

# Conductive Elastomers

Limitless Shieldings conductive elastomers are exceptionally versatile EMI shielding materials providing extremely low contact resistance between mating surfaces. By loading highly conductive metal fillers into silicone, or fuel resistant fluorosilicone elastomer, a very efficient EMI gasket with excellent environmental sealing characteristics is created. The various conductive fillers are designed to ensure galvanic compatibility whilst providing low contact resistance between mating surfaces. This ensures that a product is available to suit the broadest span of applications.

## Applications

- ⚡ Industrial controls and Instruments
- ⚡ Military equipment and Avionics
- ⚡ Waveguide and connector gaskets
- ⚡ Electronic equipment enclosures
- ⚡ Medical electronics
- ⚡ Lasers and Opticals
- ⚡ Satellite and Space
- ⚡ Base Stations
- ⚡ O-rings

## Availability

### This material is available as:

- ⚡ Sheets
- ⚡ Extrusion
- ⚡ O -rings
- ⚡ Sheets are available up to 380 x 508mm
- ⚡ Sheets start from 0.25mm thick (Excluding PSA)
- ⚡ Some materials are available on rolls
- ⚡ Fire retardant UL94 V-0 material available
- ⚡ Low outgassing (ASTM E595) material available
- ⚡ A reinforced layer can be moulded into the sheets to reinforce the gasket material
- ⚡ For custom die-cut gaskets, please submit a drawing of the gasket and the type of material required.
- ⚡ Die cut gaskets
- ⚡ Moulded components

### Extruded profiles are available in many forms:

- ⚡ Solid and hollow round sections from 0.8mm up in increments of 0.2mm.
- ⚡ Solid and Hollow D sections from 1.4mm x 1.4mm and up in increments of 0.2mm
- ⚡ U Channels from 2.4mm x 2.4mm and up in increments of 0.2mm
- ⚡ Solid and Hollow square sections from 1.4mm x 1.4mm and up in increments of 0.2mm



Property	Available Materials												
Material Type	CE-NCS	CE-NCS-V0	CE-NCF	CE-SAS	CE-SAF	CE-PSAS	CE-PSAF	CE-SCS	CE-SCF	CE-NS	CE-NF	CE-NAS	CE-NAF
<b>Elastomer</b>	VMQ	FR-VMQ	FVMQ	VMQ	FVMQ	VMQ	FVMQ	VMQ	FVMQ	VMQ	FVMQ	VMQ	FVMQ
<b>Conductive Filler</b>	Ni/C	Ni/C	Ni/C	Ag/Al	Ag/Al	Passivated Ag/Al	Passivated Ag/Al	Ag/Cu	Ag/Cu	Ni	Ni	Ni/Al	Ni/Al
<b>Colour</b>	Grey	Grey	Grey	Tan	Green	Blue	Blue	Tan	Tan	Grey	Green	Grey	Grey
<b>Volume Resistivity MIL-DTL 83528 (ohm-cm, max.)</b>	0.1	0.05	0.3	0.001	0.005	0.001	0.005	0.0009	0.01	0.1	0.1	0.08	0.03
<b>Hardness (Shore A)</b>	30-65 (Standard 65)	50-80 (Standard 60)	60	65	70	65	70	65	75	65	70	68	68
<b>Density</b>	1.93	2.2	2	2.05	2.1	2.05	2.1	3.2	4	4.5	4.8	2.05	2.15
<b>Elongation %</b>	530	400	100	280	245	280	245	280	100	150	150	320	350
<b>Tensile Strength (psi)</b>	240	225	150	240	330	240	330	240	180	200	180	200	200
<b>Tear "B" (ppi)</b>	60	45	70	38	-	38	-	45	35	40	40	50	50
<b>Thermal Conductivity (W/mK)</b>	-	-	-	-	-	-	-	-	-	-	-	1.6	-
<b>Operating Temperature</b>	-55°C to 200°C	-55°C to 200°C	-60°C to 220°C	-60°C to 220°C	-60°C to 220°C	-60°C to 220°C	-60°C to 220°C	-60°C to 220°C	-55°C to 125°C	-60°C to 220°C	-60°C to 220°C	-60°C to 220°C	-60°C to 220°C
<b>Shielding Effectiveness 20MHZ-10GHZ</b>	>113 dB	>113	>117	>114	>125	>114	>125	>111	>108	>106	>103	>110 dB	>112 dB
<b>Galvanic Corrosion 168 Hour Salt Spray</b>	-	-	-	-	-	-	-	-	-	-	-	0.08%	-
<b>Meets ASTM E595</b>	Yes	-	-	-	-	-	-	-	-	-	-	-	-
<b>UL-94 Flammability Rating</b>	-	V0	-	-	-	-	-	-	-	-	-	-	-



# Tolerances

## ⚡ Extrusions

Up to 2.0mm  $\pm$  0.13mm

2.0mm to 5.0mm  $\pm$  0.2mm

5.0mm to 9.0mm  $\pm$  0.25mm

## ⚡ Die Cut Gaskets

Overall Dimensions  $\pm$  0.15mm

Hole Centres  $\pm$  0.4mm

## ⚡ Sheet Thickness

Up to 3.2mm  $\pm$  0.15mm

# Design Information

When selecting a conductive elastomer, it is important to give attention to both the electrical and the mechanical requirements of your product design. It is often necessary to compromise on these two elements along with that other significant factor, cost.

A major consideration should be whether there is a potential threat of galvanic corrosion. In applications where this is a genuine concern, we normally recommend the use of nickel loaded variant.

This type offers the best all round package of good electrical, mechanical and cost performance.

## The Main materials to select from are:

### Silver Plated Aluminium:

A high performance material widely used for higher frequency applications. Lighter in weight than some other materials.

### Silver Plated Copper:

This material offers excellent RFI/ EMI shielding performance across the frequency spectrum, but comes at a higher price and with increased weight.

### Nickel:

This product has largely been replaced by Nickel Graphite but is still widely used in military and aerospace applications. Fluorosilicone has better aging properties than the silicone. A good performer at lower frequencies but also heavier than some other materials.

### Nickel Plated Graphite:

A high quality, cost effective material suitable for most applications. It is easily extruded and moulded. Different hardness, UL94 V-0 and ASTM E595 grades are available.



Our conductive elastomers are available in sheet or die cut gasket form, or as an extrusion or as a custom moulding. For O-ring type seals it is usually most cost efficient to extrude a section and to then vulcanize a joint. Thereby creating a mechanically strong and electrically conductive bond. As well as the standard range of extrusion we can also produce special sections to suit your design. A wide range of custom mouldings are possible, from basic O-ring seals to grommets and intricate gaskets. Round and 'D' section seals should, ideally, be mounted in a suitably dimensioned channel.

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Do not allow a gasket section to overfill its channel. When designing a channel for solid sections, ensure that its cross-sectional area is approximately 5% greater than that of the gasket section to be used.

Consider the force per unit length required to compress a gasket section to its working height.

The required closure force can be sufficient to cause an insubstantial housing or cover to distort, resulting in loss of seal. This effect may be minimized by ensuring that the pitch between fasteners is not too great





i.e. that the cover or housing does not bow to such an extent that less than the recommended compression is applied to the gasket section at any point. In addition to this, it is sometimes possible to substitute a hollow extrusion for a solid gasket

We can assist you in the early design stage of your project, to specify the most cost effective solution, whilst taking into account all of the relevant design elements.

<b>Recommended Channel Sizes</b>			
<b>Ømm</b>	<b>H (min)</b>	<b>H (max)</b>	<b>W mm</b>
1.6	1.45	1.2	1.75
1.8	1.65	1.35	1.98
2.4	2.21	1.8	2.64
3.2	2.94	2.14	3.52
4.8	4.42	3.6	5.28

**The table above indicates channel dimensions for a number of typical solid round sections.**

**The section will provide an effective EMI seal at lower compressions but it will become less efficient as a pressure seal.**

			 
<b>Recommended Compression Range</b>	10- 25%	10 - 20%	20- 90% of void height



# Ordering information

## Custom Gasket

**<Material Type>-<Drawing Number>**

(e.g. CE-SAS-123456 for a gasket cut from silver aluminium in silicone to the drawing 123456)

## Extrusion

**<Material Type>-<Part Number>**

(e.g. CE-SAS-1-2.6 for a silver aluminium extrusion, solid round, 2.6mm diameter)

## O-ring

**<Material Type>-<Section Part Number>-<ID Or Developed Length>**

(e.g. CE-SAS-1-2.6-100DL for a silver aluminium extrusion, solid round, 2.6mm diameter with a developed length of 100mm)

## Handling

These materials should not be subjected to stretching in either storage or installation otherwise the conductive particles may disperse in the rubber, resulting in degradation of the shielding performance.

In addition materials should be handled using cotton gloves to prevent surface contamination.

Care must be used when fitting gaskets into channels. This is especially the case with O-Rings. The product should be eased into the final groove shape from each end or opposite diagonals, working slowly inwards or round the outside. It must not be placed in at one end and simply pushed in along the length, this will stretch the gasket and leave excess material.

