SPECIFICATION

108-120073

Knitted Wire Mesh Gasket Material

Knitted wire mesh gasket materials for Electromagnetic Interference (EMI) shielding. The consistency of the interlocking monofilament of the knitted wire mesh provides strength and integrity for the EMI shielding applications.
Typically used in large scale enclosure applications or in situations where there are wide tolerances on hardware, knitted wire mesh gasket solutions provide EMI shielding design flexibility.
Combination of knitted wire mesh with an elastomer core, allows the gasket to "rebound" from compressive environments.

RoHS and REACH compliant.

Typical continuous operating temperature: -50°C to 200°C (-58°F to 392°F).

Please consult 9.1 Appendix 1 Material Specific Data Table at the end of this document for material specific data.

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Knitted Wire Mesh Gasket Material

1 SCOPE

This specification establishes the quality standard of manufacture of knitted wire mesh gasket materials.
The raw material specifications are defined within, as well as the quality standard of finished product designed for utilization in EMI shielding applications.
The performance of materials and products covered by this specification are defined by and tested to industry standard and do not represent application-based performance. The suitability for application of all products covered within this specification should be tested and verified within representative functional conditions for the products intended use.

2 REVISION HISTORY

Revision number	Change request	Date	Incorporated By
A	-	05/08/22	James Martin
A1	Drawing reference names changed.	12/08/22	James Martin
A2	Drawing reference error corrected	01/09/22	James Martin

3 RELATED DOCUMENTS

This specification takes precedence over documents referenced herein. Unless otherwise specified, the latest issue of referenced documents applies. The following documents form a part of this specification to the extent specified herein.

3.1 STANDARD MATERIAL SPECIFICATIONS

The following specifications define the named material or have been combined to define a material where there is a lack of single specification to completely define the product.

Monel

BS3075 – Specification for nickel and nickel alloys: wire

AMS4730 – Nickel-Copper Alloy Wire, Corrosion-Resistant 67Ni–31Cu Annealed (400)

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Tinned Copper clad Steel (TCS)

*BS EN 50117-10-1 – Coaxial cables part 10-1: Sectional specification for coaxial cables for analogue and digital signal transmission – Outdoor drop cables for systems operating at 5 MHz – 1 000 MHz

*BS4087 – Specification for Copper-Covered Steel Wire for Telephone and Telegraph purposes.

*ASTMB277 – Standard Test Method for Hardness of Electrical Contact Materials

*ASTM B452 – Standard Specification for Copper-Clad Steel Wire for Electronic Application

*ASTM B520 – Standard Specification for Tin-Coated, Copper-Clad Steel Wire for Electronic Application

*ASTM B33 – Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes

*AISI 1010 – Carbon Steel

Stainless Steel – 316 S19

BS EN 10088-3 2005 – Stainless steels Part3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes.

Silicone Sponge Rubber

General Purpose Silicone Sponge with a density of 250 Kg/m^3 (16 lbs/ft^3).

*** TCS wire has no single material specification, and therefore any standards denoted with the asterix are combined and define the TCS wire material.**

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3.2 MILITARY DETAILS (MIL-DTL) & STANDARDS

MIL-STD-285 – MILITARY STANDARD ATTENUATION MEASUREMENTS FOR ENCLOSURES, ELECTROMAGNETIC SHIELDING, FOR ELECTRONIC TEST PURPOSES, METHOD OF

IEEE 299-2006 – IEEE Standard Method for Measuring the Effectiveness of Electromagnetic Shielding Enclosures

MIL-DTL-83528 – GASKETING MATERIAL. CONDUCTIVE, SHIELDING GASKET, ELECTRONIC, ELASTOMER, EMI/RFI GENERAL SPECIFICATION FOR

4. REQUIREMENTS

4.1 COMPOSITION AND APPEARANCE

The formed and finished components covered by this specification are knitted wire mesh products formed and finished to a specific shape and dimensional standard.
Some of these products also contain an elastomer core material (such as silicone sponge) to assist with the compressibility of the product when in high frequency opening / closing applications.

The following characteristics describe the composition and appearance of the components covered by this specification:

a) A continuous defined length of knitted metallic wire or knitted metallic wire over an elastomer core.
b) The density of material should be consistent along the length of the product.
c) The knitted product should be free from tears, holes, or “laddering”.
d) The product should be shaped to drawing defined profile, dimensions and tolerances.
e) Be free from dirt, foreign debris, excess grease or oil.

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4.2 MATERIAL & PROFILE SELECTION

Various profile forms are available for knitted gasket applications. These profiles are described in the table below, along with the appropriate local PN prefixes, the 'X' denoted in these prefixes is a numerical value which codes for the wire type used in the product.

Local PN Prefix	Profile Description
11X	Knitted Solid Round
13X	Knitted Solid Rectangle
14X	Knitted Flat Bandage
15X	Knitted Solid Twin Round with Fin
21X	Knitted Round with Silicone Sponge Core
23X	Knitted Rectangle with Silicone Sponge Core

The range of standard materials for the production of components is detailed in the table below:

TE Material Code	Material Description	'X' Local PN Suffix
Monel Wire	Monel 400 Alloy Wire 0.11mm Diameter	2
TCS Wire	Tinned Copper clad Steel Wire 0.11mm Diameter	4
Stainless Steel Wire	Stainless Steel 316 Alloy Wire 0.11mm Diameter	6

Example Local PN:

236-0048-0127

Silicone Sponge Rectangular Core Knitted over with Stainless Steel Wire, 4.8mm height x 12.7mm width.

Material selection for the required component is application specific. Therefore, please consult technical documentation carefully and if you are in need of assistance, please seek advice from a customer service representative.

More detail on the performance of materials will be specified in 9.1 Appendix 1 Material Specific Data Table

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5. QUALITY ASSURANCE PROVISIONS

5.1 CLASSIFICATION OF TESTS

5.1.1 Validation Tests

Validation tests are those which are conducted periodically at our discretion to confirm that the materials manufactured perform in accordance with this specification.

5.1.3 Acceptance Tests

Acceptance Tests are those that are performed on each batch of finished formed product to confirm that the production requirements have been met.

5.2 SAMPLE PREPARATION

Details of the sample preparation for each of the different types of tests are detailed below.

5.2.1 Validation Test Samples

Samples are prepared from a randomly selected batch of material and are formed to the test specifications finished & formed shape and dimensions.

Inspection of the quality of the knitted section, as well as the stitch length is also performed at this stage.

5.2.3 Acceptance Test Samples

The acceptance tests for knitted wire mesh material are defined by the dimensional and visual inspection of the part as it is manufactured in production. This should be a consistent and regular check of the finish, as well as a check with reference to the appropriate drawing.

| Indicates Change

5.3 TEST PROCEDURES

All test procedures referenced from hereon are conducted at our discretion or by an approved test provider.

5.3.1 Validation Tests

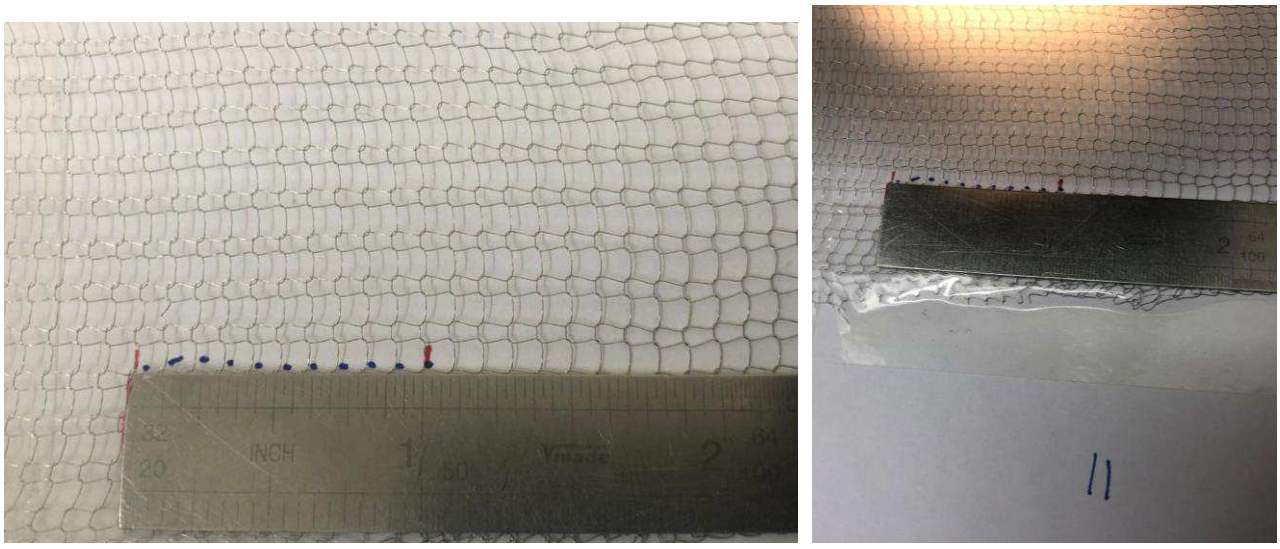
5.3.1.1 Stitch Length

For this test method a small sample of the material in question should be a single layer of knitted bandage approximately 100mm long.

A linear inch of a single layer of knitted wire mesh should be measured with a steel rule and marked against a piece of white paper.
The number of stitched within the linear inch marked should be counted. The use of a visual non-contact measuring machine may aid in the measurement and counting of this sample.

The stitch length of a single layer of knitted wire bandage should be that so that there are 8 – 12 stitches per 1" (25mm).

The images below illustrate how this measurement can be made.



Measurement and counting of stitches along a linear inch of knitted wire mesh bandage.

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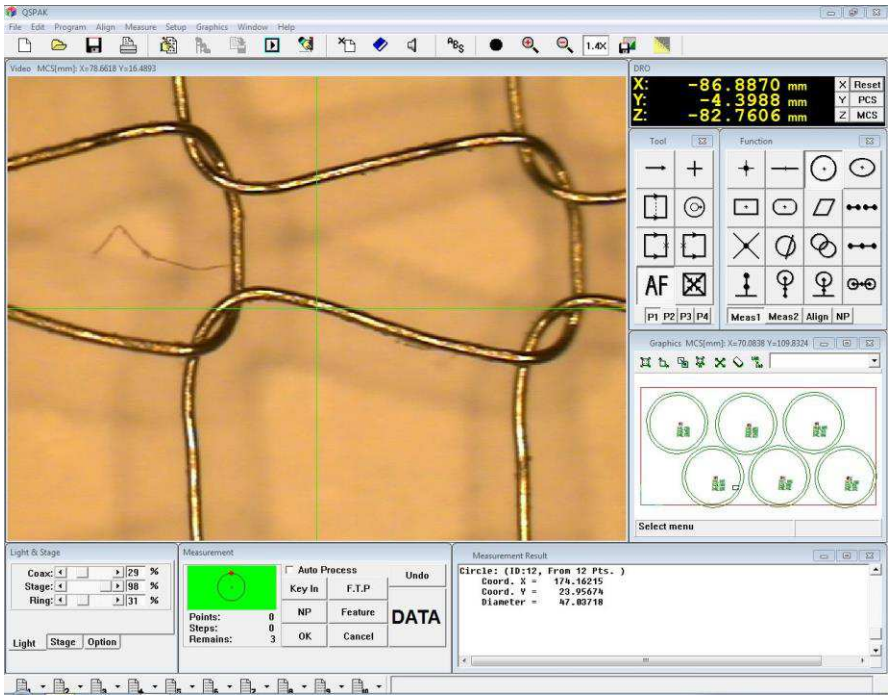

Use of the non-contact measuring machine can assist with difficult measurements and counting of the wire filament of the knitted bandage.

5.3.1.3 Material Shielding Performance

Knitted Wire Mesh products are historically tested to a modified version of the MIL-STD-285.
In some cases, methods incorporating elements of IEEE-299 & MIL-DTL-83528 were used to collect relevant data.
Shielding performance is measured across a specified frequency range, and the attenuation at each specified frequency is reported in decibels (dB) (the reduction of transmission of the specified interference frequency).

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5.3.2 Acceptance Tests

The dimensions of all parts should be in accordance with the appropriate drawings referenced below:

- C-ROUND-KNITTED-MESH
- C-RECTANGULAR-SKW-MESH
- C-FLAT-BANDAGE-KWM
- C-TWIN-ROUND-FIN-SKW-MSH
- C-ROUND-SS-CORE
- C-RECTANGULAR-SS-CORE

7 PRODUCT HANDLING

Care should be taken when handling knitted wire mesh products, protective gloves should be worn when handling the material to prevent any sharp or loose wires from causing cuts or abrasions to the product handler.

These products can be cut to the desired length using a clean pair of sharp scissors or secateurs. Any loose or frayed wires at the cut end of the product can be terminated using spot welding or encapsulation using an adhesive.

In the case of knitted products with an elastomer core, the cutting procedure is the same, however the core material should be cut independently to the wire layers. The core can then be joined using an appropriate adhesive, and the mesh layer(s) replaced over the core and sewn or joined to reinstate the integrity of the knitted layer(s).

8 PACKAGING & STORAGE

8.1 PACKAGING & HANDLING

Knitted wire mesh products should be packaged in clean & dry clear polythene bags, or where appropriate wound on a reel or spool and then wrapped in clear polythene or cellophane wrapping. The packaging should protect the product from exposure to debris, dirt, or any fluid contaminants.

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When handling or repackaging, care should be taken not to stretch the material, which could cause damage to the weave of the knit. Carefully unwind the desired length from the product package and cut appropriately as per the product handling advice.
Protective gloves and eye protection should be worn when handling the product to protect the product handler from any cuts, abrasions, or eye damage.

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8.2 STORAGE & SHELF-LIFE

Knitted wire mesh products should be stored under the following conditions:

- In original packaging or equivalent packaging to protect the product from contamination
- Free from compression by other product.
- At ambient temperature and humidity
- Isolated from corrosive materials
- Isolated from direct sunlight

Under these conditions, knitted wire mesh products have a shelf-life of 20 years.

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9 APPENDICES

9.1 Appendix 1 Material Specific Data Table

Test Specification / Material Code	Solid Knitted Monel	Solid Knitted TCS	Solid Knitted Stainless Steel	Knitted Wire Over SP16 Silicone Sponge Core
Recommended Operating Temperature Range (°C)				-50 to 200
[1]Stitch Length (Number of Stitches per inch)	8-12	8-12	8-12	8-12
[2]Elastomer Density (lbs/ft^3 / Kg/m^3)	N/A	N/A	N/A	16 / 250
Enclosure Opening Frequency (Number Of Openings)	2 – 3	2 – 3	2 – 3	Multiple
[3]Shielding Performance Magnetic Field – MIL-STD-285 (dB)				
10 kHz	28	47	-	-
100k Hz	45	67	-	-
1 MHz	64	68	-	-
10 MHz	104	104	-	-
[3]Shielding Performance Electric Field – MIL-STD-285 (dB)				
100kHz	118	118	-	-
1 MHz	136	136	-	-
10 MHz	123	126	-	-
100 MHz	99	109	-	-
[3]Shielding Performance Plane Wave Field – MIL-STD-285 (dB)				
400 MHz	96	98	-	-
1 GHz	84	77	-	-
10 GHz	46	43	-	-
[3]Shielding Performance – MIL-DTL-83528				
20 MHz	-	-	> 87	87
40 MHz	-	-	> 84	84
60 MHz	-	-	> 86	86
80 MHz	-	-	> 89	89
100 MHz	-	-	> 90	90
200 MHz	-	-	> 95	95
400 MHz	-	-	> 91	91
600 MHz	-	-	> 84	84
800 MHz	-	-	> 84	84
1 GHz	-	-	> 83	83
2 GHz	-	-	> 86	86
4 GHz	-	-	> 67	67
6 GHz	-	-	> 55	55
8 GHz	-	-	> 55	55
10 GHz	-	-	> 59	59

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1) **Stitch length is set and measured on the unformed knitted layers. This may not be apparent in the finished formed product.**
2) **Elastomer Density is that specified by the raw material suppliers technical data.**
3) **Shielding performance is representative of laboratory conditions on a representative sample of the manufactured product. Different test methodolgy has been applied for the testing of these products. Results are dependent upon the methodology applied and it is advised that customers test the product for the intended application prior to use.**

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