to proper assembly and care.

For example, for waveguides with flange attachments, there is a specified amount of torque for each corner of the waveguide. If one corner of a waveguide is torqued more or less than the other corners, a small gap will form degrading VSWR and insertion loss performance. RF leakage can also occur. This could also happen as a gasket degrades with age or heating/cooling cycles. Some threaded screws could also backup under vibration and heavy loading. Methods that ensure stable fastening can be used as long as they do not impact the RF performance and even clamping of the flanges.

Recommended Torque For Waveguide Flanges Based On Screw Size & Threads Per Inch

Screw Size	Threads Per In	Torque (in-lb)	Tension (lb)
4	40 / 80	4.5 / 5.5	235 / 280
6	32 / 40	8.5 / 10	360 / 410

8	32 / 36	18 / 20	625 / 685
10	24 / 32	23 / 32	705 / 940
1/4"	20 / 28	80 / 100	1800 / 220
5/16"	18 / 24	140 / 150	2540 / 2620
3/8"	16 / 24	250 / 275	3740 / 3950
7/16"	14 / 20	400 / 425	4675 / 4700
1/2"	13 / 20	550 / 575	6110 / 6140

Depending upon the construction of the screw, there are several recommended torque and tension parameters to ensure proper waveguide flange connection.

If there is an unaccounted-for loss or undesired VSWR effect, the next stage is to track down the area of leakage. Rather than pulling the system apart and testing each connection, a detector probe can be used to scan an assembly for leakage points while running a test. Using probes that prevent human contact with the waveguide assembly and keeping a reasonable distance to avoid arcing is recommended, as RF leaks could lead to high voltage occurrences.