

## Wave Guide Coupling

When wave guide pieces are joined together , it is done via some sort of flanges.

**Q: What is a Flange?**

A: A flange is an equipment to ensure a smooth mechanical junction and suitable electrical characteristics, for low radiation leaks and low internal reflections

These waveguide flanges come in a variety of standard formats, enabling the right types of waveguide flange to be used for the given application, but also being standardized, flanges from different manufacturers can mate together, provided they conform to the same style or standard.

### Materials Manufactured

RF waveguide couplers are made of aluminum, brass, bronze, copper, or silver and plated with cadmium, nickel, rhodium, silver, or tin.

### Flange Considerations

#### Pressurization

The atmosphere within waveguide assemblies is often pressurized, either to prevent the moisture, Pressurization requires that all joins in the waveguide be airtight. This is usually achieved by means of a

rubber O-ring seated in a groove in the face of at least one of flanges forming each join.

The flange carrying groove is called Gasket, gasket/cover or pressurizable flanges. It is only necessary for one of the flanges in each pressurizable connection to be of this type; the other may have a plain flat face. This un-grooved type is known as a cover, plain or unpressurizable flange.

### **Electrical continuity**

Electric current flows on the inside surface of the waveguides, and must cross the join between them if microwave power is to pass through the connection without reflection or loss.

### **Contact connection**

A contact connection is formed by the union of any combination of gasket and cover flanges, and ideally creates a continuous inner surface from one waveguide to the other, with no crack at the join to interrupt the surface currents. The difficulty with this sort of connection is that any manufacturing imperfections or dirt or damage on the faces of the flanges will result in a crack.

### **Types of Flanges**

Since an entire waveguide system cannot possibly be molded into one piece, the waveguide must be constructed in sections and the sections connected with joints. The three basic types of waveguide joints are:

#### **Permanent joints**

The permanent joint is a factory-welded joint that requires no maintenance.

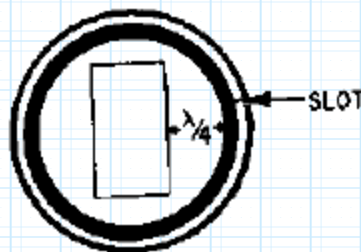
#### **Semi permanent joints**

Many times we need to take out wave guides for maintenance and other required activities. For this purpose and Semi permanent joint is used , which done via a flange. The connecting face of the flange is either square, circular or rectangular. The connection between a pair of flanges is usually made with four or more bolts, though alternative mechanisms, such as a threaded collar, may be used where there is a need for rapid assembly and disassembly.

A semi-permanent joint, called a "choke joint", is most commonly used for this purpose. The choke joint provides good electromagnetic continuity between sections of waveguide with very little power loss.

One aspect of waveguide flanges that is of particular importance is the leakage that occurs across the joint. As the joints across the waveguide flanges are metal to metal contact, and they may not be completely flat and perfect some leakage will always occur. To minimize such losses, the waveguide flange surfaces must be clean and bolts must be tightened to the required torque level.

To provide a better alignment, wave guide flanges of smaller dimension are provided with threaded flanges so they can be screwed to each other



### Rotating joints

The Waveguide Rotary Joint allows the transmission of RF signals from stationary to  $360^\circ$  rotating rectangular waveguide.

Common applications include scanning antennas of any kind used in radar and radiometer systems. Whenever a **stationary rectangular** waveguide is to be connected to a **rotating antenna**, a rotating joint must be used. A circular waveguide is normally used in a rotating joint. The rotating section of the joint also uses a **choke joint** to complete the electrical connection with the stationary section.

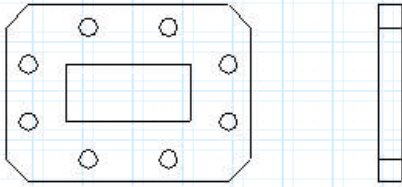
## Some Commercial Flanges

### Waveguide flange designations and terminology

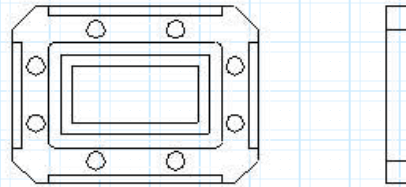
There are a number of different designations for waveguide flange types and also different abbreviations that apply to them. These are summarized in the table below:

WAVEGUIDE FLANGE DESIGNATION OR TERMINOLOGY	WAVEGUIDE FLANGE DESIGNATION OR TERMINOLOGY DETAILS AND INFORMATION
<b>Choke</b>	UG style waveguide flanges with an o-ring groove and a choke cavity.
<b>CMR</b>	CMR waveguide flanges are the miniature version of the Connector Pressurized Rectangular (CPR) style flanges.
<b>CPRF</b>	Connector Pressurized Rectangular (CPR) refers to a range of commercial rectangular waveguide flanges. CPRF is flat CPR flange.
<b>CPRG</b>	Connector Pressurized Rectangular (CPR) refers to a range of commercial rectangular waveguide flanges. CPRG is Grooved CPR flange.
<b>Cover or Plate</b>	Square, flat UG style waveguide flanges
<b>UG</b>	UG is the military standard MIL-DTL-3922 for a range of waveguide flange types

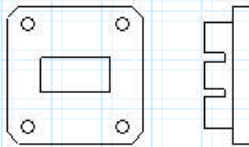
**CPRF - CPR FIAT**



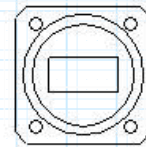
**CPRG - CPR WITH GASKET GROOVE**



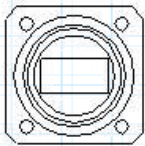
**SQUARE - SQUARE FLANGE**



**SQUARE - SQUARE FLANGE WITH O-RING GROOVE**



**CHOKER FLANGE - WITH O-RING GROOVE**



**CMR - ALTERNATE TAP/CLEARED HOLES**

