

Ingress Protection for Electrical Enclosures



Introduction

Since CGR Products' founding in 1963, we've worked with design engineers to bring projects to life, and we do everything we can to make that process efficient, affordable and successful. CGR uses a wide variety of converting methods and equipment to create parts and designs with precision and efficiency

Enclosure Protection

Enclosure gaskets are mechanical parts used to provide weatherproof seals on electrical enclosures and its doors. The typical method of attaching the gaskets is by means of a chemical fastener such as pressure sensitive adhesives (PSA). The mating surfaces many times can be irregular. In order to protect the sensitive electronic equipment inside the enclosure, a properly selected and manufactured gasket is critical. The enclosures can be used indoors or outdoors; therefore, a properly selected material and design are essential to ensure proper performance and long life. Generally, gaskets are used to seal out dust, dirt, water, Electromagnetic Interference (EMI), and Radio Frequency (RFI). Gaskets can also be used to dissipate vibration.

Industry Standards

Several organizations list industry standards for gaskets and seals.

- 1) National Electrical Manufacturers Association (NEMA)
- 2) International Electromechanical Commission (IEC)
- 3) Underwriters Laboratories (UL)
- 4) Canadian Standards Association (CSA)

IEC 60529 typically are referred to as Ingress Protection (IP) Ratings. These ingress protection ratings cover everything from dust, dirt, water, tool and human contact. IP ratings are not as stringent as UL, CSA, and NEMA standards. Some IP ratings will allow water to enter the enclosure as long as it doesn't interfere with the performance of the equipment. NEMA, CSA, and UL do not allow any ingress into an enclosure. Refer to the NEMA, CSA, and UL requirements for design guidance.

Industry Testing

Water: Direct spray tests are conducted. These tests can be a drip test, pressure hose test, or submersion test. UL requires that no water enter the unit during any of these tests. Full submersion tests can require up to 24 hours of submersion with zero entry of moisture.

Oil Swell: The gasket material is submerged in oil for 24 hours. The gasket material cannot swell over 25% of its original dimension or shrink more than 1%.

Tensile & Elongation: Some NEMA tests require tensile and elongation retention. For tensile and elongation the gasket materials are aged for 1 week @ 70 degrees C (158 F). After completion, the new and aged gasket materials are compared. To pass the tensile test the aged gasket material must stretch 75% of the same length as the new material before breaking. Elongation requires that the amount of force needed to break the aged material must be at least 75% of the new material.

Other tests include water absorption, compression deflection, and compression set. Contact CGR Products for a more detailed explanation for all of these industry tests.

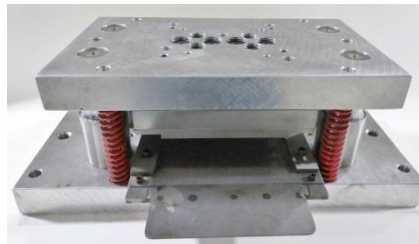
Gasket Design

Die Cut Gaskets:

Die cutting is the general process of using a die or tooling to shear webs of low-strength materials, such as rubber, fiber, foam, paper, paper, plastics, thin metals, and pressure-sensitive adhesive tapes.



[Steel Rule Die](#)



[Blanking Die](#)



[Rotary Die \(Kiss cutting\)](#)

Die cutting can produce a precise shape with no seams. These gaskets form around the entire perimeter of the enclosure or the sealing surface. These type of gaskets can be supplied individually, in sheets, kiss-cut on rolls, or in strips, with or without pressure sensitive adhesives for mounting.

Strip Gasketing:

This method is the oldest. Supplied in rolls, the manufacturers of the enclosures adhere strips of the gasket material to the enclosure surface to be sealed. One side of the gasket material will have a pressure sensitive adhesive designed to adhere to the enclosure structure. The corners are not sealed due to the strip design. This method is the most economical but the corners are areas of concern for some applications.



Strip Gasket

Fold- out / Dovetail Gasket

In instances of very large enclosures, high volumes, or the design does not allow for strip gaskets, a fold-out or dovetail gasket may be an option. The fold-out gasket allows the die cut to be expanded to its final shape, eliminating the center scrap. A dovetail gasket works in a similar fashion, except the corners are mitered and fit together comparable to a jigsaw puzzle. The design of the enclosure and level of ingress protection needed will determine if this type of gasket is suitable.



Fold-out gasket with adhesive on one side



Dovetail joint

Material Selection

Elastomeric materials are the most common and affordable materials used for enclosure gaskets and seals. These materials are available in foams, sponge, foam blends, and cork blends, with and without pressure sensitive adhesives. The key to choosing a gasket material is defining the environment in which it must perform. One must consider temperature / thermal management requirements, UV and Ozone exposure, EMI / RFI resistance, just to name a few. The following is a list of the most common elastomeric materials available that carry UL Listings and ASTM Listings:

Nitrile (NBR)

Natural Gum Rubber (NR)

Styrene Butadiene Rubber (SBR)

Ethylene Propylene (EPDM)

Butyl (IIR)

Carboxylated Nitrile (XNBR)

Neoprene (CR)

Silicone (VQM)

Fluorocarbon (FKM)

Urethane (AU, EU)

Flourosilicone (FVMQ)

Ethylene Acrylic (AEM)

Hydrogenated Nitrile (HNBR)



Surface Preparation

Few product components come off the line ready to bond. Often, some form of surface preparation is required for metal and plastic parts alike.

Degreasing is important for any component that must be bonded with another. Parts naturally pick up grease during the production process, which in turn picks up dirt, dust, and other contaminants. Both grease and particulates caught in grease are serious detriments to proper bonding.

What can CGR Products do for you?

CGR Products can assist in suggesting a material for an electrical enclosure. We have worked with many enclosure manufactures over the last 50 years. The full CGR Resource Library and team of experts are available to clients with specifications, cost charts, comparative material information and more. Our design team works with automotive, marine, appliance, plastic molding, power tool, electrical, small engine and countless other clients.

Our in-house tool and die capabilities mean maximum problem solving with minimal lead times, and an extensive inventory of raw materials supports projects of all kinds. Safety stocks are in place with our inventory of raw materials, and consultation with our experienced staff is always available to get you started.

About CGR Products

CGR Products began in 1963 in Greensboro, NC as Carolina Gasket and Rubber Company. Initially, the company focused on cutting precision gaskets for MRO applications within the booming textile industry, but has now evolved into supplying OEM and MRO products to multiple markets and offering an array of converting services. CGR Products cuts, slits, laminates, skives, and molds materials into precision components for the industrial OEM market. Operators use more than 100 pieces of quality equipment to efficiently handle jobs with precision.

The company's manufacturing capabilities increased in 1990 with the purchase of Valley Products in Decatur, Alabama, and again in 2012 with the purchase of EG Gasket in Waukesha, Wisconsin. CGR now operates in North Carolina, Alabama, and Wisconsin with 125 employees and over 170,000 square feet of manufacturing, office, and warehouse space.

[Request a quote](#) or e-mail us at csr@cgrproducts.com to learn more today.

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