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Cost Effective Grooves for the Spira Shield Family of Groove Mounted Gaskets

by

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Abstract

EMI gaskets come in two basic configurations: groove mounted and flange mounted. The groove mounted gaskets provide slightly more shielding, are significantly less expensive to purchase, are less likely to be destroyed during use, and are significantly less costly to replace if damaged. Flange mounted gaskets are often specified because of the cost of the groove required to mount the groove mounted gaskets. However, the proper selection and process used in the groove mounted application can be very cost effective.

Introduction

There are four (4) basic groove configurations which we recommend when using the "Spira Shield Family of Gaskets"[1]. The specific application of each groove is important in its selection. The specific recommended groove configurations are: (1) Regular O-Ring Groove; (2) Narrow O-Ring Groove; (3) Dovetail Groove; and (4) Pinch Boss Groove. In the selection and subsequent design of the specific groove, the recommended tolerance is a critical factor in the selection process. Please see tolerance considerations as described on the following pages.

[1] Note that the "Spira Shield Family of Gaskets" includes: Spira Shield, Quick-Shield, Ultra Quick-Shield, Flexi-Shield, Endur-o-Shield, and O-rings. For more information, see the Spira Catalog, or visit our website at: http://www.spira-emi.com/products/groove.htm.

Recommended Grooves

1. Regular O-Ring Groove. This groove is illustrated below with a width of 35% wider than the diameter of the gasket (see figure 1.) This groove is recommended when machining cost is critical and the manufacturing process is such that the gasket will not fall out of the groove during the assembly of the equipment.

The cost to machine the groove is fairly minimal. The tolerance on the groove width is ± 5%. As such, the groove can be constructed with a single pass on a milling machine in most cases.

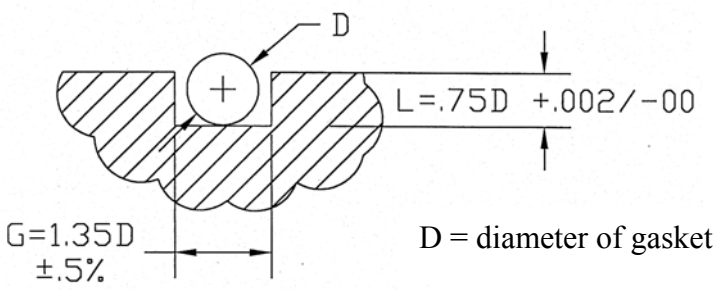

Figure 1 - Regular O-Ring Groove

2. Narrow O-Ring Groove. This groove is slightly narrower than the diameter of the gasket (see figure 2 below), and is so designed to hold the gasket in place during manufacturing and maintenance processes. The groove is more expensive to machine than the regular O-Ring groove and slightly less expensive than the Dovetail Groove. The recommended tolerance on the width of the groove is ± .001 inches. To obtain the recommended tolerance three passes must be made during the machining process.

Please note: The only gaskets recommended to be used in t his groove are Spira's moderate force gaskets or the low force "Flexi-Shield" gasket.

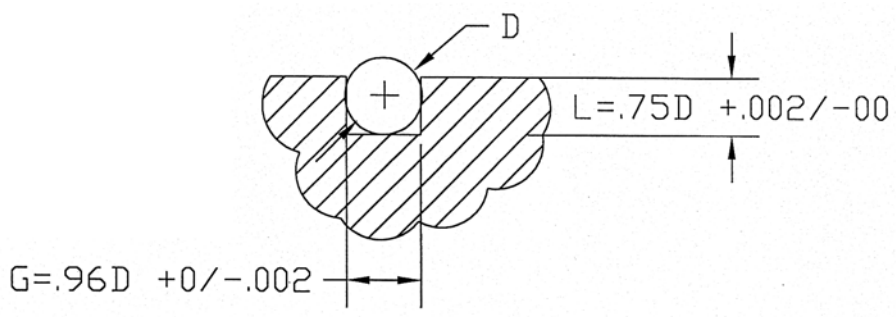

Figure 2 - Narrow O-Ring Groove

When using this groove the screw spacing must be fairly close due to the force required to compress the gasket when contained by the sides of the groove, and the screw spacing formula cannot be used.

3. Dovetail Groove. This groove is designed to hold the gasket in place during manufacturing and maintenance procedures and allows the gasket to expand laterally when compressed. The ability of the gasket to move laterally when compressed can result in the lowest cost gasket application, i.e.;

> The groove protects the gasket from damage during manufacturing and maintenance procedures. The ability for the gasket to expand laterally when compressed results in the ability to accurately predict the maximum screw spacing thus reducing the cost by reducing the required number of screws and fasteners.

If the gasket becomes damaged, replacing the gasket is extremely easy and low-cost.

The use of the groove is very cost effective when applied to the use of extrusions (i.e.; the groove can be applied to the extrusion at little or no cost). Applications include VME and Compact PCI type designs, and shielded cabinets where extrusions are used in the designing of the cabinets.

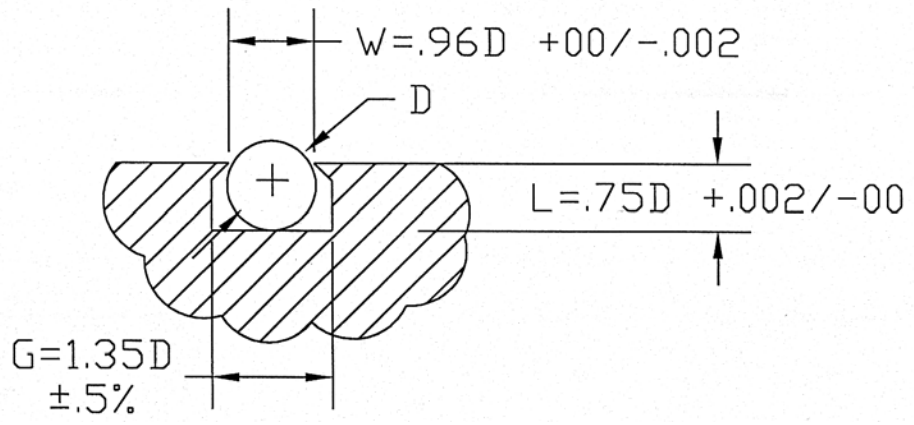

Figure 3 - Dovetail Groove

Please note: The width at the top of the groove, "w", is critical. The groove is designed to hold the gasket in place. If the groove is wider then the gasket, the gasket can fall out. If it is much narrower than the diameter of the gasket, the groove will hold the gasket down minimizing the effective height of the gasket. As such when machining the groove, the recommended width is shown in figure 3.

The groove is machined making a regular O-Ring groove with a width of .96 dia and .75 dia deep. A dovetailed cutter (supplied by Spira) is then used to machine the expanded width of the groove.

4. Pinch Boss Groove. This groove is a regular O-Ring groove with a narrowed portion of the groove every 2 to 4 inches along the length. This groove is recommended for high volume molded or die cast applications. Figure 4 illustrates a typical pinch boss. Please note! The under cut directly under the pinched area is critical. Without the undercut at the pinched area, the gasket will create excessive force on the joint surfaces where closure of the surfaces may not be possible. The recommended tolerance on all of the dimensions with the exception of the depth is ± 5%. The recommended tolerance on the depth is + .002/– 0 inches as with all the grooves.

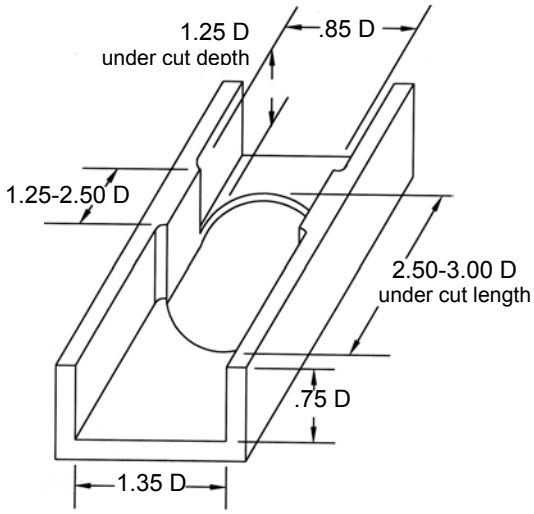

Figure 4 – Pinch Boss Configuration

The application of the groove has been successfully used by many companies, where Agilent uses the groove in its high frequency test equipment to obtain isolation between components on a printed circuit board. Figure 5 illustrates such an application.

Figure 5 – Picture of Agilent Cover with Gasket

Dimensional Tolerance Considerations

Groove Depth

The tolerance for the recommended depth for all four groove configurations is ± .001 inches (+ .002/-0). The reason for the close tolerance is two-fold: (1) If the surface for the groove is fly-cut prior to cutting the groove, the tolerance is easily obtainable without a cost impact; and (2) the purpose of an EMI gasket is to fill the unevenness of the joint surfaces being shielded.

As the tolerance of the depth of the groove increases, the size of the EMI gasket will have to increase or more screws must be used. The increase in the size of the gasket can impact a specific design application. Because we do not recommend compression of our gaskets more then 25%, if the tolerance of the groove increases, the increase should be in the depth (i.e., if the tolerance is ± 005 inches the specified tolerance should be + .010/-0. As an example, if our –06 (.094 inch diameter) gasket is selected using a ± .001 tolerance the recommended depth is .070 where the unevenness of the joint can be .022 inches. If the tolerance on the groove depth is ± .005, the unevenness of the joint can be reduced to .014 inches. The resultant cost is either closer screw spacing (more required screws) or a larger gasket.

Groove Width

The recommended groove width for the narrow O-Ring groove and the top dimension for the Dovetail Groove is ± .001 (+0 - .002) inches. In both cases, the groove is designed to hold the gasket in place.

The narrow O-Ring groove holds the gasket with the sides of the groove. As the groove becomes narrower, the force required to compress the gasket increases where closer screw spacing will be required.

If the top dimension “w” of the Dovetail Groove is narrower than that recommended, the resultant groove will reduce the distance the gasket protrudes above the top of the groove which can result in closer screw spacing. If the use of the groove is applied to an extrusion (where the tolerance of ± .001 inches cannot be held) the dimension “w” should be specified so that the width does not exceed 96% of the diameter of the gasket.

Fastener Spacing

To obtain the maximum recommended screw spacing for Spira Shield gasket applications, see page 50 in the Spira Catalog, “How to Calculate Fastener Spacing”, or visit our website: www.spira-emi.com/spacing.htm.

Spira Manufacturing Corporation has been serving the EMC community with quality EMI and RFI shielding products for over 28 years. We offer the finest, most reliable, EMI/RFI shielding gaskets and air vent honeycomb filters in the market, at very competitive prices. Please contact us if you would like any technical assistance: (818) 764-8222 or techsupport@spira-emi.com.