Choosing a Strain Relief for Any Application

Any time electrical equipment manufacturers run wires, cords, or cabling out through the chassis of the equipment, special care must be taken to protect the cable or wires from stress and damage, while continuing to meet the application requirements for the equipment. Strain reliefs (sometimes referred to as cable glands) are an excellent way of providing this protection, and sometimes can be specified to provide additional levels of protection against other potential problems. Choosing the correct strain relief requires the manufacturer to consider several important issues:

- The method of attachment to the cord
- The material of the strain relief
- The method of mounting to the chassis
- Specialized body styles
- Cable or wire size.

In this article, we will explore these topics and discuss a number of the various types of strain reliefs available on the market, in order to help you select the appropriate component to meet all the needs of your application.

**Cord Attachment** of the strain relief refers to how the strain relief and cord are assembled together. Many strain reliefs slide on over the cord and are then mechanically tightened down onto the jacket. This style typically includes gland materials and o-rings that provide liquid tight seals around the cable and the chassis where they are mounted. In some applications, this may be a critical requirement to meet, making this style the best option.

There are also some strain reliefs that are molded in place on the cable permanently. Molded strain reliefs bond to the cable in order to hold the cable in place and seal the cable/strain relief junction. However, these strain reliefs are designed to snap into holes in the chassis and may not adequately seal against liquids at this junction. These mounting holes almost always have at least one squared or flat side to prevent rotation of the strain relief in the hole. Another drawback for this type of strain relief is the fact that if the cord is damaged and needs to be replaced, the strain relief must be replaced with the cord, and would likely have to be sourced from the original cord manufacturer.

Finally, there is a mechanical snap-on strain relief. These use a clam shell-like design, which allows them to be folded over the cable and clamped in place. These strain reliefs do not have water sealing capabilities and, like the molded strain reliefs, these snap into cut-outs with squared or flat sides.

**Strain relief materials** will vary depending on the type of strain relief. Molded strain reliefs are usually PVC, or some other similar thermoplastic material, which gives them the flexibility necessary to flex and snap into the cut-outs on the chassis.

The snap-on strain reliefs are always Nylon or a similar, more rigid plastic, which is required for the snapping mechanisms to function properly.
The slide-on variety can be found in numerous materials, such as nickel-plated brass, nylon, stainless steel, and PVDF, making this style a more versatile option.

**Mounting** of the strain relief is different for the styles mentioned above and may be somewhat dictated by the application itself. Mounting of both the molded versions and the mechanical snap-on versions is done by the use of a cut-out mounting hole in the panel or chassis, into which the strain relief will snap. This makes assembly time much shorter. However, this style of mounting does not guarantee protection against water or liquids and may not secure the cord as effectively as other methods.

In contrast, the slide-on strain reliefs are threaded and are usually provided with a nut, offering two methods of attachment to the panel or chassis. One option is to make a threaded hole to fit the strain relief size being used, and simply thread the strain relief into the panel, not bothering to use the nut. There are 3 standard thread types that can be found on strain reliefs: PG (Panzer Gerwinde), NPT (National Pipe Thread), and metric.

Alternatively, a cut-out hole can be used to fit the strain relief against the panel and the lock-nut to secure it on the back-side. Both of these methods can be used to provide a watertight seal if o-rings are included.

**Specialized body styles** are available for many applications. Typically, strain reliefs are available in two general configurations: dome (or grommet) and flex. The flex style provides additional support and protection against kinking, chafing and extreme sudden bends at the point of entry. The flex styles would be more appropriate where products are intended to be moved often or where movement of the cord may be more severe.

Strain reliefs with 90° angles are available for applications where the cord must fit in a narrower space between the equipment and a wall, or another piece of equipment. These can be found in both the flex and dome style.

Strain reliefs are also available for wire harnesses and hook-up wire. These multi-cable and mini strain reliefs allow one or more individual conductors to be passed through holes in the gland. These are generally only found in dome types. Additionally, there is a version of this type that does not have any pre-drilled holes and is intended to be configurable by the customer where uncommon configurations are needed.

Other strain reliefs are made with specially shaped holes in the gland to accommodate flat cables and parallel cords, such as North American SPT types.

Finally, there are some metal strain reliefs that allow the manufacturer to terminate the shielding of shielded power cords and cable to both the strain relief and the chassis. This effectively prevents EMI (Electro Magnetic Interference) and RFI (Radio Frequency Interference) noise from entering or radiating through the hole made in the chassis to mount the strain relief.

**Cable size** is extremely important when specifying a strain relief. The outer diameter of the cable needs to be known in order to select the appropriate part for the application. Every strain relief has a specification of either a specific cable outer diameter size it will fit, or a range of cable outer diameters it will fit. When dealing with a range, it is advised to choose a product where the outer diameter of the cable to be used falls with-in the upper end of the range for the
strain relief. This will allow you to tighten the strain relief into place on the cable quickly and easily, and ensure that plenty of adjustment room exists if further tightening is needed for softer cable jacket materials.

**When specifying strain reliefs** for an application, it is wise to first consider the application and any special requirements you may need to meet. Once settled on the requirements, it is simple to run through the considerations discussed above. Some of these items may come down to a simple preference or may not matter at all. If unusual specifications exist for your application, or you are simply unsure what product would best meet your needs, you would be well advised to contact a strain relief supplier for assistance. Following these steps will help you narrow your choice to an exact part number and successfully specify the best part for your needs.