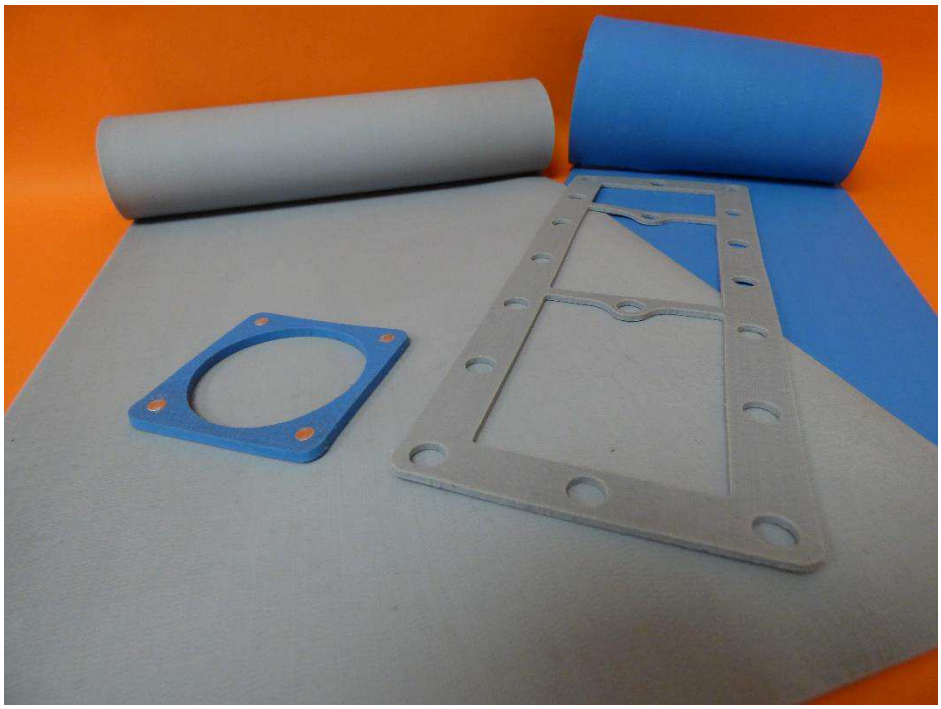
1. INTRODUCTION

This specification covers the requirements for application of RFI/EMI Oriented Wire in Silicone/Fluorosilicone articles which are designed to provide Radio Frequency Interference / Electro-Magnetic Interference (RFI/EMI) shielding / sealing solutions.

The articles referred to herein are formed to a specified shape and size and therefore considerations of application must be made to ensure that the appropriate product is selected and utilized correctly, so that the performance of the article in service is optimized.

This specification will provide technical advice on article selection & design considerations when implementing RFI/EMI Oriented Wire in Silicone/Fluorosilicone articles.



2. REFERENCE MATERIAL

2.1. Engineering Drawings

TE Connectivity Customer Drawings for specific products are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any other technical documentation supplied by TE Connectivity/Kemtron Ltd.

The appropriate drawings for the product referenced herein are detailed as follows:

- Customer Drawing C-400-WIRE-SHEET

2.2. Specifications

Product specification 108-120069 provides material specific product performance and test specification details.

2.3. Instructional Material

The TE Connectivity/Kemtron Ltd catalogue provides extensive instruction on the range of product alternative shapes and sizes that are on offer. If an alternative dimension or shape of product is required that is not covered by the scope of this specification, please consult the catalogue, and seek technical sales advice from your customer service representative.

3. REQUIREMENTS

3.1. Safety

Please use sulfur-free protective gloves when handling RFI/EMI Conductive Elastomer products. This will provide protection for the product from contamination, as well as protection for the product handler.

Some products contain sensitive metals which can tarnish or degrade when exposed to contamination, whilst others may cause skin sensitization / allergic reactions when the product is handled.

Care should be taken when handling this material as any exposed metal points may scratch unprotected skin.

3.2. Storage

A. Ultraviolet Light

The products should be stored in their original packaging & isolated from direct sunlight to prevent premature degradation of the product.

B. Chemical Exposure

Do not store product near any of the chemicals listed below as they may cause corrosion or other degradation of the material.

Acids Alkalines Sulfur Compounds Ammonia Amines

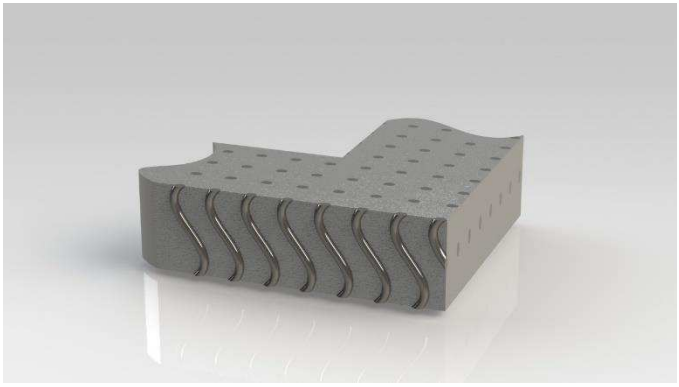
Acyl Halides Dissimilar rubbers or plastics (excluding original product packaging)

C. Shelf-Life

When stored according to the conditions above at ambient temperature and humidity, Oriented Wire in Silicone/Fluorosilicone's have a shelf-life of 20 years.

3.3. Product Overview

Oriented wire in silicone is an RFI/EMI/EMP shielding gasket material. The sheets are available in a range of thicknesses. Each sheet contains thousands of thin monel or aluminium wires that pass through the sheets thickness. These wires are crimped to form a slight zigzag which means that they do not drastically affect the compression forces required to make a seal. The wire types allow the designer to select the product best suited to their galvanic compatibility requirements. The softer blocks have a wire density of 100 wires/cm². The harder blocks have a wire density of 140 wires/cm². The wires are chemically bonded to the silicone or fluorosilicone during the manufacturing process. The elastomer provides the environmental sealing component, whilst the wires provide electrical grounding and the shielding aspect of the product. Under compression the wires have bite into the mating surface and penetrate through thin oxide layers providing low contact resistance



A choice of silicone and wire variants are available allowing this product to be used in a wide range of applications. The three material groups are 410/420, 450/460, and 470/480.

- **410**/**420** grades are 40 Shore A solid silicone with monel/aluminium wires. These grades are for use in applications where higher compression forces allow for better environmental sealing
- **450**/**460** grades are 50 Shore A solid fluorosilicone with monel/aluminium wires. These grades are available for use in environments where fuels/oils/hydraulic fluids and other contaminants are present
- **470**/**480** grades are 20 Shore A soft silicone with monel/aluminium wires. These grades are for applications that require lower compression forces. TE Connectivity/Kemtron Ltd developed these new grades of materials to fulfil a need that meets the performance of silicone sponge materials but with improved environmental sealing qualities. We have achieved this by using a very soft solid silicone with a reduced wire count of 100 wires per cm² which is the same as silicone sponge. The advantages of these new materials over silicone sponge are that we can manufacture increased sheet widths of up to 225mm with a minimum thickness of 0.8mm. Material consistency is a great advantage over silicone sponge as there is no uneven cell structure to consider that can affect moisture ingress and closure force.

3.4. Application

- A good solution for achieving RFI/EMI/EMP and environmental sealing in a single gasket.
- Ideal for use as access panels, seals, connector gaskets etc.
- Good conformity to allow for uneven surfaces.

3.5. Availability

TE Connectivity/Kemtron Ltd can offer a wide variety of options as the in-house manufactured material is cut from large blocks. The blocks are manufactured in either 150mm or 225mm widths. The sheets are cut using our high-speed slicer, enabling us to offer all thicknesses (subject to material type) to suit the customer's exact design requirement.

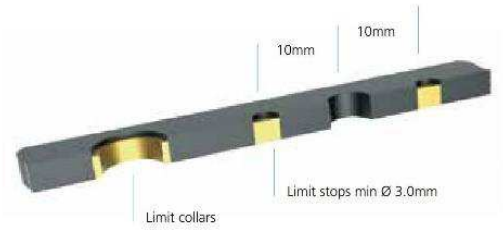
Typical uses for the sheets are:

- Die-cut or reciprocating knife-cut gaskets
- Large, fabricated gaskets
- Sheet material
- Strip material available in continuous lengths
- Self-adhesive backing to allow for easy assembly
- Can be fitted with compression limit stops or collars
- Small gaskets can be punched in one operation, keeping production costs to a minimum
- Larger gaskets can be produced cost effectively and without the constraint of sheet size limitation from strips of material fabricated into the required finished shape, thus avoiding waste material from the centre of the gasket

Part No.	Material	Min Thickness	Sheet Width(s)	Max Sheet Length
410	Monel wires in solid silicone	0.8mm	225mm (+0/-5mm)	1000mm
420	Aluminium wires in solid silicone	0.8mm	225mm (+0/-5mm)	1000mm
450	Monel wires in solid fluorosilicone	0.8mm	150mm (+0/-5mm)	1000mm
460	Aluminium wires in solid fluorosilicone	0.8mm	150mm (+0/-5mm)	1000mm
470	Monel wires in soft solid silicone	0.8mm	225mm (+0/-5mm)	1000mm
480	Aluminium wires in soft solid silicone	0.8mm	225mm (+0/-5mm)	1000mm

3.6. Design Considerations

- It is important that oriented wire in silicone isn't over compressed. If the design of the equipment does not allow for any mechanical method of preventing over-compression, by means of a compression limiting stop, the gasket should be fitted with compression limiters. These can be either compression stops or collars. Stops and collars are normally manufactured in a material that is suitable for the galvanic compatibility requirements and take the form of precisely manufactured cylinders or washers.

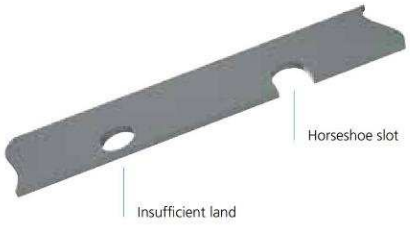


- There is no need for a conductive connection where strips or sheets are joined. This is because the wires forming the EMC contact run through the thickness of the sheet.
- An environmental seal is achieved by vulcanising the mating join with the corresponding silicone or fluorosilicone adhesive.
- The material is not suitable for frequent opening/closing or sliding applications. If your application requires this functionality, please contact your customer services representative at TE Connectivity/Kemtron Ltd.

- Recommended compression: **15% to 20%**

- Tolerances:
  - **Sheet Widths +0.0/-5mm**
  - **Thickness ± 0.13mm**

- When specifying an oriented wire in fluorosilicone (450/460): self-adhesive backing (SAB) is not recommended for use with this type of elastomer. This is due to the SAB's component chemical's ability to perform in line with the fluorosilicone elastomer. Typically, SAB is supplied with a shelf life of 6 months.
- Minimum material width should not be less than 2mm or at least the material thickness in any part of the gasket. If this cannot be achieved around fixing holes consider using a slot. Particular attention is required if specifying compression collars in holes.
- Particular consideration must be given to compression forces (see data in this section) hole centres, size and number of fixings and rigidity of mating flanges.



3.7. Compressive Forces

With oriented wire in silicone/fluorosilicone gaskets, the aim should be to limit the compression of the gasket to between 15% and 20%. (Some form of compression-stop or limit is essential with surface mounted gaskets to prevent over compression).

Example: A 3mm thick gasket should be compressed down to 2.40mm – 2.55mm.

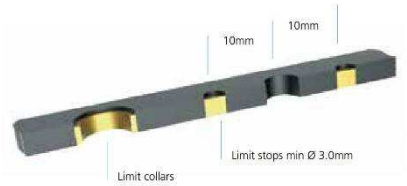
15% / 20% Compression Forces	0.8mm Thick	1.6mm Thick	2.4mm Thick
410/420	36 / 49 N/cm^2	45 / 81 N/cm^2	83 / 97 N/cm^2
450/460	38 / 61 N/cm^2	52 / 88 N/cm^2	102 / 129 N/cm^2
470/480	27 / 36 N/cm^2	43 / 65 N/cm^2	45 / 55 N/cm^2

Note, all compression force figures are subject to material tolerance deviations on raw materials that lie outside of our control.

The compressive force needs to be applied evenly across the entire length or surface of the gasket. Use a suitable number of fixings to achieve this. Using an insufficient number of fixings may lead to improper compression of the gasket and may lead to enclosure deformation.

We consider it best practice to request samples and conduct your own trials, and to always add a good margin to your force calculations.

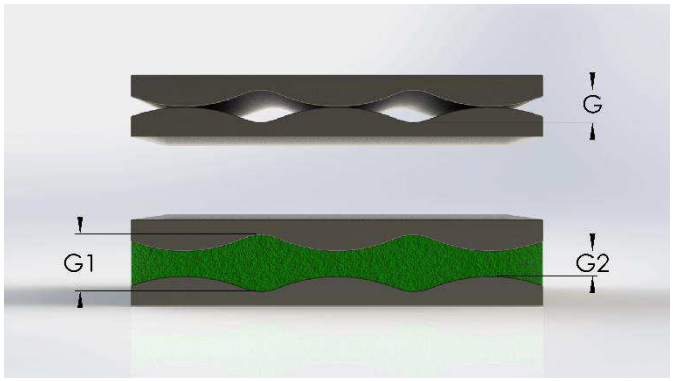
3.8. Compression Limiting



Compression stops can be built into many styles of gasket or made as an integral part of the flange. Their height should equal that of the maximum compressed height of the gasket.

Compression stops fitted into gaskets can be in the form of compression collars so that fixing bolts can pass through them or as compression stops located either side of a fixing bolt.

The thickness of the gasket for a known application can be calculated as follows e.g., Consider a gasket which can be compressed between 10% and 20% to be used on flanges which are not perfectly flat (G2), i.e., the flanges without gaskets touch at some points and leave gaps in others.



Since the gasket will compress between 10% and 20%, we will require 20% compression at the high points (G2) and 10% at the low points (G1). The greatest gap is therefore 15% of the gasket thickness (G1).

Example: We should aim to maintain a minimum of 10% compression between the low points at G1. We should not exceed 20% compression at the high points G2.

This theory is acceptable, provided that the flanges do not “bow” when placed under load. To overcome flange distortion, fixings may need to be added, the number of which will be determined by the flange stiffness/rigidity.

3.9. Notice

Information supplied in these data sheets is based on independent and laboratory tests which TE Connectivity/Kemtron Ltd believes to be reliable. TE Connectivity/Kemtron Ltd has no control over the design of customer’s product which incorporates TE Connectivity/Kemtron Ltd.’s products, therefore it is the responsibility of the user to determine the suitability for his particular application and we recommend that the user make his own test to determine suitability.

The product described in this data sheet shall be of standard quality, however the products are sold without warranty of fitness for a particular purpose, either expressed or implied, except to the extent expressly stated on TE Connectivity/Kemtron Ltd.’s invoice, quotation or order acknowledgement. TE Connectivity/Kemtron Ltd does not warrant that product described in this data sheet will be free of conflict with existing or future patents of third parties. All risks of lack of fitness, patent infringement and the like are assumed by the user.

4. REVISION HISTORY

Revision number	Change request	Date	Incorporated By
A	-	5-Jul-2022	Dominic Hemmings
