

#### EMI/RFI Shielding Products

"MAJR Difference **MAJR** Satisfaction"

U.S. SBA - Certified

**Veteran Owned Small Business** 

**ITAR Registered** 

**RoHS Compliant** 

9001:2008 Register SHIELDING • GASKETING • VENTILATION PANELS • BOARD LEVEL SHIELDS FERRITES • CONDUCTIVE ELASTOMERS • THERMAL MATERIALS • EMI WINDOWS



is an internationally recognized manufacturer of

#### Electromagnetic Interference/ Radio Frequency Interference (EMI/RFI) Shielding Products.

We serve the electronics industry, specifically, telecommunications, aerospace, computers, medical devices, instrumentation, commercial electronics, government and military.

Our product line primarily consists of gaskets, elastomers,
EMI windows, board level shields, and air ventilation/filtration panels.

These products reduce or eliminate EMI/RFI "noise"
associated with electronics and are usually installed in or on the enclosure or cabinet that contains the working electronics.

The electronics may be as small as a hand-held telephone, or as large as a satellite communications array.

Our manufacturing facility is capable of prototype to long-running production.

Always striving to exceed our customers' expectations, we provide prototyping, customizing, and flexibility in scheduling in addition to quality products.

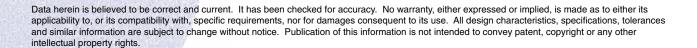
Contact us today to find how prompt, courteous service and fast turnaround will make the "MAJR" difference in your product requirements.



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#### **Quality Policy and Mission Statement**

MAJR Products provides product and technical service assistance that meets customer requirements and strives to exceed customer expectations. We are committed to continually improve our company by evaluating the process of the quality management system. Our Mission and Values are:

- Enjoy your work
- Build trust by being ethical and honest with vendors, customers, and each other
- Encourage new product ideas and manufacturing improvements
- Update employees on the status and direction of the company

#### ISO 9001:2008 Registered

MAJR Products Corporation achieved registration to the ISO 9001:2008 standard during the second quarter of 2005.

#### **Veteran Owned Small Business**

MAJR Products Corporation is qualified as a Veteran Owned small business per the guidelines set up and administrated by the Small Business Administration (SBA). The intent here is to help those that have served our nation as they come back and start and operate their own businesses. Prime contractors also receive benefits from the Federal Government for hitting certain quotas of business distributed to Veteran Owned operations. We welcome requests for quotes from purchasing agents and procurement officers looking to place business with a Veteran Owned company.

#### **ITAR Registered**

MAJR Products Corporation is an ITAR registered company.

Please call us direct if you need our registration number.

#### **RoHS Compliant**

MAJR Products Corporation is in compliance with the directives of WEEE and the European RoHS Directive 2002/95/EC as the following substances banned in these directives are excluded from our products: Cadmium, Hexavalent Chromium, Lead, Mercury, PBBs and PBDEs. A certificate can be sent upon your written request.

#### ORDERING, TERMS, MINIMUMS & OUR PART NUMBERING SYSTEM

This page will assist you in requesting quotes and ordering from MAJR Products Corporation. The basics of our quoting, ordering, minimums, terms and part numbering policies should be helpful to you in using this catalog to your advantage. As always we welcome any questions you may have regarding these policies.

- Quotes MAJR Products goal is to turn around a quote on price and delivery to each and every customer within a 48 hour period. In order for us to do this we need all the pertinent information, part number, competitive part number to cross and it is always best if a complete drawing can be provided. This process can take longer for non-standard materials and highly complicated parts.
- Minimums MAJR's minimum purchase order is based on a set dollar amount. We also set a line item minimum within that context. Phone or email us for the minimum purchase order amount. These are set across standard part numbers but can vary on custom parts based on minimum purchases that MAJR could incur on exotic or unusual materials or processes.
- Ordering All orders to MAJR must be in writing via mail, e-mail or fax. All purchase orders are reviewed per our ISO procedure and checked against quotes or recent orders completed for accuracy in pricing, delivery time, special shipping instructions or conditions, etc. Discrepancies result in immediate phone calls to the customer to be resolved. Once the correct amended PO is received and passes the customer will receive an acknowledgement, usually within a few days of the acceptance of the PO.
- <u>Terms and Conditions</u> All orders are net 30 day payment terms unless otherwise agreed upon in writing with the customer. All shipments are FOB: Saegertown, PA 16433. MAJR Products reserves the right to alter the specifications provided in this publication. Consult factory for current specifications.
- Warranty Parts are warranted for one (1) year from the date of shipment. Following that date an RMA will not be issued.

#### **MAJR Products Corporation Part Numbering System**

The numbering system is setup basically as follows:

#### AABB-CCCCC-DD EEE

- AA The first set of numbers refers to the product code. This tells what type of part it is, whether a vent panel, clicked gasket, or knitted mesh. (Example: 10BB refers to a knitted wire part while 30BB refers to a metal working part.)
- **BB** The next set of numbers refers to the <u>shape code and or product description</u> (or in the case of knitted mesh, it refers to the mesh code). This then gives us an idea of the shape of the part and what basic materials will be used.
- <u>CCCCC</u> This set of numbers is used to distinguish this part. Our catalog parts use these numbers to help identify the size (height and width) of the part. Any true custom parts to a supplied customer drawing or one created internally for a customer would be assigned a sequential number in this section.
- <u>DD</u> This set of numbers defines the specific material from which this part is made, or a finish that needs to be applied like plating. This tells us then the exact material being used to fabricate this part. (Example: AABB-CCCC-32 is a part made of aluminum while AABB-CCCC-39 is a unique material.)
- <u>EEE</u> The last set of numbers is not always present. It is only used for knitted wire, metallized fabric, and strip gaskets when the part is being cut to a specific length. (Example: 1510-CCCC-34 3.50 would be a knitted strip gasket of FX wire, cut to length of 3.50 inches.)
   In this case the 09063

Below and to the right is an example of how we use our numbering system:

The part number: 1547-09063-04

.093" TK -

This number tells us that it is a multicon strip gasket. So (AA), 15 means a strip type gasket, (BB) 47 narrows this to a multicon (oriented wire) gasket, and (DD) 04 indicates material of monel wire and silicone sponge.

refers to the thickness at .093" and the width of the strip at .625". No length is called out as multicon is quoted and sold typically by the foot.

\*NOTE: Fingerstock does not follow this system!

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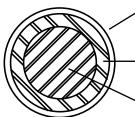


# Knitted Wire Mesh Tape(1000 Series)

Knitted Mesh Tape is a double-layered strip of knitted wire mesh providing an effective EMI shield for electrical and electronic cable assemblies. The knitted construction maximizes conformability and flexibility while minimizing bulk and weight. Knitted mesh tape uses Sn/Cu/Fe knitted or Monel wire to provide good physical strength and shielding effectiveness.

Recommended lead for most applications is 13mm (0.50 in.), although some additional shielding will be achieved when utilizing a 6mm (0.25 in.) lead. The length of EMC Shielding Tape required for each cable using these two types of lead wraps can be obtained by referring to Figure 2.

#### Cross Section of Sn/Cu/Fe Wire — Figure 1



#### Tin Coating

3% by weight offering low impedance contact and maximum corrosion resistance.

#### Copper Cladding

40% by weight offering maximum conductivity.

#### teel Core

57% by weight offering maximum strength and permeability.

#### **Specifications**

Material Description					
Wire Mesh	Sn/Cu/FE (tin-coated, copper-clad steel — see Figure 1) 0.114 + 0.012 mm (.0045 + .0005 in.) diameter in accordance with ASTM B-520.				
Width	25.4 mm (1.00 in.) nominal				
Thickness	0.45 mm (.02 in.) nominal.				
Weight	745 grams per 100 meters (8.0 oz. per 100 feet)				

# Performance Characteristics Pull Strength 222 Newtons (50 lbs.) Elongation (Maximum) 100 percent Necking (Typical) 47 percent at 111 Newtons (25 lbs.) 75 percent at 222 Newtons (50 lbs.)

Material	H-Field	E-Field		Wave
Material	100 kHz	10MHz	1 GHz	10GHz
Sn/Cu/Fe	45	60	40	30

#### Tape Length vs Cable Size — Figure 2

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	100		1	"		2	."	3	"		4"	5	;"		6	
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Length of EMC Tape per Cable/Harness Length per Inch	40			+	— .	ا	A" LE	UA	Ä	RAP (I			+		+	
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MC.	6	1	7										1		†	
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Part Number	Sleeve Dia.	Mesh Width
1008-07004-xx	0.437"	0.312" to 0.437"
1012-07006-xx	0.625"	0.500" to 0.625"
1016-07007-xx	0.750"	0.625" to 0.750"
1020-07008-xx	0.875"	0.750" to 0.875"
1026-07010-xx	1.125"	1.000" to 1.250"
1034-07016-xx	1.250"	1.250" to 1.500"
1042-07022-xx	2.250"	2.000" to 2.500"
1100-07065-xx	5.500"	7.000" to 8.000"

10 12

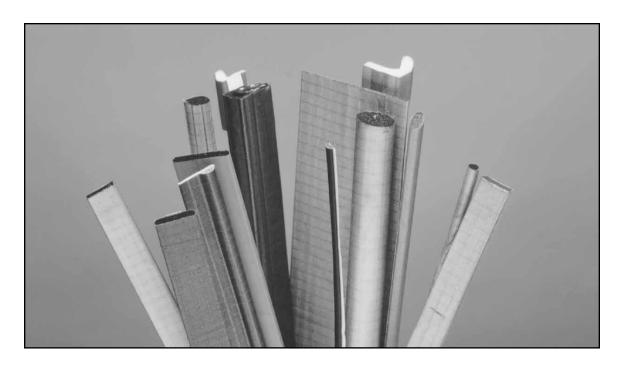
Perimeter of Cable/Harness (Inches)

16

18

xx: 31 for monel wire; 32 for aluminum wire; 34 for tin-plated, copperclad steel.

#### Metallized Fabric Cloth Over an Elastomer Core Shielding Gasket (1400 Series)



MAJR Products' Metallized Fabric Gasketing — a combination of a metallized, woven nylon cover over a foam core — provides superior EMI/RFI shielding.

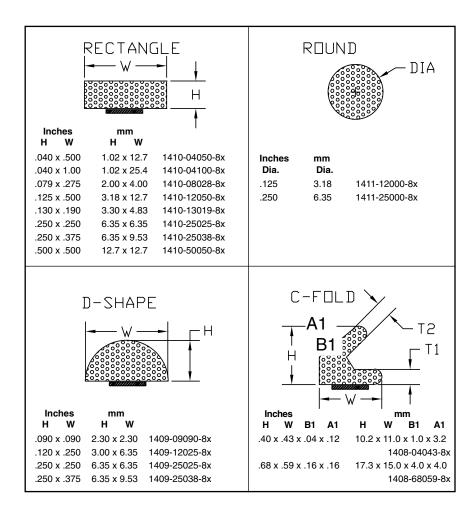
Metallized Fabric Gaskets are designed to meet the higher frequency requirements for present and future EMI/RFI performance standards for electronic enclosures.

Metallized Fabric Gaskets are available in a variety of profiles, including Asymmetrical, C-Fold, P, and D shapes. Customized profiles and fabricated die-cut parts including I/O shielding for Mil and D-Sub connectors can be manufactured to meet specific requirements with no (or minimal) set-up cost. Metallized Fabric is available with nickel-over-copper fabric. Both a pressure-sensitive adhesive and a conductive adhesive for smaller profiles are available.

#### **Features**

- High EMI/RFI Attenuation Levels
- Resilient Gasketing Material
- Fabricated/Die-Cut Parts
- Customized Profiles
- Self-Terminating
- Manufactured by MAJR Products Corp.
- UL 94 VO Fire-Retardant Materials Available

#### **Metallized Fabric Profiles**

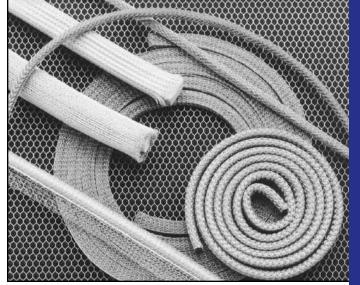


#### **Standard Fabric**

#### (83) Nickel/Copper

- Surface resistivity of .05 ohms; abrasion resistance cycle of 1,000,000 cycles.
- Per Mil DTL 83528 shielding performance of 95 dB average in frequencies of 20 MHz to 5 GHz, with compression of 50% on a 1/4" x 1/4" gasket.

#### EMI Shielding Strip: Elastomer Core (1500 Series)



#### **Features**

- Excellent Resiliency: With an elastomer core there is assurance of continued pressure over the entire length of the gasket.
- Moisture and/or Dust Protection: With two covers of mesh over an elastomer, the elastomer under pressure protrudes through the mesh to give sealing protection.
- Wide Range of Materials: The designer can choose from a wide range of materials to satisfy EMI requirements while providing for corrosion protection and sealing criteria. See Table 2 for materials.
- Excellent Attenuation Characteristics: The MAJR elastomer core shielding strip gives a high degree of attenuation in the H-Field, E-Field, as well as plane wave. The attenuation varies from over 95-100 dB in the E-Field to 35-85 dB in the H-Field.
- Versatility of Mounting Methods:
   The enclosure engineer has the option of using a groove design for holding the strip or using the mesh fin as a convenient way of strip mounting.

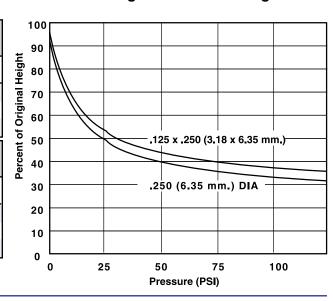
#### **Technical Information**

#### Shielding Effectiveness vs Frequency — Table 1

Material Code -02-04

ا م	Field		Frequency						
Effectiveness dB		10 kHz	100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	10 GHz
ven	Н	35	45	65		_	_	_	_
i ci	E	_	_	_	95	_	_	_	_
<u> </u>	PW	_	_	_	_	95	85	75	65
<u>ا</u> و			Material Code -10-12 Frequency						
	Field								
Snieidi	Field	10 kHz	100 kHz				400 MHz	1 GHz	10 GHz
Snieidi	Field H	_	100	F	requenc	100	400	1 GHz	_
Snieldi		kHz	100 kHz	1 MHz	requenc	100	400	1 GHz —	_
Snielding	Н	kHz	100 kHz	1 MHz	requend 18 MHz —	100	400	1 GHz — — 80	_

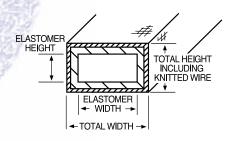
#### Pressure vs Height Deflection — Figure 1



#### Material Selection Guide — Table 2

Strip Shape							
KNIT WIRE AVAILABLE	MONEL ALUMINUM SILVER-BRASS TIN-FERROUS	YES YES YES YES	YES YES YES YES	YES YES YES YES	YES YES YES YES	YES YES YES YES	YES YES YES YES
ELASTOMER CORE AVAILABLE	NEO-SPONGE NEO-SOLID SIL.SPONGE SIL.SOLID	YES YES YES YES	NO YES NO YES	YES YES YES YES	NO YES NO YES	YES YES YES YES	NO YES NO YES
EMI RATING	10 kHz H-FIELD 18 MHz E-FIELD 1 GHz PLANE WAVE	25 to 35 dB 95 to 115 dB 75 to 100 dB	25 to 35 dB 95 to 115 dB 75 to 100 dB	25 to 35 dB 95 to 115 dB 75 to 100 dB	25 to 35 dB 95 to 115 dB 75 to 100 dB	25 to 35 dB 95 to 115 dB 75 to 100 dB	25 to 35 dB 95 to 115 dB 75 to 100 dB
ENVIRON- MENTAL SEAL	DUST RAIN & DRIP PROOF	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD
PRESSURE SEAL	30 PSI UP	FAIR	FAIR	FAIR	FAIR	FAIR	FAIR
MOUNTING METHOD	GROOVE ADHESIVE BOLT	EXCELLENT GOOD GOOD	EXCELLENT GOOD FAIR	EXCELLENT FAIR —	EXCELLENT FAIR	EXCELLENT EXCELLENT	EXCELLENT EXCELLENT
MINIMUM PRESSURE	_	15 PSI	15 PSI	5 PSI	5 PSI	5 PSI	5 PSI
MOUNTING	GROOVE COMP. STOP	YES YES	YES YES	YES NO	YES NO	YES NO	NO YES
GROOVE DEPTH OR COMPRES- SION HEIGHT	STRIP HT .06 -0.25" .2550" .50- 1.0"	85% of HT 80% of HT 75% of HT	85% of HT 80% of HT 75% of HT	75% of HT 75% of HT 70% of HT	75% of HT 75% of HT 70% of HT	75% of HT 75% of HT 70% of HT	75% of HT 75% of HT 70% of HT
TEMP. RANGE	SIL. SOLID SIL. SPONGE NEO. SOL NEO. SPONGE	-80 to 425°F -103 to 400°F -65 to 212°F -40 to 150°F	-80 to 425°F -103 to 400°F -65 to 212°F -40 to 150°F	-80 to 425°F -103 to 40°F -65 to 212°F -40 to 150°F	-80 to 425°F -103 to 400°F -65 to 212°F -40 to 150°F	-80 to 425°F -103 to 400°F -65 to 212°F -40 to 150°F	-80 to 425°F -103 to 400°F -65 to 212°F -40 to 150°F

#### Rectangular Shaped Gasket - Sponge Elastomer



Standard Elastomer Core Shielding Strip

#### Monel Wire — Table 3

Elastomer Height	Elastomer Width	Total Height	Total Width	Neoprene Sponge Part Number	Silicone Sponge Part Number
.125 (3.18)	.125 (3.18)	.160 (4.06)	.160 (4.06)	1510-12012-02	1510-12012-04
.125 (3.18)	.188 (4.78)	.160 (4.06)	.225 (5.72)	1510-12019-02	1510-12019-04
.125 (3.18)	.250 (6.35)	.160 (4.06)	.285 (7.24)	1510-12025-02	1510-12025-04
.188 (4.78)	.188 (4.78)	.225 (5.72)	.225 (5.72)	1510-19019-02	1510-19019-04
.250 (6.35)	.250 (6.35)	.285 (7.24)	.285 (7.24)	1510-25025-02	1510-25025-04
.250 (6.35)	.500 (12.70)	.285 (7.24)	.535 (13.59)	1510-25050-02	1510-25050-04

#### Tin Plated Ferrous Wire — Table 4

Elastomer Height	Elastomer Width	Total Height	Total Width	Neoprene Sponge Part Number	Silicone Sponge Part Number
.125 (3.18)	.125 (3.18)	.160 (4.06)	.160 (4.06)	1510-12012-10	1510-12012-12
.125 (3.18)	.188 (4.78)	.160 (4.06)	.225 (5.72)	1510-12019-10	1510-12019-12
.125 (3.18)	.250 (6.35)	.160 (4.06)	.285 (7.24)	1510-12025-10	1510-12025-12
.188 (4.78)	.188 (4.78)	.225 (5.72)	.225 (5.72)	1510-19019-10	1510-19019-12
.250 (6.35)	.250 (6.35)	.285 (7.24)	.285 (7.24)	1510-25025-10	1510-25025-12
.250 (6.35)	.500 (12.70)	.285 (7.24)	.535 (13.59)	1510-25050-10	1510-25050-12

#### **Round Section - Sponge Elastomer Core**



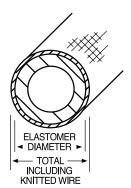
#### Monel Wire — Table 5

Elastomer Diameter	Total Diameter Over Wire	Neoprene Sponge Part Number	Silicone Sponge Part Number
.062 (1.57)	.098 (2.49)	1511-06000-02	1511-06000-04
.125 (3.18)	.160 (4.06)	1511-12000-02	1511-12000-04
.188 (4.78)	.225 (5.72)	1511-19000-02	1511-19000-04
.250 (6.35)	.285 (7.24)	1511-25000-02	1511-25000-04
.312 (7.92)	.348 (8.84)	1511-31000-02	1511-31000-04
.375 (9.53)	.410 (10.41)	1511-38000-02	1511-38000-04
.500 (12.70)	.535 (13.59)	1511-50000-02	1511-50000-04

#### Tin Plated Ferrous Wire — Table 6

Elastomer Diameter	Total Diameter Over Wire	Neoprene Sponge Part Number	Silicone Sponge Part Number
.062 (1.57)	.098 (2.49)	1511-06000-10	1511-06000-12
.125 (3.18)	.160 (4.06)	1511-12000-10	1511-12000-12
.188 (4.78)	.225 (5.72)	1511-19000-10	1511-19000-12
.250 (6.35)	.285 (7.24)	1511-25000-10	1511-25000-12
.312 (7.92)	.348 (8.84)	1511-31000-10	1511-31000-12
.375 (9.53)	.410 (10.41)	1511-38000-10	1511-38000-12
.500 (12.70)	.535 (13.59)	1511-50000-10	1511-50000-12

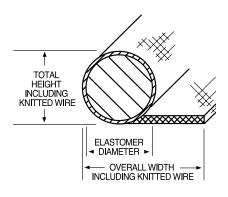
#### **Round Section - Solid Silicone Elastomer Tubing Core**



#### Monel Wire & Tin Plated Steel — Table 7

Tubing Dia (O.D.)	Diameter Over Wire	Monel Wire Part Number	Tin Plated Steel Part Number
.125 (3.18)	.160 (4.06)	1511-12000-18	1511-12000-19
.188 (4.78)	.225 (5.72)	1511-19000-18	1511-19000-19
.250 (6.35)	.285 (7.24)	1511-25000-18	1511-25000-19
.312 (7.92)	.348 (8.84)	1511-31000-18	1511-31000-19
.375 (9.53)	.410 (10.41)	1511-38000-18	1511-38000-19
.500 (12.70)	.535 (13.59)	1511-50000-18	1511-50000-19

#### **Single Fin Section - Sponge Elastomer Core**



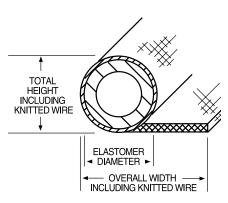
#### Monel Wire — Table 8

Elastomer Diameter	Total Height	Overall Width	Neoprene Sponge Part Number	Silicone Sponge Part Number	
.125 (3.18)	.160 (4.06)	.500 (12.70)	1512-12050-02	1512-12050-04	
.125 (3.18)	.160 (4.06)	.750 (19.05)	1512-12075-02	1512-12075-04	
.188 (4.78)	.225 (5.72)	.625 (15.88)	1512-19063-02	1512-19063-04	
.188 (4.78)	.225 (5.72)	.750 (19.05)	1512-19075-02	1512-19075-04	
.250 (6.35)	.285 (7.24)	.750 (19.05)	1512-25075-02	1512-25075-04	
.250 (6.35)	.285 (7.24)	1.000 (25.40)	1512-25100-02	1512-25100-04	
.500 (12.70)	.535 (13.59)	1.000 (25.40)	1512-50100-02	1512-50100-04	

#### Tin Plated Ferrous Wire — Table 9

Elastomer Diameter	Total Height	Overall Width	Neoprene Sponge Part Number	Silicone Sponge Part Number
.125 (3.18)	.160 (4.06)	.500 (12.70)	1512-12050-10	1512-12050-12
.125 (3.18)	.160 (4.06)	.750 (19.05)	1512-12075-10	1512-12075-12
.188 (4.78)	.225 (5.72)	.625 (15.88)	1512-19063-10	1512-19063-12
.188 (4.78)	.225 (5.72)	.750 (19.05)	1512-19075-10	1512-19075-12
.250 (6.35)	.285 (7.24)	.750 (19.05)	1512-25075-10	1512-25075-12
.250 (6.35)	.285 (7.24)	1.000 (25.40)	1512-25100-10	1512-25100-12
.500 (12.70)	.535 (13.59)	1.000 (25.40)	1512-50100-10	1512-50100-12

#### **Single Fin Section - Silicon Solid Tubing Core**



#### Monel Wire & Tin Plated Steel — Table 10

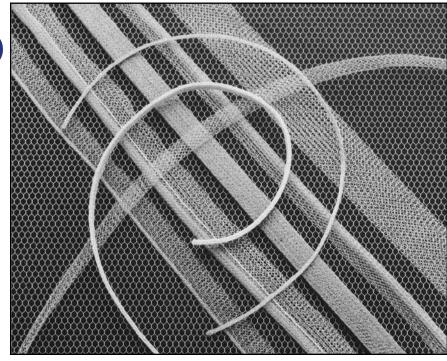
Tubing Diameter (O.D.)	Diameter Over Wire	Overall Width	Monel Wire Part Number	Tin Plated Steel Part Number
.125 (3.18)	.160 (4.06)	.500 (12.70)	1512-12050-18	1512-12050-19
. 123 (3.16)	.100 (4.00)	.750 (19.05)	1512-12075-18	1512-12075-19
.188 (4.78)	.225 (5.72)	.625 (15.88)	1512-19063-18	1512-19063-19
.100 (4.70)	.223 (3.72)	.750 (19.05)	1512-19075-18	1512-19075-19
.250 (6.35)	.285 (7.24)	.750 (19.05)	1512-25075-18	1512-25075-19
.230 (0.03)		1.00 (25.40)	1512-25100-18	1512-25100-19
.312 (7.92)	.348 (8.84)	.625 (15.88)	1512-31063-18	1512-31063-19
.512 (7.92)	.546 (6.64)	1.00 (25.40)	1512-31100-18	1512-31100-19
.375 (9.53)	.410 (10.41)	.750 (19.05)	1512-38075-18	1512-38075-19
.575 (9.55)	.410 (10.41)	1.12 (28.00)	1512-38112-18	1512-38112-19
500 (40 70)	FOF (10 FO)	1.00 (25.40)	1512-50100-18	1512-50100-19
.500 (12.70)	.535 (13.59)	1.25 (31.25)	1512-50125-18	1512-50125-19

#### **EMI-Knitted Wire Mesh**

## Gasketing (1500 Series)

All Mesh EMI-RFI knitted wire gasketing is available in various cross sections to satisfy the many different requirements encountered in shielding applications. The choice between rectangular, round, round with fin or double round with fin depends on the enclosure or equipment to be shielded.

Each strip has the same resiliency created by the knit construction but each differently dependent on material and shape. Of the most common materials used, Monel has the best spring factors while silverplated brass has the highest conductivity. All mesh gasketing which is



rectangular or round is recommended for groove mounting while single round with fin or double round with fin is recommended for flat surfaces. Surface conditions must be clean and free from such contamination as paint or oil for good conductivity and there should be an even distribution of pressure continuously along the length of the gasket.

#### **Features**

- **Proven Design:** EMI/RFI knitted wire gasketing has been the standard shielding product since its first use in 1944. Since that time, the product has been refined and new knit wire products have been introduced to the present state of the art products.
- Versatility of Materials: MAJR's provides the widest possible range of knit wire mesh materials.
  The standard knit wire mesh is either Monel or tin-plated ferrous. While these are standard,
  aluminum, silver-plated brass, gold-plated copper, tungsten, stainless steel, silver, nickel, iconel,
  and other wire can be knit and fabricated into special products by MAJR's team of engineering and
  manufacturing personnel.
- High EMI/RFI Attenuation Levels: The highest possible attenuation levels are achievable with MAJR's EMI/RFI knitted wire gasketing. Attenuation levels beyond 110 dB in the E-field and 60 dB in the H-field are common with shielding gasketing. Higher levels of attenuation are attainable with special materials and special designs.
- Resilient Gasketing Material: MAJR's knit wire gasketing material acts like thousands of tiny
  spring members which are compressed and released with each opening and closing of a cabinet
  door or enclosure cover. The spring-like gaskets assure long life with consistent point-to-point
  contact, providing high shielding effectiveness and long life.

#### **Mechanical & EMC Characteristics of All Mesh Strip**

Shielding Effectiveness: Strip from lots are formed into gasket whose inner dimension is 12.00 x 12.00 inches (304.8 x 304.8 mm) Gasket is clamped in a test fixture with thickness deflected a minimum of 20%, EMI test is performed using MIL-STD 285 as a guide. The test is performed at frequencies from .2MHz through 10GHz. (See Table 1)

#### Table 1

Code	Description
-31	Monel per QQ-N-281 Class A
-32	Aluminum
-33	Silver Plated Brass per QQ-W-321 (3% Silver by Weight)
-34	Tin Plated Copper Clad Steel per ASTM B520

#### Shielding Effectiveness vs Frequency — Table 2

	Field		Material Code - 31 Monel Frequency							
9		10 kHz	100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	10 GHz	
s dB	Н	40	60	80	_	_	_		_	
nes	E	_	_	_	110		_	_	_	
tiveness	PW	_	_	_	_	110	110	110	100	

ng Effeα	Field	Material Code - 34 Ferrous (FX) Frequency							
Shielding		10 kHz	100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	10 GHz
ည	Н	65	90	100	_	_	_	_	_
	E	_	_	_	110	_	_		_
	PW	_	_	_	-	110	110	110	100

#### Compression

Deflection and recovery characteristics of Knit Wire Mesh Strips are evaluated periodically in accordance with ASTM D395-61.

In order to be assured of obtaining comparable results to those shown in these curves, good design practices must be utilized.

Figure 1 For All Mesh Rectangular .12 x .25

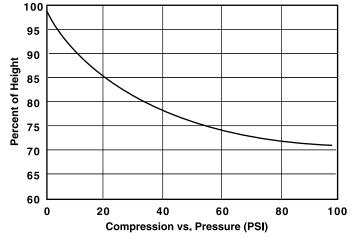


Figure 2
For All Mesh Round .25 Dia

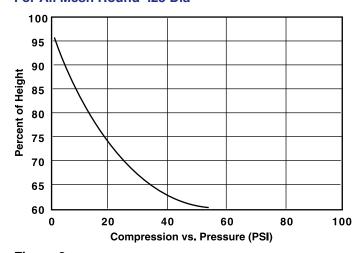
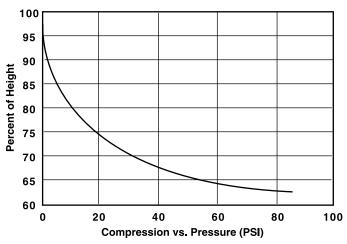


Figure 3
For All Mesh Double Round .25 x 1.00



MAJR PRODUCTS

Size vs Tolerance — Table 3

		TOLERANCE			
SHAPE	SIZE RANGE	DIM A	DIM B		
→ B → A	to .18 (4.57) .1938 (4.83 - 9.65) .3950 (9.91 - 12.70) .51 - 1.00 (12.95 - 25.40)	+.02-0 (+.51-0) +.03-0 (+.76-0) +.046-0 (+1.17-0) +.062-0 (+1.57-0)	+.02-0 (+.51-0) +.03-0 (+.76-0) +.046-0 (+1.17-0) +.062-0 (+1.57-0)		
<u>1</u>	to .12 (3.05) .13 to .38 (3.30 - 9.65) .39 to .50 (9.91 - 12.70) .51 to 1.00 (12.95 - 25.40)	+.02-0 (+.51-0) +.03-0 (+.76-0) +.046-0 (+1.17-0) +.062-0 (+1.57-0)			
A	to .18 (4.57) .1938 (4.83 - 9.65) .3950 (9.91 - 12.70) .51 - 1.00 (12.95 - 25.40)	+.02-0 (+.51-0) +.03-0 (+.76-0) +.046-0 (+1.17-0) +.062-0 (+1.57-0)	NA +.06-03 (+1.5276) + .06 (+1.52) +.0906 (+2.29-1.52)		

**WIDTH** 

Note: Dimension A measured under 4 oz. (11.34 gms.)

#### Standard Knit Wire Mesh Gasketing

All mesh EMI/RFI knitted wire gasketing is provided in a great variety of metals. The two metals whose part numbers are shown in Tables 1, 2, 3, and 4 are most common. The most common shapes are rectangular and round. Both rectangular and round gasketing are recommended where a groove is provided to hold the strip. All of

**HEIGHT** 

these EMI/RFI strips are provided by the foot and sold on spools in continuous lengths. The shape and material best suited to a set of conditions can be chosen by comparing the specifications shown. The mechanical compression and electrical shielding characteristics will assure the shielding required.

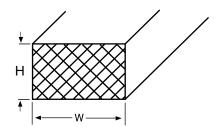
Monel

Ferrous

**Part Number** 

#### All Mesh Rectangular Strip

Table 4

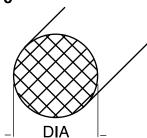


Н	W	Part Number	(Copper & Tin Plated)
.062 (1.57)	.062 (1.57)	1510-06006-31	1510-06006-34
.062 (1.57)	.125 (3.18)	1510-06012-31	1510-06012-34
.062 (1.57)	.187 (4.75)	1510-06018-31	1510-06018-34
.062 (1.57)	.312 (7.92)	1510-06031-31	1510-06031-34
.062 (1.57)	.375 (9.53)	1510-06038-31	1510-06038-34
.062 (1.57)	.500 (12.70)	1510-06050-31	1510-06050-34
.093 (2.36)	.093 (2.36)	1510-09009-31	1510-09009-34
.093 (2.36)	.125 (3.18)	1510-09012-31	1510-09012-34
.093 (2.36)	.187 (4.75)	1510-09018-31	1510-09018-34
.093 (2.36)	.250 (6.35)	1510-09025-31	1510-09025-34
.093 (2.36)	.375 (9.53)	1510-09038-31	1510-09038-34
.125 (3.18)	.125 (3.18)	1510-12012-31	1510-12012-34
.125 (3.18)	.187 (4.75)	1510-12018-31	1510-12018-34
.125 (3.18)	.250 (6.35)	1510-12025-31	1510-12025-34
.125 (3.18)	.312 (7.92)	1510-12031-31	1510-12031-34
.125 (3.18)	.375 (9.53)	1510-12038-31	1510-12038-34
.125 (3.18)	.500 (12.70)	1510-12050-31	1510-12050-34
.125 (3.18)	.750 (19.05)	1510-12075-31	1510-12075-34
.125 (3.18)	1.000 (25.40)	1510-12100-31	1510-12100-34
.187 (4.75)	.187 (4.75)	1510-18018-31	1510-18018-34
.187 (4.75)	.250 (6.35)	1510-18025-31	1510-18025-34
.187 (4.75)	.312 (7.92)	1510-18031-31	1510-18031-34
.250 (6.35)	.250 (6.35)	1510-25025-31	1510-25025-34
.250 (6.35)	.312 (7.92)	1510-25031-31	1510-25031-34
.250 (6.35)	.375 (9.53)	1510-25038-31	1510-25038-34
.250 (6.35)	.500 (12.70)	1510-25050-31	1510-25050-34
.375 (9.53)	.375 (9.53)	1510-38038-31	1510-38038-34

Note: Aluminum, brass (silver-plated) and other materials are available in sizes above. Other sizes are available upon request.

#### **All Mesh Round Strip**

#### Table 5

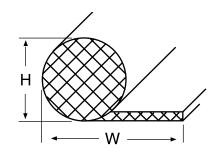


Diameter	Monel Part Number	Ferrous Part Number (Copper & Tin Plated)
.062 (1.57)	1511-06000-31	1511-06000-34
.093 (2.36)	1511-09000-31	1511-09000-34
.125 (3.18)	1511-12000-31	1511-12000-34
.156 (3.96)	1511-16000-31	1511-16000-34
.187 (4.75)	1511-18000-31	1511-18000-34
.250 (6.35)	1511-25000-31	1511-25000-34
.312 (7.92)	1511-31000-31	1511-31000-34
.375 (9.53)	1511-38000-31	1511-38000-34
.500 (12.70)	1511-50000-31	1511-50000-34

Note: Aluminum, brass (silver-plated) and other materials are available in sizes above. Other sizes are available upon request.

#### All Mesh Single Round with Fin Strip

#### Table 6

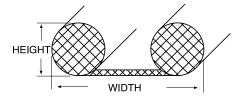


HEIGHT Round Portion	WIDTH Fin Portion	Monel Part Number	Ferrous Part Number (Copper & Tin Plated)
.062 (1.57)	.375 (9.53)	1512-06038-31	1512-06038-34
.062 (1.57)	.500 (12.70)	1512-06050-31	1512-06050-34
.093 (2.36)	.500 (12.70)	1512-09050-31	1512-09050-34
.125 (3.18)	.375 (9.53)	1512-12038-31	1512-12038-34
.125 (3.18)	.625 (15.88)	1512-12063-31	1512-12063-34
.125 (3.18)	.750 (19.05)	1512-12075-31	1512-12075-34
.156 (3.96)	.500 (12.70)	1512-16050-31	1512-16050-34
.187 (4.75)	.625 (15.88)	1512-18063-31	1512-18063-34
.250 (6.35)	.500 (12.70)	1512-25050-31	1512-25050-34
.250 (6.35)	.750 (19.05)	1512-25075-31	1512-25075-34
.250 (6.35)	1.000 (25.40)	1512-25100-31	1512-25100-34
.312 (7.92)	.625 (15.88)	1512-31063-31	1512-31063-34
.312 (7.92)	.875 (22.23)	1512-31087-31	1512-31087-34
.375 (9.53)	1.000 (25.40)	1512-38100-31	1512-38100-34
.437 (11.10)	1.000 (25.40)	1512-44100-31	1512-44100-34
.500 (12.70)	1.000 (25.40)	1512-50100-31	1512-50100-34

Note: Aluminum, brass (silver-plated) and other materials are available in sizes above. Other sizes are available upon request.

### All Mesh Double Round with Fin Strip

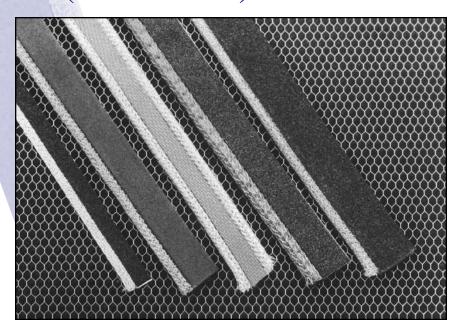
#### Table 7



Round HEIGHT	Connecting WIDTH	Monel Part Number	Ferrous Part Number (Copper & Tin Plated)
.062 (1.57)	.500 (12.70)	1514-06050-31	1514-06050-34
.125 (3.18)	.500 (12.70)	1514-12050-31	1514-12050-34
.125 (3.18)	.750 (19.05)	1514-12075-31	1514-12075-34
.125 (3.18)	1.000 (25.40)	1514-12100-31	1514-12100-34
.187 (4.75)	.625 (15.88)	1514-18063-31	1514-18063-34
.187 (4.75)	1.000 (25.40)	1514-18100-31	1514-18100-34
.250 (6.35)	.750 (19.05)	1514-25075-31	1514-25075-34
.250 (6.35)	1.000 (25.40)	1514-25100-31	1514-25100-34
.375 (9.53)	1.000 (25.40)	1514-38100-31	1514-38100-34

Note: Aluminum, brass (silver-plated) and other materials are available in sizes above. Other sizes are available upon request.

# EMI Shield Seal Gasketing (1500 Series)



Shield Seal Strip is available in various material combinations and sizes. MAJR's versatility of materials and sizes provides assurance of protection against weather conditions including temperature extremes as well as protection against Electro Magnetic Interference and Radio Frequency Interference leakage. The material used conforms to the military specifications. The elastomers (Neoprene or Silicone) are available with or without an adhesive backing.

The Shield Seal Strip is used in applications such as electronic cabinets where this type of material is utilized around the doors of the cabinet to seal off stray EMI signals. The Shield Seal Strip is also used extensively to shield electronic boxes of various sizes and shapes.

Adhesive backing on the elastomer is often preferred due to the ease of strip mounting. The knit wire mesh is available in various wire materials with Monel and Ferrous materials being the most popular. Double Shield Seal materials are available for added shielding effectiveness. Consult the attenuation characteristics to determine which material would best suit your requirements.

Shield Seal Strip with adhesive backing is a convenient method of getting the optimum combination of materials for engineering or prototype models. In production it is more convenient and economical to have MAJR manufacture the complete gasket with the necessary mounting holes, compression stops and other special mechanical considerations. Each gasket would be complete and ready for installation thereby increasing reliability and reducing labor costs during assembly of the end product.

#### **Features**

#### High Reliability:

Shield-Seal as provided by MAJR is carefully inspected and periodically tested in our shielded room testing facilities. These tests guarantee the highest possible reliability of materials to our customers.

#### • High Attenuation:

MAJR's tests show this shielding material as capable of over 110dB of shielding effectiveness in the E-Field and over 70 dB in the H-Field. MAJR provides state-of-theart shielding effectiveness.

- Wide Choice of Standard Materials: Standard
  materials are available to meet
  extreme temperature conditions (-75° to 260°C)
  and EMI shielding conditions
  (beyond 110dB).
- Protection Against Adverse Atmospheric Conditions:

The various elastomer materials as provided by MAJR protect electronic equipment against moisture and dust under severe temperature variations.

There is a proper elastomer for almost every condition. Special materials are available through contacting our application engineers.

#### Ease of Installation:

MAJR's Shield Seal material is available with an adhesive backing for ease of application. This pre-applied adhesive eliminates any danger of adhesive contamination and greatly reduces installation time.

#### **Technical Information**

Elastomers bonded to knit wire shielding material serve three functions in the final configuration:

- 1. Moisture Seal
- 2. Pressure Seal
- 3. Securing of EMI Shield to Enclosure

#### **EMI/RFI Shielding**

The data presented in Table 1 was derived from laboratory tests performed upon EMI gaskets at MAJR. Test samples had an inside dimension of 12.00 x 12.00 inches (304.8 x 304.8 mm).

#### Shielding Effectiveness vs Frequency — Table 1 **MONEL WIRE**

Field		Material Code -02-04 Frequency						
	10 kHz	100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	
Н	40	60	80	_	_	_	_	
E	_	_	_	110	_	_	_	
PW	-	_	1	I	110	110	110	

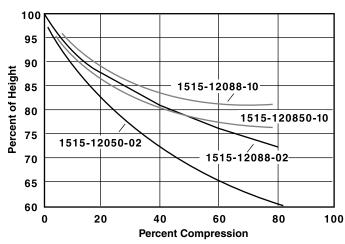
#### **TIN PLATED FERROUS WIRE**

m		KI IZ	KHZ	IVITIZ	IVII IZ	IVITIZ	IVITIZ	GHZ				
s dB	Н	40	60	80	_	_	_	_				
Jes	E	_	_	_	110	_	_	_				
ive	PW	_	_	_	_	110	110	110				
) Effec	H 40 60 80 — — — — — — — — — — — — — — — — — —											
ing		Material Code -10-12 Frequency										
ielc	Field						_					
Shielding	Field	10 kHz	100 kHz				400 MHz	1 GHz				
Shield	Field H	_	100	F 1	requenc	y 100	400	1 GHz				
Shield		kHz	100 kHz	f 1 MHz	requenc	y 100	400	1 GHz —				

#### **Compression Forces**

Figure 1 shows comparative data for solid and sponge elastomers indicating pressure required to deflect elastomer from its original height. (For reference only.)

#### Compression vs Pressure — Figure 1





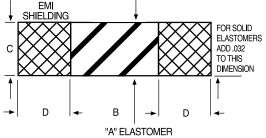
DIMENS	IONS in inc	ches and (m	illimeters)	PART NUMBERS						
A	В	С	D	Neo. Sponge & Monel	Silicone Sponge & Monel	Neo. Sponge & Tin Plated Ferrous	Silicone Sponge & Tin Plated Ferrous Wire			
.062 (1.57)	.250 (6.35)	.062 (1.57)	.125 (3.18)	1515-06038-02	1515-06038-04	1515-06038-10	1515-06038-12			
.062 (1.57)	.375 (9.53)	.062 (1.57)	.125 (3.18)	1515-06050-02	1515-06050-04	1515-06050-10	1515-06050-12			
.093 (2.36)	.375 (9.53)	.093 (2.36)	.125 (3.18)	1515-09050-02	1515-09050-04	1515-09050-10	1515-09050-12			
.093 (2.36)	.500 (12.70)	.093 (2.36)	.125 (3.18)	1515-09063-02	1515-09063-04	1515-09063-10	1515-09063-12			
.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	1515-12025-02	1515-12025-04	1515-12025-10	1515-12025-12			
.125 (3.18)	.188 (4.78)	.125 (3.18)	.188 (4.78)	1515-00052-02	1515-00052-04	1515-00052-10	1515-00052-12			
.125 (3.18)	.250 (6.35)	.125 (3.18)	.125 (3.18)	1515-12038-02	1515-12038-04	1515-12038-10	1515-12038-12			
.125 (3.18)	.250 (6.35)	.125 (3.18)	.250 (6.35)	1515-00053-02	1515-00053-04	1515-00053-10	1515-00053-12			
.125 (3.18)	.375 (9.53)	.125 (3.18)	.125 (3.18)	1515-12050-02	1515-12050-04	1515-12050-10	1515-12050-12			
.125 (3.18)	.625 (15.88)	.125 (3.18)	.125 (3.18)	1515-12075-02	1515-12075-04	1515-12075-10	1515-12075-12			
.188 (4.78)	.188 (4.78)	.188 (4.78)	.125 (3.18)	1515-19019-02	1515-19019-04	1515-19019-10	1515-19019-12			
.188 (4.78)	.250 (6.35)	.188 (4.78)	.125 (3.18)	1515-19038-02	1515-19038-04	1515-19038-10	1515-19038-12			
.188 (4.78)	.500 (12.70)	.188 (4.78)	.125 (3.18)	1515-19063-02	1515-19063-04	1515-19063-10	1515-19063-12			
.250 (6.35)	.250 (6.35)	.250 (6.35)	.125 (3.18)	1515-25038-02	1515-25038-04	1515-25038-10	1515-25038-12			
.250 (6.35)	.500 (12.70)	.250 (6.35)	.125 (3.18)	1515-25063-02	1515-25063-04	1515-25063-10	1515-25063-12			
.375 (9.53)	.500 (12.70)	.375 (9.53)	.250 (6.35)	1515-38075-02	1515-38075-04	1515-38075-10	1515-38075-12			

Note: Aluminum wire is available.

All part numbers above are for elastomer without adhesive back. Change 1515 to 1516 for elastomer with pressure-sensitive adhesive (Neoprene sponge and silicone sponge only).

Table 3

Double EMI Shield-Seal Strip



DIMENS	SIONS in inc	ches and (m	illimeters)	PART NUMBERS						
Α	В	С	D	Neo. Sponge & Monel	Silicone Sponge & Monel	Neo. Sponge & Tin Plated Ferrous	Silicone Sponge & Tin Plated Ferrous Wire			
.125 (3.18)	.250 (6.35)	.125 (3.18)	.125 (3.18)	1515-00061-02	1515-00061-04	1515-00061-10	1515-00061-12			
.125 (3.18)	.375 (9.53)	.125 (3.18)	.125 (3.18)	1515-00062-02	1515-00062-04	1515-00062-10	1515-00062-12			
.125 (3.18)	.500 (12.70)	.125 (3.18)	.125 (3.18)	1515-00063-02	1515-00063-04	1515-00063-10	1515-00063-12			
.188 (4.78)	.500 (12.70)	.188 (4.78)	.125 (3.18)	1515-00068-02	1515-00068-04	1515-00068-10	1515-00068-12			

# Multicon (Wire Shielding Gasket (1500 Series)

MAJR's Multicon Material is a combination of silicone and conductive paths to provide a superior environmental seal and EMI/RFI shielding. The two materials are combined to form a single material which provides the best in both weather and EMI/RFI shielding.

Multicon is provided in solid or sponge silicone with either monel or aluminum wires for conductivity. The conductive wires are dispersed throughout the width of the material to provide the best possible protection against EMI/RFI contamination. Constructed in such a way that when pressure is applied to the gasket, hundreds of sharp wire ends become exposed making electrical contact with the surfaces to be shielded.

Multicon is available in solid silicone (30 durometer) from .032 to .312 thick and in widths of .062 to 9" wide. Sponge silicone (closed cell) Multicon is available from .062 to .312 thick and in widths of .093 to 9" wide. Multicon is also available with monel or aluminum conductive paths as standard. Other combinations of materials are available on special order.

Multicon is held in place in a groove in the equipment to be shielded or by using screws and bolts with a compression stop. 10 to 20 percent compression of the gasket is accomplished by the groove method or by providing metal stops in the Multicon gaskets. Uniform pressure throughout the gasket by means of compression stops provides maximum shielding from the gasket and is recommended wherever possible.

Multicon is used in high pressure requirements using solid silicone and low pressure requirements using sponge silicone, both having a temperature range of -60°F to 500°F under continuous use.

#### Design Data Multicon EMI Gasket

A matrix of independently suspended conductive paths molded in a silicone elastomeric base defines the construction of MAJR's Multicon EMI shielding material. Integral bonding of the randomly dispersed monel wire into the silicone elastomer ensures uniform surface contact under pressure. This bonding process creates a multi "spring" effect with each contact point, thus contact is maintained under severe environmental conditions of oxidation and vibration.

#### Installation

EMI gaskets fabricated from Multicon can be secured to the lid of an enclosure by spot bonding with a nonconductive adhesive or coating of the entire interface with conductive adhesive. In either case, a slight pressure (10 PSI - .70gms/cm²) is recommended during adhesive setting period to endure that the gasket lies flat against mating surface.

Multicon EMI gasket material also lends itself to groove installation. Groove walls should have a seven degree (7°) draft to allow for elastomer flow under compression.



#### **Features**

- The Best Combined Materials:
   MAJR combines two of the finest materials for EMI/RFI shielding to give a single material that both shields products from stray electronic interference and from exposure to weather. The advantage of the combined material also provides a shield and seal in a minimum cross-section.
- High Reliability: MAJR has combined monel wire and silicone rubber. Through MAJR's propietary methods, the wires are fused to the silicone providing the highest possible reliability when used to protect electronic circuits.
- Excellent Attenuation Characteristics: MAJR's Multicon material has a proven history of years of successful shielding applications. The attenuation characteristics of over 100dB in the E-Field to over 50 dB in the H-Field makes Multicon ideal for a wide variety of applications.
- Minimum Cross Section Required to Provide a Weather and RF Seal: MAJR has taken silicone rubber and combined it with monel wire in such a way that 1/8 inch material thickness is all that is required to give both a weather seal and an RF seal.

#### **EMI Shielding**

The data presented in Table 1 represents shielding effectiveness of Multicon gaskets based on laboratory tests of a unit whose finished dimensions are 12.00 x 12.00 inches (304.8 x 304.8 mm).

#### Shielding Effectiveness vs Frequency — Table 1

	Field	Material Code - 03 Frequency										
8		10 kHz	100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	5 GHz			
s dB	Н	50	65	95			1		1			
Jes	E	_	_	_	100	_	_	_	_			
tive	PW	100 100 100										
ng Effectiveness	Field		Material Code - 04 Frequency									
Shielding		10 kHz	100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	5 GHz			
S	Н	43	52	75	_	_	_	_	_			

95

95

95

85

70

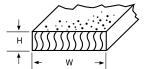
#### Table 2

Ε

PW

CRITERIA	STAN	IDARD
	Solid Silicone	Sponge Silicone
Color	Gray	Gray
Durometer	30	N/A
Wire Distribution (Contacts per inch²)	700-900	225-300
Wire Void Area	.09 Dia. Max.	.156 Dia. Max.
Total Voids	1 per foot	3 per foot
Uniformity of Contact Surface Flatness in Inches	Within .004	Within .010

#### Multicon Sheet Part Numbers



#### Table 3

HEIGHT H	WIDTH W	SILICONE & MONEL Solid	SILICONE & ALUMINUM   Solid
.032 (0.76)	3.000	1547-03300-03	1547-03300-07
.040 (1.02)	3.000	1547-04300-03	1547-04300-07
.062 (1.57)	3.000	1547-06300-03	1547-06300-07
.125 (3.18)	3.000	1547-12300-03	1547-12300-07
.040 (1.02)	6.000	1547-04600-03	1547-04600-07
.062 (1.57)	6.000	1547-06600-03	1547-06600-07
.125 (3.18)	6.000	1547-12600-03	1547-12600-07
.040 (1.02)	9.000	1547-04900-03	1547-04900-07
.062 (1.57)	9.000	1547-06900-03	1547-06900-07
.125 (3.18)	9.000	1547-12900-03	1547-12900-07

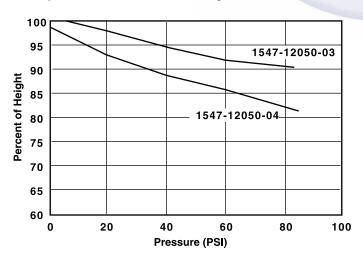
Monel, aluminum strips and sponge sheets available.

Supplied in 36" lengths; other sizes available.

#### **Installation Forces**

Knowing the operating environment is very important to determining the pressures required to compress the Multicon gasket to its optimum point. In less severe conditions such as dust and dripproofing, sponge Multicon can be used, thus reducing the amount of pressure required to deflect gasket 10% by approximately 40 PSI (2.8 gms/cms). Figure 1 shows comparative compression characteristics between sponge and solid Multicon.

#### Compression vs Pressure — Figure 1



#### Multicon Strip Part Numbers

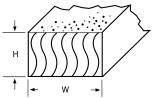
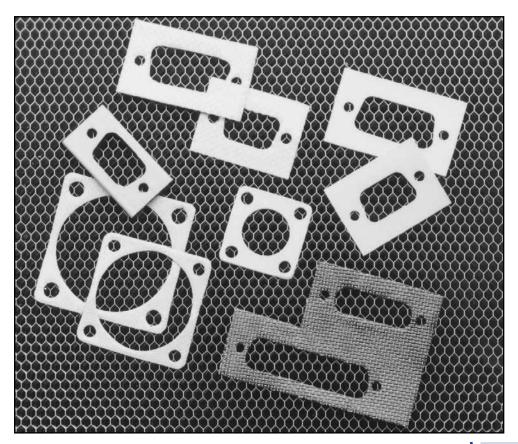


Table 4

Table 4										
HEIGHT	WIDTH	SILICONE	& MONEL							
Н	W	Solid	Sponge							
.032 (0.76)	.125 (3.18)	1547-03012-03	_							
.032 (0.76)	.250 (6.35)	1547-03025-03	_							
.032 (0.76)	.500 (12.70)	1547-03050-03	_							
.040 (1.02)	.125 (3.18)	1547-04012-03	_							
.040 (1.02)	.250 (6.35)	1547-04025-03	_							
.040 (1.02)	.500 (12.70)	1547-04050-03	_							
.062 (1.57)	.125 (3.18)	1547-06012-03	1547-06012-04							
.062 (1.57)	.188 (4.78)	1547-06019-03	1547-06019-04							
.062 (1.57)	.250 (6.35)	1547-06025-03	1547-06025-04							
.062 (1.57)	.375 (9.53)	1547-06038-03	1547-06038-04							
.093 (2.36)	.125 (3.18)	1547-09012-03	1547-09012-04							
.093 (2.36)	.250 (6.35)	1547-09025-03	1547-09025-04							
.125 (3.18)	.125 (3.18)	1547-12012-03	1547-12012-04							
.125 (3.18)	.250 (6.35)	1547-12025-03	1547-12025-04							
.125 (3.18)	.500 (12.70)	1547-12050-03	1547-12050-04							
.188 (4.78)	.188 (4.78)	1547-19019-03	1547-19019-04							
.250 (6.35)	.125 (3.18)	1547-25012-03	1547-25012-04							
.250 (6.35)	.250 (6.35)	1547-25025-03	1547-25025-04							
.250 (6.35)	.500 (12.70)	1547-25050-03	1547-25050-04							

# EMI/RFI Gaskets for Connectors (2000 Series)



Grounding of Connectors to an enclosure bulkhead in a manner that will reduce the ingress or egress of EMI/RFI interference can be accomplished through the use of the following connector gaskets.

Table 4 depicts the gasket dimensions for the various connector shell sizes. This table also gives the ordering part numbers for the four materials offered in Table1.

The material and physical parameters listed in Table 1 are intended as a guide in determining which product is best suited for the application for which the connector is being used. The choice of elastomer and metal combination used for grounding is dependent upon the environment in which the equipment will be operating.

Hundreds of different sizes of connector gaskets have been manufactured by MAJR and are available upon request. We can also custom make a connector gasket to your specifications.

#### **Features**

- Material Choice: Connector gaskets materials can be selected to meet environmental and mechanical requirements of the package to be shielded.
- Standardization: Die-cut connector gaskets are available for standard type connectors.

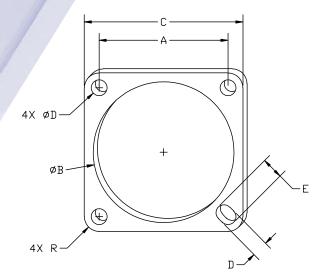
Low Cost: MAJR's connector
 gaskets offer optimum RF grounding of connectors at minimal cost.

#### **EMI Shield and Moisture Seal:**

 The elastomer embedded product both an EMI shield and moisture seal in a minimum thickness, thus not requiring extended protrusion from surface of enclosures.

#### **Design Data - Dimensional Characteristics**

#### EMI/RFI Shielding Connector Gasket — Figure 1



NDTE: THE RADIUS OF EACH CORNER IS EQUAL TO  $\frac{C-A}{2}$ 

NDTE: FOR DIMENSION "E", THE HOLE WILL BE SLOTTED THROUGH TO "B" DIAMETER WHEN  $\frac{(1.41 \text{ X A}) - D - B}{2} \le 0.032$  INCH

See Table #2

#### **Materials Selection**

Connector gaskets can be supplied in a variety of materials both non-conductive and conductive. A wide variety of materials are available to meet customer temperature ranges, conductivity, durometer and thickness of material to fill the void in the application

#### Connector Gasket Material Selection — Table 1

Material Designation	Shield Material	Elastomer Material	Mil-DTL- 83528 Type
-03 Multicon	Monel Inbedded	Silicone	
-04 Multicon	Monel Inbedded	Silicone Sponge	
-05 Radthin	Aluminum	Neoprene	
-07 Radthiin or Multicon	Aluminum	Silicone	
-08 Multicon	Aluminum	Silicone Sponge	
-52 Ni/G Conductive Elastomer	Nickel/Graphite	Silicone	
-61 Ag//Glass Conductive Elastomer	Silver/Glass	Silicone	M
-62 Ag/Cu Conductive Elastomer (85 duro)	Silver/Copper	Silicone	K
-63 Ag/Al Conductive Elastomer	Silver/Aluminum	Silicone	В
-64 Ag/Al Conductive Elastomer	Silver/ Aluminum	Fluorosilicone	D
-65 Ag/Ni Conductive Elastomer	Silver/Nickel	Silicone	L
-66 Ag Conductive Elastomer	Silver	Silicone	E
-68 Ag/Cu Condutive Elastomer (65 duro)	Silver/Copper	Silicone	Α
-69 Ag Conductive Elastomer	Silver	Fluorosilicone	F
-74 Ag/Cu Conductive Elastomer	Silver/Copper	Fluorosilicone	С
-76 Ag Conductive Elastomer	Silver	Silicone	I
-78 Ag Conductive Elastomer (80 duro)	Silver	Silicone	Н
-79 Ag/Cu Conductive Elastomer (80 duro)	Silver/Copper	Silicone	G

# THE MAJE PRODUCTS

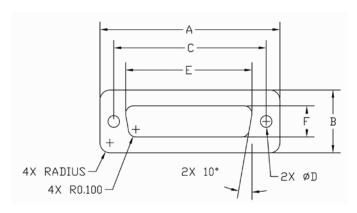
#### **EMI/RFI Mounting Flange Gaskets for Connectors — Table 2**

											Part Numbers		
Shell Size	MIL	-DTI SER		999   IV	MIL P/N: M83528/ 004X-[]	۸	Din B	nensio	ons D	ΙE	MULTICON (Oriented wire silicone) P/n:	RADTHIN (Elastomer impregnated wire) P/N:	CONDUCTIVE ELASTOMER & M83528/004X-[] P/N:
	'	II	111	IV		Α	D	C	ע		P/N:	P/IN:	P/N:
6		,			[001]	0.469	0.375	0.738	0.141	0.141	2047-60601-XX	2040-60601-XX	2050-60601-XX
8		$\sqrt{}$			[002]	0.594	0.630	0.840	0.135		2047-60802-XX	2040-60802-XX	2050-60802-XX
					[003] [004]	0.594 0.594	0.568 0.500	0.812 0.875	0.125 0.156		2047-60803-XX 2047-60804-XX	2040-60803-XX 2040-60804-XX	2050-60803-XX 2050-60804-XX
9	V				[004]	0.394	0.300	0.965	0.135		2047-60903-XX	2040-60903-XX	2050-60903-XX
ľ	,		√		[000]	0.719	0.750	0.965	0.135	0.222	2047-60904-XX	2040-60904-XX	2050-60904-XX
10		$\sqrt{}$			[005]	0.719	0.750	0.965	0.135		2047-61003-XX	2040-61003-XX	2050-61003-XX
					[006]	0.719	0.680	0.937	0.125		2047-61004-XX	2040-61004-XX	2050-61004-XX
	,			,	[007]	0.719	0.625	1.000	0.156		2047-61005-XX	2040-61005-XX	2050-61005-XX
11	V		,	√	[800]	0.812	0.875	1.060	0.141		2047-61101-XX	2040-61101-XX	2050-61101-XX
10	V		√		[000]	0.812	0.875	1.060	0.141	0.206	2047-61103-XX	2040-61103-XX	2050-61103-XX
12	V				[008] [009]	0.812 0.813	0.875 0.750	1.060 1.094	0.141		2047-61202-XX 2047-61203-XX	2040-61202-XX 2040-61203-XX	2050-61202-XX 2050-61203-XX
13	V			V	[010]	0.906	1.005	1.153			2047-61305-XX	2040-61205-XX 2040-61305-XX	2050-61305-XX
	ľ		√	'	[010]	0.906	1.000	1.156	0.141	0.206	2047-61306-XX	2040-61306-XX	2050-61306-XX
14	$\sqrt{}$		·		[010]	0.906	1.005	1.153	-	0.20	2047-61401-XX	2040-61401-XX	2050-61401-XX
					[011]	0.906	0.938	1.125	0.125		2047-61402-XX	2040-61402-XX	2050-61402-XX
					[012]	0.906	0.875	1.188	0.156		2047-61403-XX	2040-61403-XX	2040-61403-XX
15	$\sqrt{}$		١,	√	[013]	0.969	1.135	1.258	0.156		2047-61501-XX	2040-61501-XX	2050-61501-XX
		,	√			0.969	1.135	1.258	0.156	0.206	2047-61503-XX	2040-61503-XX	2050-61503-XX
16		$\sqrt{}$			[013]	0.969	1.135	1.258	0.156		2047-61602-XX	2040-61602-XX	2050-61602-XX
					[014] [015]	0.969 0.969	1.063	1.250 1.281	0.125 0.156		2047-61603-XX 2047-60604-XX	2040-61603-XX 2040-60604-XX	2050-61603-XX 2050-60604-XX
17	V			V	[015]	1.062	1.260	1.351	0.156		2047-60604-XX 2047-61701-XX	2040-60604-XX 2040-61701-XX	2050-60604-XX 2050-61701-XX
''	,		<b>√</b>	\ \ \	[010]	1.062	1.260	1.351	0.156	0.222	2047-61701-XX	2040-61703-XX	2050-61701-XX
18		$\sqrt{}$	,		[016]	1.062	1.260	1.351	0.156	0.222	2047-61801-XX	2040-61801-XX	2050-61801-XX
					[017]	1.062	1.189	1.343	0.125		2047-61802-XX	2040-61802-XX	2050-61802-XX
					[018]	1.062	1.135	1.375	0.156		2047-61803-XX	2040-61803-XX	2050-61803-XX
19	$\sqrt{}$			√	[019]	1.156	1.375	1.500	0.141		2047-61901-XX	2040-61901-XX	2050-61901-XX
			√			1.156	1.375	1.500		0.206	2047-61903-XX	2040-61903-XX	2050-61903-XX
20					[019]	1.156	1.375	1.500	0.141		2047-62002-XX	2040-62002-XX	2050-62002-XX
		$\sqrt{}$			[020] [021]	1.156 1.156	1.312 1.250	1.467 1.500	0.125		2047-62003-XX 2047-62004-XX	2040-62003-XX 2040-62004-XX	2050-62003-XX 2050-62004-XX
21	V			V	[021]	1.250	1.500	1.625	0.172		2047-62101-XX	2040-62101-XX	2050-62101-XX
	ľ		√	'	رمدد	1.250	1.500	1.625	0.141	0.206	2047-62103-XX	2040-62103-XX	2050-62103-XX
22		$\sqrt{}$	·		[022]	1.250	1.500			0.20	2047-62202-XX	2040-62202-XX	2050-62202-XX
					[023]	1.250	1.437	1.562			2047-62203-XX	2040-62203-XX	2050-62203-XX
					[024]	1.250	1.375	1.625	0.172		2047-62201-XX	2040-62201-XX	2050-62201-XX
23	$\sqrt{}$		١,	√	[025]	1.375	1.625	1.750	1		2047-62301-XX	2040-62301-XX	2050-62301-XX
			V			1.375	1.625	1.750	1	0.259	2047-62303-XX	2040-62303-XX	2050-62303-XX
24		$\sqrt{}$			[025]	1.375	1.625	1.750			2047-62402-XX	2040-62402-XX	2050-62402-XX
					[026]	1.375	1.563	1.703			2047-62403-XX	2040-62403-XX	2050-62403-XX 2050-62401-XX
25	V			V	[027] [028]	1.375 1.500	1.500 1.750	1.750 1.875	0.203		2047-62401-XX 2047-62502-XX	2040-62401-XX 2040-62502-XX	2050-62502-XX
23	ľ		V	'	رندن	1.500	1.750	1.875		0.259	2047-62502-XX 2047-62503-XX	2040-62502-XX	2050-62502-XX 2050-62503-XX
28			,		[029]	1.562	1.750	2.000			2047-62801-XX	2040-62801-XX	2050-62801-XX
29					, ,	1.568	2.000	2.171	0.172	0.195	2047-62901-XX	2040-62901-XX	2050-62901-XX
32					[030]	1.750	2.000	2.250	0.219		2047-63201-XX	2040-63201-XX	2050-63201-XX
33						1.734	2.187	2.356		0.234	2047-63301-XX	2040-63301-XX	2050-63301-XX
36					[031]	1.938	2.250				2047-63601-XX	2040-63601-XX	2050-63601-XX
40					[032]	2.188	2.500	2.750	0.219		2047-64001-XX	2040-64001-XX	2050-64001-XX
44					[033]	2.375	2.781	3.000			2047-64401-XX	2040-64401-XX	2050-64401-XX
48					[034]	2.625	3.031		'		2047-64801-XX	2040-64801-XX	2050-64801-XX
Replace-X with: Custom sizes can be made -A Ag/Cu sil 65 to your specificationsB Ag/Al sil -D Ag/Al fluoro		Replace -XX with: -03 sil solid w/monel -04 sil sponge w/monel -07 sil solid w/alum -08 sil sponge w/alum	Replace -XX with: -05 neo solid w/alum -07 sil solid w/alum	Replace -XX with: -62 Ag/Cu type K -63 Ag/Al type B -64 Ag/Al fluoro type D -65 Ag/Ni type L -66 Ag type E -68 Ag/Cu 65 type A -more material available									

#### EMI/RFI Mounting Flange Gaskets for Connectors — Table 3

Shell Size	U	imensions (	See Figure 1	)	Material Part Number				
SIZE		ì			MULTICON	RADTHIN	CONDUCTIVE		
O.L.O	Α	В	С	D	(Oriented wire in silicone)	(Elastomer impregnated wire)	ELASTOMER		
ST	ANDARD	GASKETS	FOR AN,	HT, MIL-C	TL-5015 & MS-	3102 CONNECT	TORS		
8	0.594	0.500	0.875	0.172	2047-40213-XX	2040-20381-XX	2050-40213-XX		
10	0.719	0.625	1.000	0.172	2047-40214-XX	2040-20382-XX	2050-40214-XX		
12	0.813	0.750	1.094	0.172	2047-40215-XX	2040-20383-XX	2050-40215-XX		
	0.906	0.875	1.188	0.172	2047-40216-XX	2040-20384-XX	2050-40216-XX		
	0.969	1.000	1.281	0.172	204740217-XX	2040-20385-XX	2050-40217-XX		
	1.063	1.125	1.375	0.203	2047-40218-XX	2040-20386-XX	2050-40218-XX		
	1.156	1.250	1.500	0.203	2047-40219-XX	2040-20387-XX	2050-40219-XX		
	1.250	1.375	1.635	0.203	2047-40220-XX	2040-20388-XX	2050-40220-XX		
24	1.375	1.500	1.750	0.203	2047-40221-XX	2040-20389-XX	2050-40221-XX		
	1.563	1.750	2.000	0.203	2047-40222-XX	2040-20390-XX	2050-40222-XX		
	1.750 1.938	2.000 2.188	2.250 2.500	0.219 0.219	2047-40223-XX	2040-20391-XX	2050-40223-XX		
	2.188	2.100	2.750	0.219	2047-40224-XX 2047-40225-XX	2040-20392-XX	2050-40224-XX		
	2.100	2.436	3.000	0.219	2047-40225-XX 2047-40226-XX	2040-20393-XX 2040-20394-XX	2050-40225-XX 2050-40226-XX		
	2.625	3.031	3.250	0.219	2047-40220-XX 204740227-XX	2040-20395-XX	2050-40227-XX		
ST	ANDARD	GASKETS	FOR PT,	PC, JT, MI	L-DTL-26482, N	/IS-3110 CONNE	CTORS		
6	0.469	0.375	0.688	0.130	2047-40348-XX	2040-20396-XX	2050-40348-XX		
8	0.594	0.500	0.812	0.130	2047-40204-XX	2040-20397-XX	2050-40204-XX		
10	0.719	0.625	0.938	0.130	2047-40205-XX	2040-20398-XX	2050-40205-XX		
12	0.813	0.750	1.031	0.130	2047-40206-XX	2040-20399-XX	2050-40206-XX		
14	0.906	0.875	1.125	0.130	2047-40207-XX	2040-20400-XX	2050-40207-XX		
16	0.969	1.000	1.219	0.130	2047-40208-XX	2040-20401-XX	2050-40208-XX		
18	1.063	1.125	1.312	0.130	2047-40209-XX	2040-20402-XX	2050-40209-XX		
20	1.156	1.250	1.438	0.130	2047-40210-XX	2040-20403-XX	2050-40210-XX		
22	1.250	1.375	1.563	0.130	2047-40211-XX	2040-20404-XX	2050-40211-XX		
24	1.375	1.500	1.688	0.130	2047-40212-XX	2040-20405-XX	2050-40212-XX		
ST	ANDARD	GASKETS	SP CON	NECTORS					
6	0.641	0.375	0.953	0.160	2047-40355-XX	2040-20406-XX	2050-40355-XX		
8	0.734	0.500	1.047	0.160	2047-40356-XX	2040-20407-XX	2050-40356-XX		
10	0.812	0.625	1.125	0.160	2047-40357-XX	2040-20408-XX	2050-40357-XX		
12	0.938	0.750	1.250	0.160	2047-40358-XX	2040-20409-XX	2050-40358-XX		
14	1.031	0.875	1.344	0.160	2047-40359-XX	2040-20410-XX	2050-40359-XX		
16	1.125	1.000	1.437	0.160	2047-40360-XX	2040-20411-XX	2050-40360-XX		
18	1.203	1.125	1.516	0.160	2047-40361-XX	2040-20412-XX	2050-40361-XX		
20	1.297	1.250	1.672	0.160	2047-40362-XX	2040-20413-XX	2050-40362-XX		
22	1.375	1.375	1.750	0.160	2047-40363-XX	2040-20414-XX	2050-40363-XX		
ST	ANDARD	GASKETS	RF CON	NECTOR					
BN	0.500	0.437	0.687	0.109	2047-40364-XX	2040-20415-XX	2050-40364-XX		
BNC	0.500	0.437	0.687	0.109	2047-40365-XX	2040-20416-XX	2050-40365-XX		
С	0.719	0.625	1.000	0.172	2047-40366-XX	2040-20417-XX	2050-40366-XX		
HN	0.906	0.750	1.188	0.140	2047-40367-XX	2040-20418-XX	2050-40367-XX		
LC	1.437	1.250	2.000	0.257	2047-40368-XX	2040-20419-XX	2050-40368-XX		
N	0.719	0.625	1.000	0.172	2047-40369-XX	2040-20420-XX	2050-40369-XX		
UHF	0.969	1.000	1.282	0.172	2047-40370-XX	2040-20421-XX	2050-40370-XX		
		Custom sizes can be to your specificat			Replace -XX with: -03 sil solid w/monel -04 sil sponge w/monel -07 sil solid w/alum -08 sil sponge w/alum	Replace -XX with: -05 neo solid w/alum -07 sil solid w/alum	Replace -XX with: -62 Ag/Cu type K -63 Ag/Al type B -64 Ag/Al fluoro type D -65 Ag/Ni type L -66 Ag type E -68 Ag/Cu 65 type A -more material available		

#### D-Subminiature Gaskets for Connectors — Figure 2



#### D-Subminiature Gaskets for Connectors — Table 4

				Part Numbers					
Shell Size			Dimer	nsions		MULTICON (Oriented wire	RADTHIN (Elastomer	CONDUCTIVE ELASTOMER	
	A   B   C   D   E   F		in silicone) P/N:	impregnated wire) P/N:	P/N:				
9 PIN	1.213	0.594	0.984	0.120	0.697	0.360	2047-19334-XX	2040-19334-XX	2050-19334-XX
15 PIN	1.556	0.600	1.312	0.130	1.080	0.370	2047-19335-XX	2040-19335-XX	2050-19335-XX
25 PIN	2.087	0.594	1.852	0.120	1.583	0.378	2047-19336-XX	2040-19336-XX	2050-19336-XX
37 PIN	2.729	0.594	2.500	0.120	2.231	0.378	2047-19337-XX	2040-19337-XX	2050-19337-XX
50 PIN	2.635	0.605	2.406	0.120	2.109	0.466	2047-19338-XX	2040-19338-XX	2050-19338-XX
			zes can be mad specifications.	Replace -XX with: -03 sil solid w/monel -04 sil sponge w/monel -07 sil solid w/alum -08 sil sponge w/alum	Replace -XX with: -05 neo solid w/alum -07 sil solid w/alum	Replace -XX with: -62 Ag/Cu type K -63 Ag/Al type B -64 Ag/Al fluoro type D -65 Ag/Ni type L -66 Ag type E -68 Ag/Cu 65 type A -more material available			

MAJR PRODUCTS

## EMI/RFI Grounding Washers (2500 Series)

EMI/RFI grounding washers are manufactured from knitted wire mesh stocking that is formed into a resilient metal washer by compressing in a close-tolerance forming die. The grounding washer can be supplied in various diameters and thicknesses to satisfy the many requirements as indicated in the Applications shown in Figures 1 through 4.

By varying the weight of the stocking mesh inserted into the compression die, the density of the washers can be varied, thus increasing or decreasing unit resilience, depending on the needs of the specific application. Washers with a metal density of 15 to 20 percent will "flow" under compression and thus will fill a gap or seam under minimal pressure (10 psi).

A grounding washer with a metal density of 30 to 40 percent provides a snug fit around a shaft or rod, but when compressed against the wall of a metal enclosure (as shown in Figure 3) will act as a slip-ring thus grounding the rotating shaft to enclosure. This eliminates the possibility of the shaft acting as an antenna to radiate or pick up unwanted noises.

The all-metallic construction of the grounding washers that can be supplied in varying alloys makes them especially effective in hostile environments of temperature or chemicals.

#### **Design Data**

#### **Applications**

Figures 1 through 4 show some of the possible mounting methods for grounding washers.

Figure 1 With Washer & Jam Nut

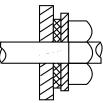


Figure 2 With Shaft Shoulder

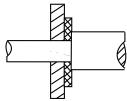


Figure 3
With Positive Stop Cup Washer

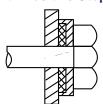
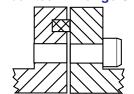


Figure 4
Mounted in Flange Groove





#### **Features**

- Resiliency: Grounding washers, when designed into applications that require recovery after the unit has been deflected, can be supplied in a resiliency that will return to 90 to 95 percent of free height after deflection of 25 percent.
- All Metallic Construction:
  For applications requiring
  grounding where the temperature and chemical environments are extreme, MAJR can supply grounding washers in a variety of wire types.
- Density Variations:
   Grounding washers can be supplied in varying metal densities from 15 to 40 percent to satisfy the compressibility or vary the snugness of fit on a rotating shaft.
- Multiple Applications:
   The compact construction

The compact construction of the metallic grounding washer makes the unit suitable for applications where the unit is in compression, rotating or sheer, without degrading the effectiveness of unit conductivity.

#### **Available Sizes**

#### Table 1 — Grounding Washer Diameters

O.D.

I.D.

**Part Number** 

	_	
250A-70005-xx	0.218	0.062
250A-70007-xx	0.375	0.250
250A-70010-xx	1.000	0.500
250A-70015-xx	0.234	0.109
250A-70020-xx	0.500	0.250
250A-70027-xx	0.635	0.500
250A-70076-xx	1.120	0.810
250A-70079-xx	2.322	2.202
250A-70084-xx 250A-70094-xx	1.370 0.062	1.120 0.000
250A-70094-XX 250A-70106-xx	1.425	1.043
250A-70108-xx	1.437	1.063
250A-70109-xx	1.437	1.083
250A-70110-xx	1.437	1.102
250A-70115-xx	0.255	0.150
250A-70117-xx	0.885	0.625
250A-70118-xx	0.630	0.550
250A-70119-xx	1.380	1.250
250A-70120-xx	0.320	0.260
250A-70121-xx	0.880	0.810
250A-70122-xx	0.635	0.375
250A-70134-xx	0.937	0.687
250A-70135-xx	0.625	0.469
250A-70136-xx	1.620	1.125
250A-70137-xx	2.130 0.495	1.600
250A-70138-xx 250A-70144-xx	0.495	0.295 0.375
250A-70144-XX 250A-70145-xx	0.875	0.373
250A-70150-xx	2.125	1.812
250A-70158-xx	1.500	1.000
250A-70160-xx	2.950	2.875
250A-70170-xx	2.642	2.562
250A-70180-xx	0.910	0.790
250A-70200-xx	0.750	0.250
250A-70300-xx	0.225	0.130
250A-70310-xx	0.410	0.250
250A-70320-xx	0.350	0.175
250A-70350-xx	0.906	0.344
250A-70360-xx	0.550	0.200
250A-70500-xx 250A-70501-xx	0.875	0.344 0.315
250A-70501-xx 250A-70502-xx	0.875 0.275	0.315
250A-70502-XX 250A-70503-xx	0.273	0.150
250A-70503-XX	0.300	0.187
250A-70505-xx	1.688	0.250
250A-70507-xx	1.812	1.562
250A-70508-xx	0.600	0.438
250A-70509-xx	0.500	0.375
250A-70510-xx	0.800	0.650
250A-70511-xx	2.835	2.047
250A-70512-xx	3.543	2.632
250A-70513-xx	0.300	0.187
250A-70514-xx	0.755	0.630
250A-70515-xx	2.000	1.000
250A-70516-xx	0.305	0.248
250A-70517-xx	2.180 0.750	2.060
250A-70518-xx 250A-70600-xx	1.370	0.500 0.750
250A-70650-xx	2.625	0.750
250A-70030-XX 250A-70700-xx	0.500	0.200
250A-70700 XX	0.450	0.170
250A-70720-xx	1.250	0.315
250A-70730-xx	1.880	0.680
250A-70740-xx	1.000	0.300
250A-70750-xx	1.800	0.480
250A-70755-xx	1.100	0.315
250A-70756-xx	0.900	0.480
250A 70000 vv	0.304	0.333

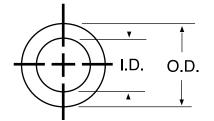


Table 2 shows washer sizes that can readily be supplied from existing tooling. Thickness can be varied from .032 to .125.

#### **Tolerances**

#### Table 2

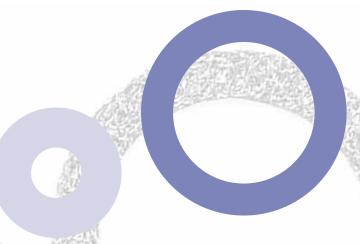
Sizes	O.D.	I.D.
Up to 1	+0.015, -0.000	+0.000, -0.015
(Up to 25.40)	(+0.38)	(-0.38)
1 to 2	+0.020, -0.000	+0.000, -0.020
(25.40 to 50.80)	(+0.51)	(-0.51)
2 to 3	+0.025, -0.000	+0.000, -0.025
(50.80 to 76.20)	(+0.63)	(-0.63)
3 to 4	+0.030, -0.000	+0.000, -0.030,
(76.20 to 101.60)	(+0.76)	(-0.76)
Over 4	+0.040, -0.000	+0.0000.040
(101.60)	(+1.02)	(-1.02)

#### **Materials**

Grounding washers can be supplied using knit wire mesh of the following materials:

Table 3

Code	Description
-31	Monel per QQ-N-281 Class A
-32	Aluminum
-33	Silver Plated Brass per QQ-W-321 (3% Silver by Weight)
-34	Tin Plated Copper Clad Steel per ASTM B520



250A-70800-xx

250A-70950-xx

A = Thickness. Thickness needs to be specified at time of request or order.

0.394

1.375

Phone: (814) 763-3211 • Fax: (814) 763-2952 • e-mail: sales@majr.com

0.323

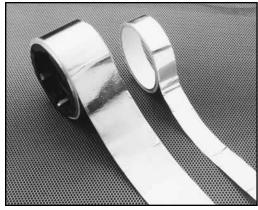
1.125

<sup>\*</sup> xx: See Table 3 for material codes.

#### EMI Shielding Tape with Conductive Adhesive (2800 Series)

Tapes are an economical EMI shielding solution for a variety of commercial uses. The tapes are available in copper or aluminum backed with conductive pressuresensitive adhesives. Copper tape meets the requirements of MIL-T-47012 for corrosion resistance. Typical properties are shown in Table 1.

Copper tape is available with a non-conductive adhesive for applications requiring surface conductivity only. Standard length rolls and die-cut custom shapes can be ordered. Other types of shielding tape are available by request.





#### **Typical Applications for Shielding Tapes**

Provide a low impedance connection between a braided cable shield and the metal connector backshell in molded cables. An effective EMI-shielded assembly can be achieved without soldering the tape to the braid or backshell.

- EMI radiation measurement trouble-shooting, using tape to shield ventilation slots or seam gaps.
- Provide electrical continuity in seams of EMI shielding rooms and electronic enclosures.
- Supply electrical contact to surfaces that can't be soldered, such as conductive plastic or aluminum.
- Provide EMI shielding for cables when tape is wrapped around the cable. (An overlap is recommended.)
- Provide ESD shielding.
- Provide corrosion-resistant ground contact points.
- Fabric tape available where weight and flexibility are important, such as for wrapping cables.

#### **Properties** — Table 1

	Copper Foil with Conductive Acrylic Adhesve	Aluminum Foil with Conductive Acrylic Adhesve	Conductive Fabric with Conductive Adhesive
Color	Copper	Silver	Silver
Tempurature Resistance	155 degress C	_	-40 C to +110 C
Resistivity through Adhesive	10 milliohms/square inch	40 milliohms/square inch	50 milliohms/square inch
Elongation at Break	4%	5%	_
Backing	.0014" (1oz) Copper Foil	.0018" Aluminum Foil	0.003" conductive fabric
Adhesive	Conductive Acrylic	Conductive Acrylic	_
Inter Liner	Polyethelene Coated Paper Line	_	_
Adhesive (thickness)	<del>-</del>	_	.002"
Peel Strength	35 oz./inch of width	35 oz./inch of width	51 oz./inch of width
Breaking Strength	25 lbs./inch of width	15 lbs./inch of width	_
RFI attenuation	<del>-</del>	_	90 – 100 dB from 20 MHz to 10 GHz
Tape Dimensions (Max)	_	_	Width 1000mm, Length 100 M

#### EMI/RFI Shielded Rigid Frame Gasket (3000 Series)

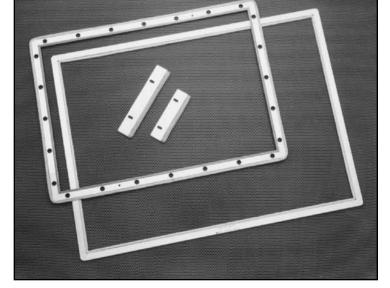
Rigid Mounting Frame EMI/RFI Gaskets consist of an aluminum extrusion with a specially designed jaw. When closed, the jaw crimps the fin of the knit wire EMI gasket to form a rigid construction with the EMI gasket held firmly in place.

This extrusion, when fabricated into a frame with the corners of aluminum extrusion mitered and heliarc welded, provides a gasket assembly that can be installed with flat-head screws. This design makes retrofitting in the field a relatively easy task and at the same time provides a positive stop for controlled compression of the EMI Gasket.

Rigid frame gasket is especially recommended for large cabinet doors or access panels that are frequently opened.

For applications requiring a moisture seal, an elastomer strip can be bonded to the edge of the extrusion opposite the gasket.

An added barrier to EMI/RFI interference can be achieved by utilizing a double-shielded construction. The double-shield gasket is recommended for large doors where controlling the mating surface joint unevenness can be difficult and expensive. A further consideration for utilizing the rigid frame approach is the load bearing support of extruded aluminum which aids in applications where shock and vibration are encountered.



#### Mounting

Rigid mounting frames, which provide a positive stop to prevent over-compression of shielded gaskets, can be mounted to the access cover or enclosure. Mounting to the access cover is the recommended method. This minimizes the possibility of damage to the EMI/RFI gasket during servicing when the cover is removed. Also mounting to the cover will add to the rigidity of the cover assembly.

#### **Features**

- Proven Design: EMI/RFI knitted wire gasketing has been the standard shielding product since its
  first use in 1944. Since that time, the product has been refined and new knit wire products have
  been introduced to the present state of the art products, all of which are currently manufactured at
  the modern facilities of MAJR Products.
- **Versatility of Materials:** MAJR provides the standard knit wire mesh in either monel, tin-plated ferrous, or knit mesh with elastomer core of neoprene or silicone sponge.
- High EMI/RFI Attenuation Levels: The highest possible attenuation levels are achievable with MAJR's EMI/RFI knitted wire gasketing. Attenuation levels beyond 110 dB in the E-Field and 65 dB in the H-Field are common with MAJR's shielding gasketing. Higher levels of attenuation are attainable with special materials and special design available through MAJR's engineering team.
- Resilient Gasketing Material: MAJR's knit wire gasketing material acts like thousands of tiny spring
  members which are compressed and released with each opening and closing of a cabinet door or
  enclosure cover. The spring-look gaskets assure long life with consistent point-to-point contact,
  providing high shielding effectiveness and long life.

Table 1
Single EMI/RFI Gasket

EMI/RFI	Gasket De	scription	Knit Wire Mesh Round .18	Knit Wire Mesh Round .25	Knit Wire Mesh Rectangular	Knit Wire Mesh Rectangular	Knit Wire Over .18 D. Elastomer	Knit Wire Over .25 D. Elastomer
CROSS	SECTION (	(FRAME)						
T	W	Shielding Material						
.093 (2.4)1	.375 (9.5)	Monel	3028-80009-31	3028-80020-31	3028-80064-31	3028-80053-31	3028-80031-31	3028-80042-31
		Tin-Plate Steel	3028-80009-34	3028-80020-34	3028-80064-34	3028-80053-34	3028-80034-34	3028-80042-34
.093 (2.4)	.437 (11.1)	Monel	3028-80010-31	3028-80021-31	3028-80065-31	3028-80054-31	3028-80032-31	3028-80043-31
		Tin-Plate Steel	3028-80010-34	3028-80021-34	3028-80065-34	3028-80054-34	3028-80032-34	3028-80043-34
.125 (3.17)	.375 (9.5)	Monel	3028-50011-31	3028-80022-31	3028-80066-31	3028-80055-31	3028-80033-31	3028-80044-31
		Tin-Plate Steel	3028-50011-34	3028-80022-34	3028-80066-34	3028-80055-34	3028-80033-34	3028-80044-34
.125 (3.17)	.437 (11.1)	Monel	3028-50012-31	3028-80023-31	3028-80067-31	3028-80056-31	3028-80034-31	3028-80045-31
		Tin-Plate Steel	3028-50012-34	3028-80023-34	3028-80067-34	3028-80056-34	3028-80034-34	3028-80045-34
.125 (3.17)	.500 (12.7)	Monel	3028-50013-31	3028-80024-31	3028-80068-31	3028-80057-31	3028-80035-31	3028-80046-31
		Tin-Plate Steel	3028-50013-34	3028-80024-34	3028-80068-34	3028-80057-34	3028-80035-34	3028-80046-34
.125 (3.17)	.625 (15.8)	Monel	3028-50014-31	3028-80025-31	3028-80069-31	3028-80058-31	3028-80036-31	3028-80047-31
		Tin-Plate Steel	3028-50014-34	3028-80025-34	3028-80069-34	3028-80058-34	3028-80036-34	3028-80047-34
.125 (3.17)	.750 (19.0)	Monel	3028-50015-31	3028-80026-31	3028-80070-31	3028-80059-31	3028-80037-31	3028-80048-31
		Tin-Plate Steel	3028-50015-34	3028-80026-34	3028-80070-34	3028-80059-34	3028-80037-34	3028-80048-34
.125 (3.17)	1.00 (25.4)	Monel	3028-50016-31	3028-80027-31	3028-80071-31	3028-80060-31	3028-80038-31	3028-80049-31
		Tin Plate Steel	3028-50016-34	3028-80027-34	3028-80071-34	3028-80060-34	3028-80038-34	3028-80049-34

Table 2

Double EMI/RFI Gasket

EMI/RFI	Gasket De	scription	Knit Wire Mesh Round .18	Knit Wire Mesh Round .25	Knit Wire Mesh Rectangular	Knit Wire Mesh Rectangular	Knit Wire Over .18 D. Elastomer <sup>2</sup>	Knit Wire Over .25 D. Elastomer <sup>2</sup>
CROSS	CROSS SECTION (FRAME)							
T	T W Shielding Material							
.125 (3.17)	.500 (12.7)	Monel	3028-50017-31	3028-50028-31	3028-50072-31	3028-50061-31	3028-50039-31	3028-50050-31
		Tin-Plate Steel	3028-50017-34	3028-50028-34	3028-50072-34	3028-50061-34	3028-50039-34	3028-50050-34
.125 (3.17)	.625 (15.8)	Monel	3028-50018-31	3028-50029-31	3028-50073-31	3028-50062-31	3028-50040-31	3028-50051-31
		Tin-Plate Steel	3028-50018-34	3028-50029-34	3028-50073-34	3028-50062-34	3028-50040-34	3028-50051-34
.125 (3.17)	.750 (19.0)	Monel	3028-50019-31	3028-50030-31	3028-50074-31	3028-50063-31	3028-50041-31	3028-50052-31
		Tin-Plate Steel	3028-50019-34	3028-50030-34	3028-50074-34	3028-50063-34	3028-50041-34	3028-50052-34

Dimensions are in inches and (metric)

#### EMI/RFI Shielded Air Filtration Panels (3000 Series)

Filtering of the intake air of electronic equipment enclosures where EMI/RFI shielding is also a criteria is the task of MAJR's line of shielded air filters. High-efficiency air filters are supplied ready to install with an EMI/RFI gasket as an integral part of the filter assembly. The rigidity of the mounting frame makes installation and removal for cleaning an easy task.

The filter media used in the panels can be supplied as a dry or wet filter. Impingement of fine dust particles on filters with a glutinous oil coating is greatly enhanced.

The shielded air filter media shown represent the common sizes and mounting configurations available. In all cases, the EMI gasket is supplied as an integral part of the vent assembly.

#### **Design Data EMI/RFI Shielding**

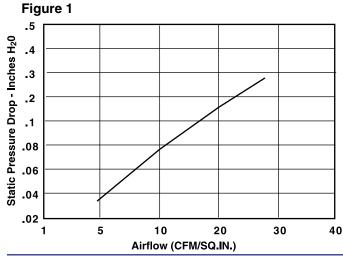
#### Shielding Effectiveness vs Frequency — Table 1

Field				ial Co	<b>de - 57</b> cy	,				
	100 kHz									
Н	52	68	_	_	_	_				
E	_	_	95	_	_	_	_			
PW	_	_	_	90	70	65	50			

m		KIIZ	IVIIIZ	IVITIZ	IVII IZ	IVITIZ	GHZ	GHZ		
s dB	Н	52	68	_	_	_	_			
nes	E	_	_	95			_	_		
tive	PW	_	_	_	90	70	65	50		
ffec			Mate	rial C	ode - 5	7 Trim	Line			
Jg E	Field	Frequency								
Shielding Effectiveness		100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	10 GHz		
S	Н	29	36	_	_	_	_			
	Е	_	_	75	_	_	_	_		

The values in Table 1 show shielding characteristics for standard MAJR shielded air filters. Note that the data indicated is based on a unit whose opening was 12.00 x 12.00 (305 x 305 mm) and tested under laboratory conditions.

#### **Static Pressure Drop vs. Air Flow Resistance**



The low resistance to air flow of these panels will minimize pressure drop within the cabinet allowing air to move freely through the intake while performing the desired dust filtration function. The curves in Figure 1 show the resistance per square inch for standard filter media.

#### **Features**

- Optimum Shielding, Air Flow and Dust Filtration Installation of the air filter into the electronic enclosure provides an effective dust filter with minimal resistance to air flow while simultaneously providing attenuation of electromagnetic interference to levels indicated in Figure 1.
- **Standard Configurations** The broad selection of sizes of shield air filter media provides the widest choice in design objectives.
- Ease of Installation EMI/FRI shielded air filters are supplied with EMI/RFI gasket and mounting holes or captive fasteners — ready for installation into cabinet.
- **Special Design** Many applications require a special shape or mounting configuration. MAJR's engineering group can assist with designs.

MAJR

#### **Mounting Installation**

Four mounting frames are offered as a standard for installation into the cabinet. In each case, the extruded aluminum frame is designed with a "tooth" that bites into the filter grill to ensure grounding of frame to filter media.

Figure 2

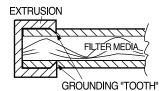


Figure 3 Through Hole Style 3031

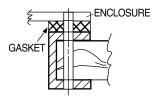


Figure 4
Captive Fastener Style 3032

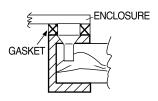


Figure 5
Recess Mount Style 3036

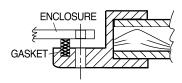


Figure 6 Trim Line Style 3038

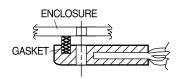


Figure 7 Through Hole Style 3033

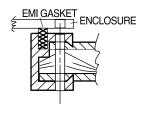


Table 2 - Style 3031 EMI/RFI Shielded Air Filtration Panel with Through Holes

OPE	NING	Part Number				FRAME	DIMENS	IONS					
Width	Length	<b>Dry Filter</b>	AA	BB	Α	В	С	D	Е	F	G	Н	J
3.00 (76.2)	3.00 (76.2)	3031-20303-57	4.00 (101.6)	4.00 (101.6)	3.50 (88.9)	3.50 (88.9)	1.75 (44.5)	1.75 (44.5)	_	_	_	_	4
3.00 (76.2)	5.00 (127.0)	3031-20305-57	6.00 (152.4)	4.00 (101.6)	5.50 (139.7)	3.50 (88.9)	1.00 (25.4)	1.75 (44.5)	1	3.50 (88.9)	-	_	6
3.00 (76.2)	11.00 (279.4)	3031-20311-57	12.00 (304.8)	4.00 (101.6)	11.50 (292.1)	3.50 (88.9)	1.25 (31.8)	1.75 (44.5)	3	3.00 (76.2)	-	_	10
4.00 (101.6)	4.00 (101.6)	3031-20404-57	5.00 (127.0)	5.00 (127.0)	4.50 (114.3)	4.50 (114.3)	.750 (19.1)	2.25 (57.2)	1	3.00 (76.2)	-	_	6
4.00 (101.6)	9.00 (228.6)	3031-20409-57	10.00 (254.0)	5.00 (127.0)	9.50 (241.3)	4.50 (114.3)	1.25 (31.8)	2.25 (57.2)	2	3.50 (88.9)	-	_	8
5.00 (127.0)	5.00 (127.0))	3031-20505-57	6.00 (152.4)	6.00 (152.4)	5.50 (139.7)	5.50 (139.7)	1.00 (25.4)	1.00 (25.4)	1	3.50 (88.9)	1	3.50 (88.9)	8
5.00 (127.0)	11.00 (279.4)	3031-20511-57	12.00 (304.8)	6.00 (152.4)	11.50 (292.1)	5.50 (139.7)	1.25 (31.8)	1.00 (25.4)	3	3.00 (76.2)	1	3.50 (88.9)	12
6.00 (152.4)	6.00 (152.4)	3031-20606-57	7.00 (177.8)	7.00 (177.8)	6.50 (165.1)	6.50 (165.1)	1.50 (38.1)	1.50 (38.1)	1	3.50 (88.9)	1	3.50 (88.9)	8
6.00 (152.4)	9.00 (228.6)	3031-20609-57	10.00 (254.0)	7.00 (177.8)	9.50 (241.3)	6.50 (165.1)	1.25 (31.8)	1.50 (38.1)	2	3.50 (88.9)	1	3.50 (88.9)	10
7.00 (177.8)	14.00 (355.6)	3031-20714-57	15.00 (381.0)	8.00 (203.2)	14.50 (368.3)	7.50 (190.5)	.750 (19.1)	.750 (19.1)	4	3.25 (82.6	2	3.00 (76.2)	16
9.00 (228.6)	9.00 (228.6)	3031-20909-57	10.00 (254.0)	10.00 (254.0)	9.50 (241.3)	9.50 (241.3)	1.25 (31.8)	1.25 (31.8)	2	3.50 (88.9)	2	3.50 (88.9)	12
11.00 (279.4)	11.00 (279.4)	3031-21111-57	12.00 (304.8)	12.00 (304.8)	11.50 (292.1)	11.50 (292.	1.25 (31.8)	1.25 (31.8)	3	3.00 (76.2)	3	3.00 (76.2)	16
14.00 (355.6)	14.00 (335.6)	3031-21414-57	15.00 (381.0)	15.00 (381.0)	14.50 (368.3)	14.50 (368.3)	1.25 (31.8)	1.25 (31.8)	4	3.00 (76.2)	4	3.00 (76.2)	20
18.00 (457.2)	18.00 (457.2)	3031-21818-57	19.00 (482.6)	19.00 (482.6)	18.50 (469.9)	18.50 (469.9)	1.75 (44.5)	1.75 (44.5)	5	3.00 (76.2)	5	3.00 (76.2)	24

Change to -58

for Wet Filter.

Please see figure 6 on page 39 for a dimensional reference drawing.

Table 3 - Style 3033 EMI/RFI Shielded Air Filtration Panel with Through Holes

OPE	NING	Part Number				FRAME	DIMENS	IONS					
Width	Length	<b>Dry Filter</b>	AA	BB	Α	В	С	D	Ε	F	G	Н	J
3.00 (76.2)	3.00 (76.2)	3033-20303-57	4.25 (107.9)	4.25 (107.9)	3.50 (88.9)	3.50 (88.9)	1.75 (44.5)	1.75 (44.5)	_	_	_	_	4
3.00 (76.2)	5.00 (127.0)	3033-20305-57	6.25 (158.8)	4.25 (107.9)	5.50 (139.7)	3.50 (88.9)	1.00 (25.4)	1.75 (44.5)	1	3.50 (88.9)	_	_	6
3.00 (76.2)	11.00 (279.4)	3033-20311-57	12.25 (311.2)	4.25 (107.9)	11.50 (292.1)	3.50 (88.9)	1.25 (31.8)	1.75 (44.5)	3	3.00 (76.2)	_	_	10
4.00 (101.6)	4.00 (101.6)	3033-20404-57	5.25 (133.4)	5.25 (133.4)	4.50 (114.3)	4.50 (114.3)	.750 (19.1)	2.25 (57.2)	1	3.00 (76.2)	_	_	6
4.00 (101.6)	9.00 (228.6)	3033-20409-57	10.25 (260.4)	5.25 (133.4)	9.50 (241.3)	4.50 (114.3)	1.25 (31.8)	2.25 (57.2)	2	3.50 (88.9)	_	_	8
5.00 (127.0)	5.00 (127.0))	3033-20505-57	6.25 (158.6)	6.25 (158.6)	5.50 (139.7)	5.50 (139.7)	1.00 (25.4)	1.00 (25.4)	1	3.50 (88.9)	1	3.50 (88.9)	8
5.00 (127.0)	11.00 (279.4)	3033-20511-57	12.25 (311.2)	6.25 (158.6)	11.50 (292.1)	5.50 (139.7)	1.25 (31.8)	1.00 (25.4)	3	3.00 (76.2)	1	3.50 (88.9)	12
6.00 (152.4)	6.00 (152.4)	3033-20606-57	7.25 (184.2)	7.25 (184.2)	6.50 (165.1)	6.50 (165.1)	1.50 (38.1)	1.50 (38.1)	1	3.50 (88.9)	1	3.50 (88.9)	8
6.00 (152.4)	9.00 (228.6)	3033-20609-57	10.25 (260.4)	7.25 (184.2)	9.50 (241.3)	6.50 (165.1)	1.25 (31.8)	1.50 (38.1)	2	3.50 (88.9)	1	3.50 (88.9)	10
7.00 (177.8)	14.00 (355.6)	3033-20714-57	15.25 (387.4)	8.25 (209.6)	14.50 (368.3)	7.50 (190.5)	1.50 (38.1)	1.50 (38.1)	3	3.50 (88.9)	1	3.50 (88.9)	16
9.00 (228.6)	9.00 (228.6)	3033-20909-57	10.25 (260.4)	10.25 (260.4)	9.50 (241.3)	9.50 (241.3)	1.25 (31.8)	1.25 (31.8)	2	3.50 (88.9)	2	3.50 (88.9)	12
11.00 (279.4)	11.00 (279.4)	3033-21111-57	12.25 (311.2)	12.25 (311.2)	11.50 (292.1)	11.50 (292.	1.25 (31.8)	1.25 (31.8)	3	3.00 (76.2)	3	3.00 (76.2)	16
14.00 (355.6)	14.00 (335.6)	3033-21414-57	15.25 (387.4)	15.25 (387.4)	14.50 (368.3)	14.50 (368.3)	1.25 (31.8)	1.25 (31.8)	4	3.00 (76.2)	4	3.00 (76.2)	20
18.00 (457.2)	18.00 (457.2)	3033-21818-57	19.25 (488.9)	19.25 (488.9)	18.50 (469.9)	18.50 (469.9)	1.75 (44.5)	1.75 (44.5)	5	3.00 (76.2)	5	3.00 (76.2)	24

Change to -58

for Wet Filter.

Table 4 - Style 3036 EMI/RFI Shielded Air Filtration Panel with Through Holes

OPEI	NING	Part Number				FRAME	DIMENS	IONS					
Width	Length	<b>Dry Filter</b>	AA	BB	Α	В	С	D	Ε	F	G	Н	J
3.00 (76.2)	3.00 (76.2)	3036-20303-57	5.25 (133.4)	5.25 (133.4)	4.50 (114.3)	4.50 (114.3)	2.25 (57.2)	2.25 (57.2)	_	_	_	_	4
3.00 (76.2)	5.00 (127.0)	3036-20305-57	7.25 (184.15	5.25 (133.4)	6.50 (165.2)	4.50 (114.3)	1.75 (44.5)	2.25 (57.2)	1	3.50 (88.9)	_	_	6
3.00 (76.2)	11.00 (279.4)	3036-20311-57	13.25 (336.6)	5.25 (133.4)	12.50 (317.5)	4.50 (114.3)	1.75 (44.5)	2.25 (57.2)	3	3.00 (76.2)	_	_	10
4.00 (101.6)	4.00 (101.6)	3036-20404-57	6.25 (158.8)	6.25 (158.8)	5.50 (139.7)	5.50 (139.7)	1.00 (25.4)	1.00 (25.4)	1	3.50 (88.9)	1	3.50 (88.9)	8
4.00 (101.6)	9.00 (228.6)	3036-20409-57	11.25 (366.6)	6.25 (158.8)	10.50 (266.7)	5.50 (139.7)	.75 (19.1)	1.00 (25.4)	3	3.00 (76.2)	1	3.50 (88.9)	12
5.00 (127.0)	5.00 (127.0))	3036-20505-57	7.25 (184.15	7.25 (184.15	6.50 (165.2)	6.50 (165.2)	.50 (12.7)	1.50 (38.1)	2	2.75 (69.9)	1	3.50 (88.9)	10
5.00 (127.0)	11.00 (279.4)	3036-20511-57	13.25 (336.6)	7.25 (184.15	12.50 (317.5)	6.50 (165.2)	1.00 (25.4)	1.50 (38.1)	3	3.50 (88.9)	1	3.50 (88.9)	12
6.00 (152.4)	6.00 (152.4)	3036-20606-57	8.25 (209.6)	8.25 (209.6)	7.50 (190.5)	7.50 (190.5)	.75 (19.1)	.75 (19.1)	2	3.00 (76.2)	2	3.00 (76.2)	12
6.00 (152.4)	9.00 (228.6)	3036-20609-57	11.25 (285.7)	8.25 (209.6)	10.50 (266.7)	7.50 (190.5)	.75 (19.1)	.75 (19.1)	2	3.00 (76.2)	2	3.00 (76.2)	14
7.00 (177.8)	14.00 (355.6)	3036-20714-57	16.25 (412.8)	9.25 (234.9)	15.50 (393.7)	8.50 (215.9)	.75 (19.1)	.75 (19.1)	4	3.50 (88.9)	2	3.50 (88.9)	16
9.00 (228.6)	9.00 (228.6)	3036-20909-57	11.25 (285.7)	11.25 (285.7)	10.50 (266.7)	10.50 (266.7)	.75 (19.1)	.75 (19.1)	3	3.00 (76.2)	3	3.00 (76.2)	16
11.00 (279.4)	11.00 (279.4)	3036-21111-57	13.25 (336.6)	13.25 (336.6)	12.50 (317.5)	12.50 (317.5)	1.00 (25.4)	1.00 (25.4)	3	3.50 (88.9)	3	3.50 (88.9)	16
14.00 (355.6)	14.00 (335.6)	3036-21414-57	16.25 (412.8)	16.25 (412.8)	15.50 (393.7)	15.50 (393.7)	.75 (19.1)	.75 (19.1)	4	3.50 (88.9)	4	3.50 (88.9)	20
18.00 (457.2)	18.00 (457.2)	3036-21818-57	20.25 (514.35)	20.25 (514.35	19.50 (495.3)	19.50 (495.3)	.75 (19.1)	.75 (19.1)	6	3.00 (76.2)	6	3.00 (76.2)	28

Change to -58

for Wet Filter.

# EMI/RFI Shielded Ventilation Panels (3000 Series)

MAJR's line of ready-to-install honeycomb cooling vents provide optimum EMI/RFI shielding with minimum pressure drop for the ventilating air. Shielding effectiveness is accomplished using waveguide design principles.

The choice of the shielded honeycomb that best meets design considerations is based on three main criteria: Shielding, Air Flow and Mounting. For most

applications, aluminum Code-32 honeycomb (properly installed using MAJR's mounting frame with integral EMI/RFI gasket) will provide a degree of attenuation that will be within specification limits (See Table 1). However, for the lower frequency range (H-Field) it may be necessary to specify MAJR's material Tin Plated Steel Code-44.

Although heavier in weight than aluminum, an increase of 20-40dB H-field shielding effectiveness can be achieved in the lower frequency range by the use of the higher permeable-44 grade.

Common sides and mounting configurations are available. In all cases, the EMI gasket is supplied as an integral part of the vent assembly. Mounting of the vent to a shielded enclosure is accomplished by means of through holes supplied in the panel or captive fasteners located and installed to specific dimensions.

#### **Design Data**

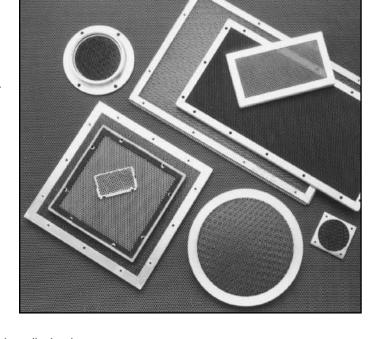
#### **EMI/RFI Shielding**

#### Shielding Effectiveness vs Frequency — Table 1

#### **□ CHROMATE FINISH**

ctiveness	Field	Aluminum Material Code - 32 Frequency								
Effecti		100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	10 GHz		
	Н	35	50	_	_		_			
į	Е	_	_	60	_		_	_		
Shielding	PW	_	_		60	60	50	50		

The data in Table 1 shows shielding characteristics for standard MAJR shielded vents. Note that the data indicated is based on a unit whose opening was 12.00 x 12.00 (305 x 305 mm) and tested under laboratory conditions per MIL-STD 285.



#### **Features**

- Ease of Installation
   Shielded air vents are supplied with EMI gasket and
   magniting holes or continue.
  - mounting holes or captive fasteners so as to be ready for installation into the cabinet.
- Special Designs
  - MAJR's engineering group can assist with applications requiring special mounting or shape.
- Painted Units
  - Vents mounted on the outside of cabinet can be supplied with exposed surfaces painted to meet the Military Standard color of the cabinet.
- Optimum Shielding and Air Flow
  - Installation of the honeycomb
     with its 4:1 opening to
    depth ratio provides the
    waveguide below cut-off effect
    required to attenuate EMI/RFI
    interference while not impeding the air flow required to
    cool the packaged enclosure.
- Standard Configurations
   A broad selection of sides provides the widest choice in meeting design objectives.
- RoHS Compliant

#### Table 1 (Continued)

PW

	Field	Aluı	Aluminum Tin Plate Material Code - 42 Frequency										
		100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	10 GHz					
s dB	Н	65	80			_		_					
Jes	E	_	_	90	_	_	_	_					
tive	PW	_	_	_	85	85	85	80					
Shielding Effectiveness	Field	Steel Tin Plate Material Code - 44 Frequency											
ieldi		100 kHz	1 MHz	18 MHz	100 MHz	400 MHz	1 GHz	10 GHz					
S	Н	75	80	_	_	_	_	_					

#### Air Flow Resistance — Figure 1

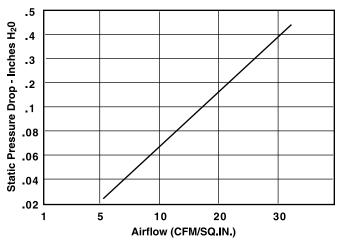
The low resistance to air flow of MAJR'S shielded honeycomb panels will minimize pressure drop within cabinet, allowing air to move freely through the intake and exhaust to perform the desired cooling function. The curves in Figure 1 show the resistance per square inch for standard honeycomb vents.

90

90

90

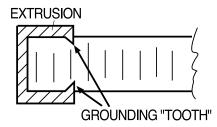
85



#### **Mounting Installation**

Four mounting frames are offered as a standard for installation into the cabinet. In each case, the extruded aluminum frame is designed with a "tooth" that bites into the honeycomb to ensure grounding of the frame to the honeycomb. (See Figure 2).

Figure 2



Figures 3 through 5 depict the frames offered as standard mounting configurations. Although these frames represent those sections that are most popular, MAJR offers a wide range of shapes for those applications requiring special mounting.

Figure 3 - Style 3031 Through Hole

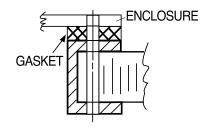


Figure 4 - Style 3032 Captive Fastener

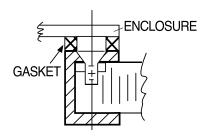


Figure 5 - Style 3036 Recess Mount

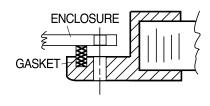


Figure 6 -Style 3031 EMI/RFI Shielded Ventilation Panel with Through Holes

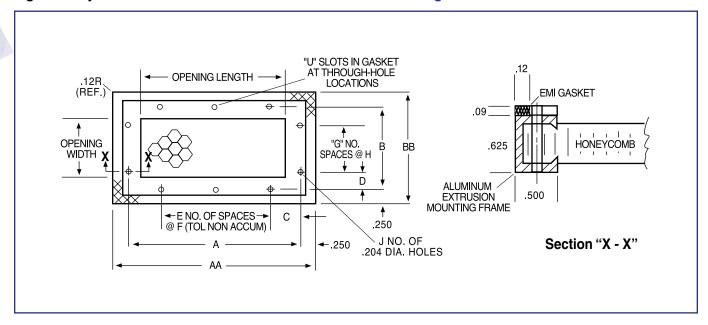


Table 2

OPE	NING	Part Number	FRAME DIMENSIONS										
Width	Length	-32 Material	AA	BB	Α	В	С	D	Ε	F	G	Н	J
3.00 (76.2)	3.00 (76.2)	3031-20303-xx	4.00 (101.6)	4.00 (101.6)	3.50 (88.9)	3.50 (88.9)	1.75 (44.5)	1.75 (44.5)	_	_	_	_	4
3.00 (76.2)	5.00 (127.0)	3031-20305-xx	6.00 (152.4)	4.00 (101.6)	5.50 (139.7)	3.50 (88.9)	1.00 (25.4)	1.75 (44.5)	1	3.50 (88.9)	-	_	6
3.00 (76.2)	11.00 (279.4)	3031-20311-xx	12.00 (304.8)	4.00 (101.6)	11.50 (292.1)	3.50 (88.9)	1.25 (31.8)	1.75 (44.5)	3	3.00 (76.2)	-	_	10
4.00 (101.6)	4.00 (101.6)	3031-20404-xx	5.00 (127.0)	5.00 (127.0)	4.50 (114.3)	4.50 (114.3)	.750 (19.1)	2.25 (57.2)	1	3.00 (76.2)	-	_	6
4.00 (101.6)	9.00 (228.6)	3031-20409-xx	10.00 (254.0)	5.00 (127.0)	9.50 (241.3)	4.50 (114.3)	1.25 (31.8)	2.25 (57.2)	2	3.50 (88.9)	-	_	8
5.00 (127.0)	5.00 (127.0))	3031-20505-xx	6.00 (152.4)	6.00 (152.4)	5.50 (139.7)	5.50 (139.7)	1.00 (25.4)	1.00 (25.4)	1	3.50 (88.9)	1	3.50 (88.9)	8
5.00 (127.0)	11.00 (279.4)	3031-20511-xx	12.00 (304.8)	6.00 (152.4)	11.50 (292.1)	5.50 (139.7)	1.25 (31.8)	1.00 (25.4)	3	3.00 (76.2)	1	3.50 (88.9)	12
6.00 (152.4)	6.00 (152.4)	3031-20606-xx	7.00 (177.8)	7.00 (177.8)	6.50 (165.1)	6.50 (165.1)	1.50 (38.1)	1.50 (38.1)	1	3.50 (88.9)	1	3.50 (88.9)	8
6.00 (152.4)	9.00 (228.6)	3031-20609-xx	10.00 (254.0)	7.00 (177.8)	9.50 (241.3)	6.50 (165.1)	1.25 (31.8)	1.50 (38.1)	2	3.50 (88.9)	1	3.50 (88.9)	10
7.00 (177.8)	14.00 (355.6)	3031-20714-xx	15.00 (381.0)	8.00 (203.2)	14.50 (368.3)	7.50 (190.5)	.750 (19.1)	.750 (19.1)	4	3.25 (82.6	2	3.00 (76.2)	16
9.00 (228.6)	9.00 (228.6)	3031-20909-xx	10.00 (254.0)	10.00 (254.0)	9.50 (241.3)	9.50 (241.3)	1.25 (31.8)	1.25 (31.8)	2	3.50 (88.9)	2	3.50 (88.9)	12
11.00 (279.4)	11.00 (279.4)	3031-21111-xx	12.00 (304.8)	12.00 (304.8)	11.50 (292.1)	11.50 (292.	1.25 (31.8)	1.25 (31.8)	3	3.00 (76.2)	3	3.00 (76.2)	16
14.00 (355.6)	14.00 (335.6)	3031-21414-xx	15.00 (381.0)	15.00 (381.0)	14.50 (368.3)	14.50 (368.3)	1.25 (31.8)	1.25 (31.8)	4	3.00 (76.2)	4	3.00 (76.2)	20
18.00 (457.2)	18.00 (457.2)	3031-21818-xx	19.00 (482.6)	19.00 (482.6)	18.50 (469.9)	18.50 (469.9)	1.75 (44.5)	1.75 (44.5)	5	3.00 (76.2)	5	3.00 (76.2)	24

xx = Require Finish

3031-20303-32 — Ventilation Panel with Chromate Finish



# Fan Air Filters and **Ventilation Panels** (3000 Series)

MAJR's fan ventilation panels are manufactured to meet the commercial market's requirements for a low-cost, high-quality EMI-shielded filter or vent panel. These units are available in five standard sizes using a filter media or 0.250" thick honeycomb material and have an overall thickness with gasket of 0.407". Standard gasket is a Monel wire embedded in a solid silicone with an optional gasket of a beryllium copper fingerstock. Tin plate (MIL-T-10727), nickel plate (MIL-C-26074A) or a RoHS compliant plating available upon request.

Shielding effectiveness is up to 50-60 dB range at 1 GHz, depending on the materials used. Standard lead times are in the two-to-three week range for most sizes with quicker deliveries available based on plating and quantities required.

**Table 1 - Product Identification** 

Dimensions		Part Numbers
1.57" x 1.57"	(40mm x 40mm)	3031-04040-32
1.97" x 1.97"	(50mm x 50mm)	3031-05050-32
2.36" x 2.36"	(60mm x 60mm)	3031-06060-32
3.15" x 3.15"	(80mm x 80mm)	3031-08080-32
4.72" x 4.72"	(120 mm x 120mm)	3031-12012-32

For a tin-plated panel, use -42;

for electroless nickel -49;

for a filter media -57;

for RoHS compliant -90.

Other sizes available upon request.



# EMI/RFI Shielded Windows (3500 Series)

MAJR Products provides a range of defined polycarbonate laminates that can be machined, bus barred and gasketed to meet your optical and EMI/RFI Shielding requirements within a short lead-time without compromising quality or performance.



# **Features**

- EMI/RFI Shielded Window Properties the materials and construction have been optimized to provide superior EMI/RFI shielding performance, optical clarity and environmental durability.
- Hard Coatings are designed to provide polycarbonate windows with improved chemical, scratch and abrasion resistance. Hard coatings are applied in a class 10000 clean room via a permanent, high durability UV curing process. Hard coatings are tested for chemical abrasion resistance using ASTM-D-1308 and for abrasion resistance using ASTM-D-1044.
- Antiglare hard coatings diffuse surface reflections but still maintain very good uniformity and image resolution for electronic display applications. The standard antiglare hard coating measures 60 gloss units via ASTM-D-523 using a gloss meter at 60 deg.
- Antireflective hard coatings improve light transmission and reduce reflection of polycarbonate windows. The antireflective coatings are broad band vapor deposited coatings which reduce surface reflections to less than 0.75% over the visible spectrum. The antireflective coatings are deposited over a clear or antiglare hard coating to combine improved durability with enhanced optical performance.
- Optical Fine Wire (OFW) or MEM-100 printed mesh provide excellent EMI/RFI attenuation and optical performance. Standard OFW mesh is 80

- strands per inch and constructed from 0.0011" stainless steel wire that has been silver plated and conductively blackened. Resistance of the OFW or MEM-100 mesh is <0.05 ohms/sq. and light transmission is 75% to 80%.
- Conductive Coatings provide optical shielding for less demanding applications. A 10 ohms/sq. conductive coating will provide approximately 80% to 85% light transmission and 20-30 dB's of EMI/ RFI attenuation from 100 MHz to 1 GHz.
- Quality laminated panels are manufactured, inspected and tested to the S113 specification or as required by the customer.

# Adhesive Polycarbonate Substrate Adhesive Hardcoat - clear or antireflective

# Technical Information\*

# ■ Dimensions (Industry Standards, Custom Available)

Laminate Thickness	Thickness Tolerance	Minimum Part Size	Maximum Part Size	Tolerance up to 200mm	Tolerance >200mm to 400mm	Tolerance >400mm to 650mm	Tolerance on Parts >650mm	Square Edge Profile?	Step Edge Profile?
1.5mm	(+/-) 0.2mm	6.0mm	400mm x 300mm	(+/-) 0.2mm	(+/-) 0.3mm	NA	NA	Yes, Available	Yes, Available
2.0mm	(+/-) 0.2mm	6.0mm	480mm x 650mm	(+/-) 0.2mm	(+/-) 0.3mm	(+/-) 0.5mm	NA	Yes, Available	Yes, Available
3.0mm	(+/-) 0.3mm	6.0mm	700mm x 1100mm	(+/-) 0.2mm	(+/-) 0.4mm	(+/-) 0.5mm	(+/-) 1.0mm	Yes, Available	Yes, Available
4.0mm	(+/-) 0.4mm	6.0mm	700mm x 1100mm	(+/-) 0.2mm	(+/-) 0.5mm	(+/-) 0.5mm	(+/-) 1.0mm	Yes, Available	Yes, Available

# Machining Detail

Holes - Minimum Diameter: 2.0mm

90° Countersink: Yes Gasket Grooves: Yes

Gasket Groove Minimum Dimensions (wxd): 3.0 x 0.3mm

Radius - Minimum Internal or External: 1mm

Other Details Available: Custom

# ■ Optical Specifications

Color: Clear (Standard) / Colors (Custom) Surface Finish: Clear or Non-Glare Hard Coat Light Transmission: 80% - 85% (Standard) Mesh Angle: 22.5°, 30°, 45°, 90° Tolerance +/-5° Cosmetics: ISO 9001:2008 Visual Inspection Procedure

# ■ Busbar – All Thicknesses

On Edge Only - "I" Shape: Yes Edge and 1 Surface - "L" Shape: Yes Edge and 2 Surfaces - "U" Shape: Yes

Edge, Step and 1 Surface - "Z" Shape: Custom

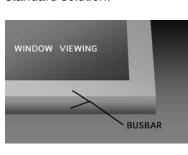
Minimum Width: 2.0mm

Busbar Conductivity: <0.2 ohms/100mm

\*All technical information and specifications are based on industry standards and common application dimensions and finishes. If your needs fall outside these parameters, please contact our sales department. We have done many specialized designs for our customers and would welcome the opportunity to work with you on your requirements.

# Silver Epoxy Busbar

Silver epoxy busbar is applied to the perimeter of machined windows for conductivity / connectivity to a metal bezel or the metal case, faceplate, door, etc. Ceramic busbars are also available but are more highly specialized to applications and not a typical standard solution.



# **Typical Bus Bar Shapes**

# I-Shape On outer edge of window only.

L-Shape -On outer edge of window & one surface.

# U-Shape-

Z-Shape -

On outer edge of window & "step" & one surface.

# On outer edge of window & two surfaces connecting

# **Typical Busbar Widths (mm)**

2.0mm | 3.0mm | 4.0mm | 5.0mm

6.4mm | 10.0mm | 12.7mm

15.0mm

\*Others by request / per custom design.

# Conductive Elastomers (5000 Series)

# **General Descriptions**

Conductive Elastomers are a molded elastomer filled with conductive inert particles. It provides high electrical conductivity, broadband shielding and moisture sealing.

Conductive Elastomers are manufactured to provide reliable and cost-effective shielding for a wide range of EMI applications. Conductive Elastomers are manufactured in sheets, molded parts, strips and die-cut flat gaskets.

# **Application Information**

Conductive Elastomers should be used where there is a need for high broadband shielding combined with excellent moisture-sealing properties.

In order to assure electrical conductivity and sealing reliability, recommended design compression is 7% - 15% of original height for sheets and rectangular strips. For "O" and "D" shapes the recommended compression is 12% - 30%.

# Adhering and Joining

For splicing, joining and bonding Conductive Elastomer gaskets to enclosures, MAJR recommends a two-component, electrically conductive, silver silicone adhesive sealant of medium viscosity. This material provides a flexible bond and a resilient seal. If necessary, MAJR can provide this sealant with your order; ask your representative.

# **EMI Shielding Performance\***

MAJR's Conductive Elastomers Shielding Effectiveness has been tested in accordance with MAJR's Test Methods and based upon modified MIL-STD-285. Typical Shielding effectiveness values are based on a 5" square aperture.

MAJR's Conductive Elastomers Shielding Effectiveness has been tested in accordance with the test method described in paragraph 4.6.12 of MIL-DTL-83528.

## Material Selection — Table 1

			Conduc	ctive Elas	tomer				
Material Designation Number		52	61	62	63	64	65	66	67
Elastomer		Silicone	Silicone	Silicone	Silicone	Fluorosilicone	Silicone	Silicone	Silicone
MIL-DTL-83528 Type			М	K	В	D	L	Е	
Material Description		Ni/Gr	Ag/Glass	Ag/Cu	Ag/Al	Ag/Al	Ag/Ni	Ag	Carbor
Volume resistivity	Ohm-cm	0.1	0.006	0.005	0.008	0.012	0.005	0.002	7
Hardness	Shore A	30-70	65	85	65	70	75	65	70
Operating Temp.	Deg. C. Min.	-55	-55	-45	-55	-55	-55	-55	-55
	Deg. C. Max.	150	160	125	160	160	125	160	200
Material Designation Number		68	69	74	75	76	77	78	79
Elastomer		Silicone	Fluorosilicone	Fluorosilicone	Fluorosilicone	Silicone	Fluorosilicone	Silicone	Silicone
MIL-DTL-83528 Type		Α	F	С		ı		Н	G
Material Description		Ag/Cu	Ag	Ag/Cu	Ni/Gr	Ag	W/AI	Ag	Ag/Cu
Volume resistivity	Ohm-cm	0.004	0.002	0.01	0.1	0.01	1.00	0.005	0.007
Hardness	Shore A	65	75	75	65	45	60-70	80	80
Operating Temp.	Deg. C. Min.	-55	-65	-55	-55	-55	-50	-55	-45
	Deg. C. Max.	125	160	125	150	160	200	160	125

# Table 2 - Standard Sheets: (Other Sizes Available)

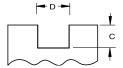
Height	Part Number	Standard Size
.020 [0.51]	5000-02000-xx	12" Square [305 mm square]
.032 [0.76]	5000-03000-xx	12" Square [305 mm square]
.040 [1.02]	5000-04000-xx	12" Square [305 mm square]
.062 [1.57]	5000-06000-xx	12" Square [305 mm square]
.093 [2.36]	5000-09000-xx	12" Square [305 mm square]
.125 [3.18]	5000-12000-xx	12" Square [305 mm square]

<sup>\*</sup> Other sheet sizes available upon request.

Part Dimensions



**Groove Dimensions** 



# Table 3 - Standard "D" Shapes

Α	Part	Groove Dimensions			
Dimension*	Number	C +.006 -0 [0.15]	D +.006 -0 [0.15]		
.062 [1.57]	5009-06006-xx	.045 [1.14]	.065 [1.65]		
.093 [2.36]	5009-09009-xx	.070 [1.78]	.097 [2.46]		
.125 [3.18]	5009-12012-xx	.091 [2.31]	.128 [3.25]		
.188 [4.78]	5009-18018-xx	.141 [3.58]	.193 [4.90]		
.250 [6.35]	5009-25025-xx	.187 [4.75]	.255 [6.48]		

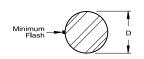
# **Table 4 - Standard Rectangle:**

	.125 [3.18]	.188 [4.78]	.250 [6.35]	.375 [9.53]	.500 [12.70]
Height	Part Number				
.032 [0.76]	5010-03012-xx	5010-03019-xx	5010-03025-xx	5010-03038-xx	5010-03050-xx
.062 [1.57]	5010-06012-xx	5010-06019-xx	5010-06025-xx	5010-06038-xx	5010-06050-xx
.093 [2.36]	5010-09012-xx	5010-09019-xx	5010-09025-xx	5010-09038-xx	5010-09050-xx
.125 [3.18]	5010-12012-xx	5010-12019-xx	5010-12025-xx	5010-12038-xx	5010-12050-xx
.188 [4.78]	5010-18012-xx	5010-18019-xx	5010-18025-xx	5010-18038-xx	5010-18050-xx
.250 [6.35]	5010-25012-xx	5010-25019-xx	5010-25025-xx	5010-25038-xx	5010-25050-xx

<sup>\*</sup>Other dimensions of this part are available upon request.

# Table 5 - Standard Round:

Diameter	Part Number
.062 [1.57]	5011-06000-xx
.093 [2.36]	5011-09000-xx
.125 [3.18]	5011-12000-xx
.188 [4.78]	5011-18000-xx
.250 [6.35]	5011-25000-xx



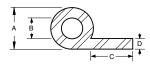
# Table 6 -Hollow Core:

Outside Diameter	Inside Diameter	Part Number
.090	.050	5011-09050-XX
.103	.040	5011-10040-XX
.125	.045	5011-12045-XX
.156	.050	5011-16050-XX
.250	.125	5011-25012-XX
.312	.192	5011-31019-XX
.375	.250	5011-38025-XX



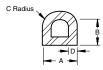
MAJR PRODUCTS

# **Table 9 - P-Strip Tubing - Hollow Core:**



14510	• •	tilp it	359	
Α	В	С	D	Part Number
.200	.080	.650	.062	5012-20065-XX
.250	.125	.250	.062	5012-25025-XX
.250	.125	.375	.062	5012-25038-XX
.250	.150	.375	.062	5012-25015-XX
.312	.187	.563	.062	5012-31056-XX
.360	.255	.420	.070	5012-36042-XX
.200	.080	.275	.062	5012-20028-XX
.250	.125	.625	.062	5012-25063-XX

# **Table 10 - Hollow D-Strip:**



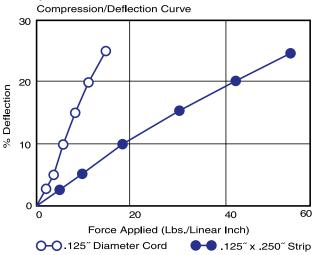
Α	В	С	D	Part Number
.156	.078	.078	.045	5013-16078-XX
.187	.093	.093	.050	5013-19093-XX
.250	.125	.125	.065	5013-25013-XX
.312	.156	.156	.062	5013-31016-XX
.312	.200	.112	.062	5013-31011-XX
.487	.080	.244	.080	5013-48024-XX

# **Ordering Information:**

Replace xx with the appropriate material code:
Nickel Graphite (52)
Silver-Plated Glass (61)
Silver-Plated Copper (62)
Silver-Plated Aluminum (63)
Silver-Plated Aluminum FluoroSilicone (64)
Silver-Plated Nickel (65)
Silver (66)
Silver Plated Copper Fluorosilicone (68)

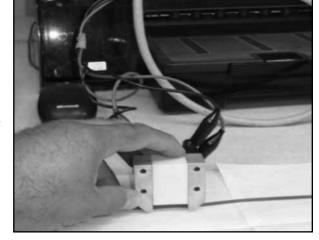
For cross-sections not listed above and custom design applications and molded parts, contact your MAJR representative.

Figure 3
Compression and Deflection Data:



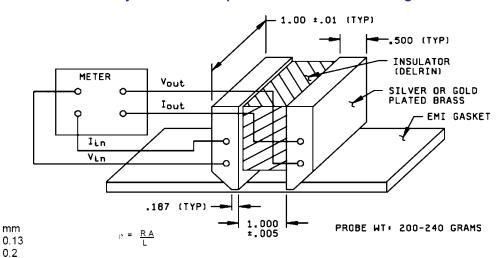
# Volume Resistivity Measurement Service

MAJR Products Corporation utilizes the standard DC volume resistivity test measurement procedure as stated in MIL-DTL-83528. When used with a milliohm meter capable of measuring to one milliohm, the MIL-DTL-83528 2-point resistance test measurement method (modified ASTM D991) reveals the DC surface resistance of the conductive



elastomer gasket under test. With the DC surface resistance known from the test probe (figure #1), the DC volume resistivity of the gasket can be calculated using the area of the gasket, multiplied by the resistance, divided by the distance between test probes. When making DC volume resistivity gasket measurements on various areas of a sheet or segments of an extrusion, the resistive range and consistency of the gasket can be analyzed. Figure #2 shows a conductive elastomer extrusion gasket under test.

## MIL-DTL-83528 DC Volume resistivity measurement probe and calculation — Figure 1



A = Smallest cross section area of part or sample between probe electrodes (cm<sup>2</sup>).

# 1.000 NOTES:

Inches

.005

.187

.500

1. Dimensions are in inches.

4.75

12 70

25.40

- 2. Metric equivalents are given for general information only.
- 3. Where applicable the probe will be placed on the flat surface of the item.

Where: p = DC volume resistivity in ohm-cm.

R = Measured resistance in ohms.

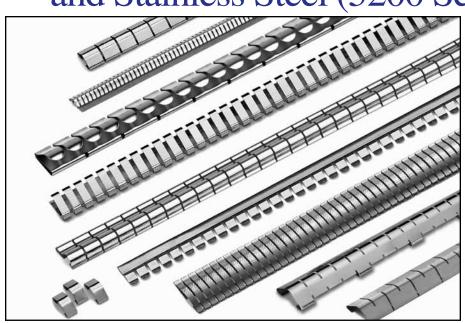
L = Distance between two electrodes in cm. or 2.54 cm.

4. Unless otherwise indicated, tolerance is ±.010 (0.25 mm).

# DC Volume resistivity measurement — Figure 2



# Fingerstock Gasketing Beryllium Copper and Stainless Steel (5200 Series)



Our fingerstock gasketing made of Beryllium Copper is ideal for repeated opening and closing applications where high attenuation performance and mechanical strength is required.

Beryllium copper's electrical properties provide shielding effectiveness over an extremely broad frequency range. Mechanically, Beryllium Copper yields a high deflection range, with low compression set.

Beryllium Copper, alloy 25, is used for maximum spring properties of strength and fatigue resistance. A variety of fingerstock is also available in stainless steel. Contact our factory for profiles and availability.

# **Features**

- **RoHS Compliant Material**
- High EMI/RFI Attenuation Levels
- Available in a Variety of Platings / Finishes
- Wide Range of Configurations
- **High Temperature** Tolerance
- TF Low Compression

# 5220 Series



# **GAP RANGE UP TO .06"**

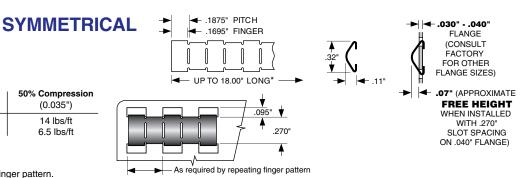
# **Compression Force**

5220-02C32-XX

	25% Compression (0.053")	<b>50% Compression</b> (0.035")
Standard	2.7 lbs/ft	14 lbs/ft
"TF" Style	2.5 lbs/ft	6.5 lbs/ft

## **APPLICATION DATA**

1. \*Actual length determined by finger pattern.



# 5220 SeriesSnap-on Mounting



# 5220-13I36-XX

# **SOFT NO-SNAG FINGERS**

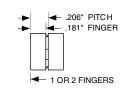
# **GAP RANGE UP TO .068"**

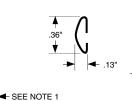
Standard

#### **APPLICATION DATA**

Notes:

- Length of slot as required by number of fingers.
- 2. Spacing determined by attenuation requirements.





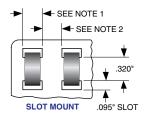
.095' SLOT

SEE NOTE 2

**EDGE MOUNT** 



FREE HEIGHT WHEN INSTALLED WITH .320" SLOT SPACING ON .050" FLANGE)



# 5230 Series Stick-on Mounting



# 5230-01C35-XX

# **SOFT NO-SNAG FINGERS**

# **Compression Force**

	25% Compression (0.083")	<b>50% Compression</b> (0.055")
Standard	25 lbs/ft	89 lbs/ft
"TF" Style	6 lbs/ft	23 lbs/ft

Note: Also available with optional double adhesive transfer tape.

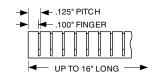
# - .11" FREE HEIGHT - .187" PITCH - .169" FINGER - .35" - .03R INSIDE TYP. MOUNTING SURFACE

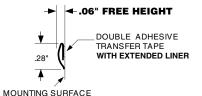
# 5230-02B28-XX

# **LOW PROFILE NO-SNAG**

# **Compression Force**

	25% Compression (0.045")	<b>50% Compression</b> (0.030")
Standard	5.5 lbs/ft	20 4 lbs/ft



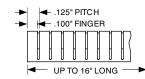


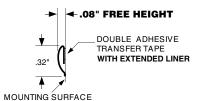
# 5230-03B32-XX

# **LOW PROFILE NO-SNAG**

# **Compression Force**

	25% Compression (0.060")	50% Compression (0.040")
Standard	6.8 lhs/ft	17 lhs/ft





# 5230 SeriesStick-on Mounting

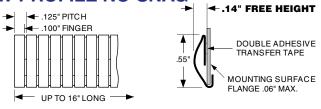


# 5230-09B60-XX

# **HOOK & STICK-ON LOW PROFILE NO-SNAG**

#### **Compression Force**

	25% Compression	50% Compression
	(0.105")	(0.070")
Standard	19 lbs/ft	35 lbs/ft
TF	6.8 lbs/ft	14 lbs/ft

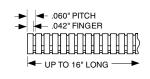


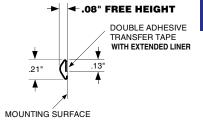
# 5230-10J21-XX

# **SOFT NO-SNAG FINGERS**

# **Compression Force**

	25% Compression	50% Compression
	(0.060")	(0.040")
Standard	11 lbs/ft	34 lbs/ft





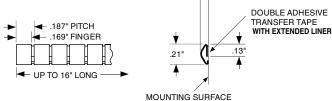
■.08" FREE HEIGHT

# 5230-11C21-XX

# **SOFT NO-SNAG FINGERS**

### **Compression Force**

	25% Compression	50% Compression
	(0.090")	(0.060")
Standard	12 lbs/ft	24 lbs/ft



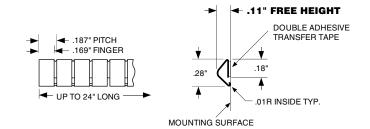
# 5230-12C28-XX

# SOFT FINGERS

# **Compression Force**

	25% Compression	50% Compression
	(0.083")	(0.055")
Standard	15 lbs/ft	32 lbs/ft

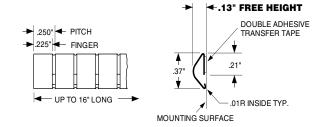
Note: Also available in 25 ft. rolls.



# 5230-14D37-XX SOFT NO-SNAG FINGERS

# **Compression Force**

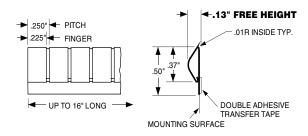
	25% Compression	50% Compression
	(0.098")	(0.065")
Standard	10 lbs/ft	21 lbs/ft



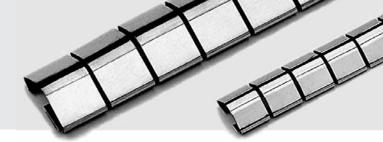
# 5230-15D50-XX SOFT NO-SNAG FINGERS

# **Compression Force**

	25% Compression (0.098")	<b>50% Compression</b> (0.065")
Standard	10 lbs/ft	21 lbs/ft



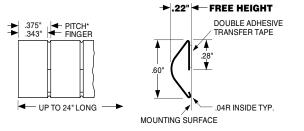
# 5230 Series Stick-on Mounting SEE PAGE 4 FOR HOW TO ORDER



# 5230-16E60-XX SOFT NO-SNAG FINGERS

#### **Compression Force**

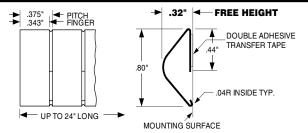
	25% Compression	50% Compression
	(0.165")	(0.110")
Standard	10 lbs/ft	20 lbs/ft
TF	2.0 lbs/ft	7.2 lbs/ft



# 5230-17E80-XX SOFT NO-SNAG FINGERS

#### **Compression Force**

	25% Compression (0.240")	<b>50% Compression</b> (0.160")
Standard	7 lbs/ft	17 lbs/ft



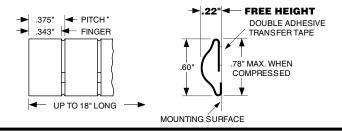
# 5230-21E60-XX

# **NO-SNAG FINGERS**

#### **Compression Force**

	25% Compression	50% Compression
	(0.165")	(0.110")
Standard	13 lbs/ft	32 lbs/ft

Note: Also available in .187" Pitch.



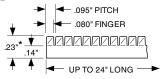
# 5230-24T95-XX

# TWISTED CONTACTS

# **Compression Force**

	25% Compression (0.023")	50% Compression (0.015")
Standard	5.8 lbs/ft	35 lbs/ft
"TF" Style	4.9 lbs/ft	19 lbs/ft

Notes: Also available in 25 ft. rolls. (SS)Also available in Stainless Steel



\*COMPRESSED DIM.

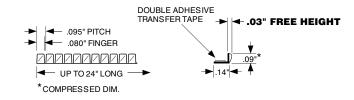
# DOUBLE ADHESIVE TRANSFER TAPE

# 5230-25-95T90-XX TWISTED CONTACTS

#### **Compression Force**

	25% Compression (0.023")	<b>50% Compression</b> (0.015")
Standard	12 lbs/ft	51 lbs/ft
"TF" Style	2.5 lbs/ft	10 lbs/ft

Note: SS Also available in Stainless Steel



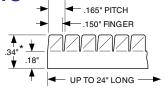
# 5230-26-165T-XX

# TWISTED CONTACTS

#### **Compression Force**

	25% Compression (0.053")	<b>50% Compression</b> (0.035")
Standard	18 lbs/ft	36 lbs/ft
"TF" Style	4.2 lbs/ft	11 lbs/ft

Notes: Also available in 25 ft. rolls. SSAlso available in Stainless Steel



\* COMPRESSED DIM.



Phone: (814) 763-3211 • Fax: (814) 763-2952 • e-mail: sales@majr.com

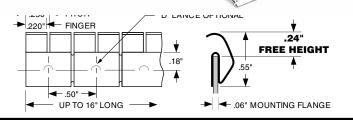
0

# 5240 SeriesClip-on Mounting



5240-01D70-XX

PERPENDICULAR CONTACT

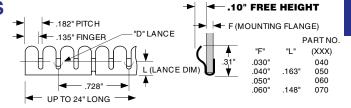


# 5240-07L09-XX

# CYLINDRICAL RADIUS

## **Compression Force**

	25% Compression	50% Compression		
	(0.075")	(0.050")		
Standard	14 lbs/ft	49 lbs/ft		
"TF" Style	4.5 lbs/ft	22 lbs/ft		
Note: Non-standard lance location(s).				



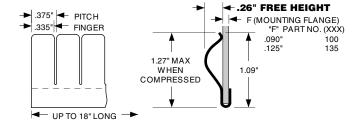
# 5240-12E90-XX

# STRIP GASKETS

#### **Compression Force**

	25% Compression	50% Compression
	(0.195")	(0.130")
Standard	17 lbs/ft	43 lbs/ft

Note: Drawing shown at reduced scale.



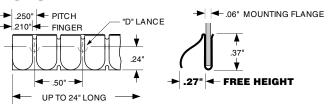
# 5240-14D27-XX

# **REVERSE BEND CONTACTS**

#### **Compression Force**

	25% Compression	50% Compression
	(0.203")	(0.135")
Standard	5 lbs/ft	15 lbs/ft

Note: Non-standard lance location(s). Also available in 25 ft. rolls. Scores for break off between 1/2" increments optional.



# 5250 SeriesSpecial Mounting

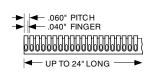


# 5250-01R60-XX

# **REVERSE BEND SPHERICAL**

# **Compression Force**

	25% Compression (0.675")	<b>50% Compression</b> (0.045")
Standard	7 lbs/ft	10 lbs/ft



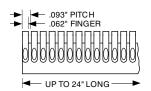


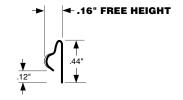
# 5250-03R93-XX

# REVERSE BEND SPHERICAL

# **Compression Force**

	25% Compression	50% Compression
	(0.120")	(0.080")
Standard	15 lbs/ft	47 lbs/ft





# 5250-04R60-XX

# **REVERSE BEND CONTACTS**

# **Compression Force**

	25% Compression (0.053")	<b>50% Compression</b> (0.035")
Standard	18 lbs/ft	41 lbs/ft



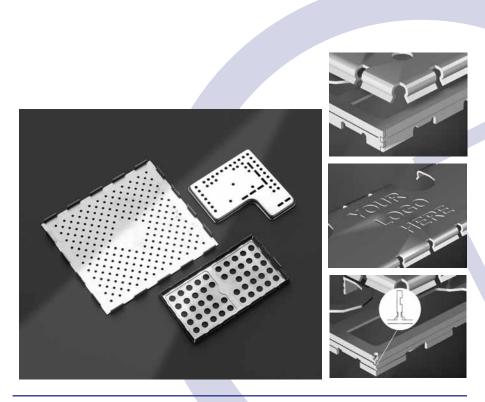


MAJR PRODUCTS

# Custom Board Level Shielding (5300 Series)

MAJR specializes in the design of custom shielding solutions, Board Level Shields (BLS) are manufactured specifically to meet the requirements of specific EMI/RFI applications. Using precision photo etching and stamping techniques, MAJR can supply custom tailored solutions for standard and non-standard Board Level Shield designs. Ideally Board Level Shields should be designed to suit the application and not vice versa.

- Manufacturing methods offer greater design scope and flexibility
- Low cost tooling represents a low risk entry strategy
- Integral bend lines enable more intricate geometries
- Bend lines offer greater coplanarity for easier assembly
- Use of digital tooling reduces lead-times
- Any mounting method, (conventional through hole, SMT or mechanical) can be accommodated
- Unique design features ease assembly and optimize performance
- I/D marks and legends available at no extra cost
- High efficiency heat dissipation venting available
- Easily formed manually or with 'soft' tooling



# Board Level Shield (BLS) Types

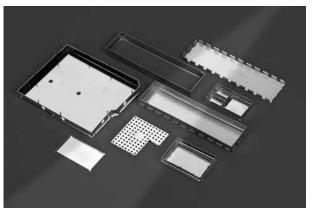
# **One-piece Board Level Shield**



Custom one-piece BLS with half-etched bend lines and 'Quiet' construction features offer outstanding attenuation combined with excellent coplanarity for ease of assembly. These can be shipped fully formed or flat pack for self-assembly, either manually or with soft tooling. They can be virtually any size and can incorporate a wide variety of design features to enhance performance and ease of use.

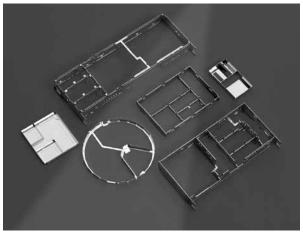
Seam soldering is also available for complete can integrity, if required.

# **Two-piece Board Level Shield**



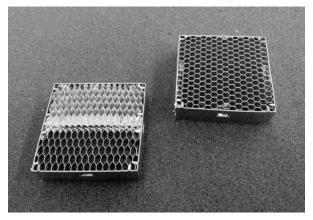
Custom circuit board shielding BLS with removable lids are designed to protect sensitive components from noise while giving access for rework and adjustments. Removable fingered lids provide easy access to the enclosure contents and high attenuation in service.

# Labyrinth / multi-compartment Board Level Shield



A multi-compartmental BLS is an effective alternative to multiple BLS. It is cost effective to produce and offers significant savings in terms of initial cost, assembly time and real estate management. A matrix of walls, all folding easily from a single sheet and complemented with a separate lid, provides an efficient enclosure with enhanced accessibility for rework or the tuning of devices.

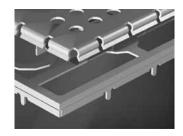
# EMI/RFI Shielding Thermal Management Board Level Shield



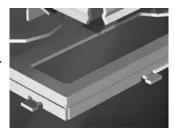
MAJR Shield is an EMI/RFI Board Level Shield that allows significant heat dissipation of electronic components. Thermally, MAJR Shield incorporates either straight honeycomb with standoff fence mounting for convection "Chimney effect" heat dissipation or angled honeycomb for forced air applications – both configurations provide high EMI/RFI shielding performance and heat dissipation for today's high frequency and compact circuits.

# Design features for attachment / assembly

Location pins for through hole attachment during wave soldering and securing the BLS for manual soldering. If necessary, these pins can be given a 'rounded' profile by post etching.



■ SMT feet are effectively small pads for solder attach to an earth circuit or ground plane in a multilayer construction by way of micro vias.

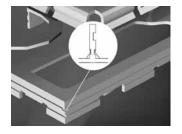


Serrated base edge
Surface mount BLS
requiring solder attach
along an entire wall can
have base serrations

have base serrations incorporated to enable the molten solder to flow through the wall and

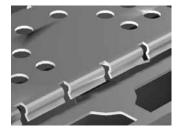


SAM line SAM is a Solder Anti-Migration feature, essentially a partially etched lateral line on the walls of a shielding BLS that discourages 'wicking' of the solder up the walls of the BLS that



might scavenge material from the joint area.

■ Pick and place lands can be provided, even on two-piece BLS, to enable automatic handling and placement. Typically on a one-piece ventilated BLS, an area on the top is left without perforations



to enable vacuum manipulation. In a two-piece BLS a special land is designed into the BLS body. It can be easily removed with a simple twist after assembly and before the lid is finally positioned.

### Mech Mount

Several solderless through hole attachment designs whereby the pins maintain constant electrical contact with PTH (plated through holes). This enables BLS to attached or be removed and replaced a limited number of times, without the need for a further thermal excursion.

# Design features for attenuation and noise reduction 'Quiet' Venting

As devices carry more power, they generate more heat and require ever more cooling. The addition of a shielding may raise the operating temperature of the device past the critical limit.

Perforations have been made in BLS for many years, the maximum permissible dimension being a function of the device frequency and the level of attenuation desired. Contact MAJR for optimization.

Quiet venting can increase the open area of a BLS for optimum cooling by perforating a pattern of very small holes, effectively a mesh, into both the walls and tops of BLS. This process also reduces the 'maximum linear dimension' to improve attenuation performance and does not add significantly to the part cost of the BLS. To perforate the walls of a 'drawn' BLS requires multistage tooling which can be costly.

Quiet venting also has the additional benefit of enabling some vision systems to 'look' inside the BLS to check component existence and correct placement.

# 'Quiet' Finger-clip Lids

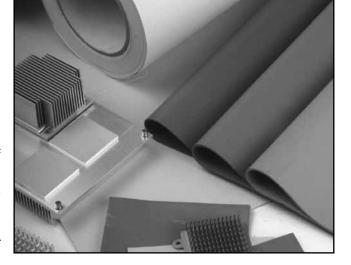
The new 'quiet' design for securing lids in twopiece and labyrinth BLS types provides positive engagement of the lid with an etch line in the BLS



wall. The design gives maximum conductivity and a snap-fit that makes disassembly just as easy. This design offers excellent anti-rattle performance.

# Thermal Management Materials (6000 Series)

MAJR 6000 thermal Management materials consist of sheet, adhesive, and grease compounds; these thermal materials are used in a wide variety of markets such as LED, chip sets for IC controller packages, IT for industrial and personal computers, DRAM Modules, telecom devices, automotive control units, and a variety of other products used in military and commercial markets.



**Product Application (6001 - 6023)** The thermal materials described below are incorporated in our 6000 Series for thermal interface materials.

- · All materials are rated at UL 94 VO
- Colors are varied dependant on material
- Other material specifications such as thickness, standard sheet size, density, and resistance are available upon request.

# Product Technical Data (6001) — Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.7	W/m-k	ASTM D5470
Hardness	5.0	Shore A	ASTM D2240
Dielectric breakdown	>10	KV	ASTM D149

# Product Technical Data (6002) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.6	W/m-k	ASTM D5470
Hardness	15	Shore A	ASTM D2240
Dielectric breakdown	>7	KV	ASTM D149

# Product Technical Data (6003) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	2.2	W/m-k	ASTM D5470
Hardness	10	Shore A	ASTM D2240
Dielectric breakdown	>5	KV	ASTM D149

# Product Technical Data (6004) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	3.2	W/m-k	ASTM D5470
Hardness	20	Shore A	ASTM D2240
Dielectric breakdown	>7.0	KV	ASTM D149

# Product Technical Data (6005) – Conductive Grease

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	3.6	W/m-k	ASTM D5470
Hardness	-	Shore A	ASTM D2240
Dielectric breakdown	1.0 at 0.1mm	KV	ASTM D149



# Product Technical Data (6007) – Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	0.8	W/m-k	ASTM D5470
Hardness	20	Shore C	ASTM D2240
Dielectric breakdown	>4	KV	ASTM D149

# Product Technical Data (6008) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.0	W/m-k	ASTM D5470
Hardness	30	Shore C	ASTM D2240
Dielectric breakdown	>6	KV	ASTM D149

# Product Technical Data (6009) – Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.0	W/m-k	ASTM D5470
Hardness	15	Shore C	ASTM D2240
Dielectric breakdown	>6.3	KV	ASTM D149

# Product Technical Data (6010) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.2	W/m-k	ASTM D5470
Hardness	15	Shore C	ASTM D2240
Dielectric breakdown	>6.5	KV	ASTM D149

# Product Technical Data (6011) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.5	W/m-k	ASTM D5470
Hardness	25	Shore C	ASTM D2240
Dielectric breakdown	>5.2	KV	ASTM D149

# Product Technical Data (6012) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	2.0	W/m-k	ASTM D5470
Hardness	25	Shore C	ASTM D2240
Dielectric breakdown	>6	KV	ASTM D149

# Product Technical Data (6013) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	2.5	W/m-k	ASTM D5470
Hardness	25	Shore C	ASTM D2240
Dielectric breakdown	>5.3	KV	ASTM D149

# Product Technical Data (6014) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	3.0	W/m-k	ASTM D5470
Hardness	25	Shore C	ASTM D2240
Dielectric breakdown	>4.8	KV	ASTM D149

# Product Technical Data (6015) – Thermal Insulator

	PROPERTY	RANGE	UNIT	TEST METHOD
	Thermal conductivity	0.8	W/m-k	ASTM D5470
	Hardness	75	Shore A	ASTM D2240
ù	Dielectric breakdown	>4	KV	ASTM D149

# Product Technical Data (6016) - Thermal Insulator

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.0	W/m-k	ASTM D5470
Hardness	85	Shore A	ASTM D2240
Dielectric breakdown	>4	KV	ASTM D149

# Product Technical Data (6017) - Thermal Insulator

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	0.7	W/m-k	ASTM D5470
Hardness	85	Shore A	ASTM D2240
Dielectric breakdown	>6.5	KV	ASTM D149

# Product Technical Data (6018) - Thermal Tape

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.0	W/m-k	ASTM D5470
Hardness	(Tape – Fiberglass)	-	-
Dielectric breakdown	2 - 6	KV	ASTM D149

# Product Technical Data (6019) - Thermal Tape

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.2	W/m-k	ASTM D5470
Hardness	Tape	-	-
Dielectric breakdown	1.57 – 2.29	KV	ASTM D149

# Product Technical Data (6020) - Thermal Tape

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	0.75	W/m-k	ASTM D5470
Hardness	Tape – Glass Fabric	-	-
Dielectric breakdown	>4	KV	ASTM D149

# Product Technical Data (6021) - Thermal Pad

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	4.72	W/m-k	ASTM D5470
Hardness	40	Shore A	ASTM D2240
Volume Resistivity	1.65 x 107	Ohm/cm	ASTM D257

# Product Technical Data (6022) - Thermal Pad

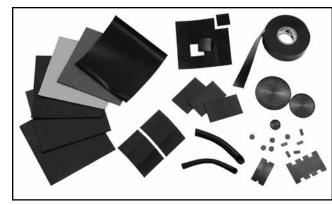
PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	1.5	W/m-k	ASTM D5470
Hardness	54	Shore A	ASTM D2240
Volume Resistivity	1.38 x 1014	Ohm/cm	ASTM D257

# Product Technical Data (6023) - Thermal Fabric

PROPERTY	RANGE	UNIT	TEST METHOD
Thermal conductivity	0.9	W/m-k	ASTM D5470
Hardness	Fabric	-	-
Volume Resistivity	1.0 x 1014	Ohm/cm	ASTM D257

# Broadband Microwave Absorber Materials (6500 Series)

Introducing the MAJR 6500 EMI Absorber material product line. The 6501 product is an RoHS Compliant 6500 electromagnetic absorbing material, sheet stock. This absorber is used in a wide variety of markets such as Cellular and telecom, electronic device, radar cross



section reduction, and a variety of other antenna and electronic housing applications.

The 6501 material is an elastomer based thin, flexible, and easy to install in even the tightest of applications. The absorber can be supplied die cut or water jet cut to your specification. In addition, for installation ease the absorber can be supplied with pressure sensitive adhesive.

## **Features**

- \*This material is ultra soft and can be applied to irregular surfaces.
- \*Incorporation of a self adhesive backing for ease of use in general to high altitude / vibration applications.

PROPERTY ABSORBER 6501	CHARACTERISTIC
Frequency	10 MHz - 8 GHz
MIL-A-17161D	Loss dB @1.0mm thk: 0.9GHz (-1.7), 1.8 GHz (-2.35), 2.4 GHz (-3.04)
Thickness w/o adh.	0.22mm, 0.25mm, 0.33mm, 0.6mm, 1.0mm, 1.5mm, 2.0mm, 2.5mm
Temperature range	-20°C to +100°C
Surface resistivity	10 <sup>6</sup> Ohm
RoHS	Compliant
Application use	Computer / Notebook Cellular and Telecom Military — Reduction of radar cross section RFID Tag / Readers - Antenna Systems Oscillators and Amplifiers Aeronautical devices GPS systems Digital camera and video recorders
Standard size	40 cm x 40 cm

# Ferrites (7000 Series)



# Flat Cable Suppression Core (FP Type)

Split ferrites for EMI suppression on flat cable assemblies.

- Internal floppy disk and hard disk ribbon cables.
- Internal ribbon cables between circuit boards and data connectors.
- Internal ribbon cables with 8, 16, 32 or 64-bit digital signal busses.

# Flat Cable Suppression Cores (FS Type)

Rectangular solid ferrites for EMI suppression on flat cable assemblies.

- Internal floppy disk ribbon cables.
- Internal ribbon cables between circuit boards and data connectors.
- Internal ribbon cables with 8, 16, 32 or 64-bit digital signal busses.

# Round Cable Suppression Core (KCFType)

Enclosures for channel-type EMI-suppressor snaps.

- Internal and external power cables.
- Internal cables between PC boards and data connectors.

# Round Cable Suppression Cores (RC Type)

Enclosures for channel-type EMI-suppressor snaps.

- Internal and external power cables.
- Internal cables between PC boards and data connectors.

# Connector Suppressor Elements (FD Type)

EMI suppression for connectors and dual in-line integrated circuits.

• 9, 15, 25 and 37 pin subminiature "D" connectors.

# Connector Suppressor Elements (F Type)

Specially designed for Ethernet module jacks or phone jacks.

# Toroidal Cores (T Type)

T-type ring cores for coupling transformers and balancing coils, fixed coils and filter coils.

# Sleeve Cores (RH Type)

Produced for assembling cable wire and making MATV CATV.

 Internal and external computer data and power cables.

# Wound Chip Beads (FBC Type)

For computer products (mother board, hard disk, TV card, etc.); communication products (pager, cordless phone, etc.); modems, OA products, power suppliers, etc.

Counter-measures for complying with CE, FCC, or VCCI radiated emissions.

# Multi-line Suppressor Beads (SH Type)

- Filtering of power input pins of oscillators or logic devices using high speed docks.
- Filtering of low-frequency input/output signal entering/exiting shielded enclosures.
- High frequency filtering of medium speed docks and video signals.
- Preventing oscillation in high-frequency amplifiers.

# Wide Band Choke (7R61 Series)

Mainly used in PC boards to filter EMI from the outside.

 High-performance medium-current DC power and signal filtering.

# Rod Cores (R Type)

For coils which do not require adjustments as well as for magnetic shielding.

# Balun Cores (RID, RHH, R4H Types)

For wide-band transformers that provide balance to unbalanced transformers. Also used in the input circuits for TV and FM tuners, and in CATV, MATV networks and installations.

# Multi-layer Chip Beads (FBM Type)

EMI suppression for various electric equipment by the addition of impedance to the circuit. Particularly effective with unstable grounding. High-frequency EMI prevention of computers, printers, VCRs, TVs and portable telephones.

# Multi-layer Chip Inductors (FLM Type)

EMI suppression for various electric equipment by the addition of impedance to the circuit. Suitable for all computer-related products. For composing different LC filters with capacitors to modify signal wave-form, such as TV-out in a notebook computer or audio-out in a CD-ROM circuit.

# Wound Chip Inductors (FLC Type)

Used for computer products (hard disks, floppy disks, etc.), communication products (cordless phones, etc.), modems, OA products, TV sets, VCRs, etc.

- Counter-measures for complying with CE, FCC, VDE or VCCI radiated emissions.
- High resistance to heat and humidity as well as resistance to mechanical shocks and pressure.
- Accurate dimensions for automatic surface mounting.

# Common Mode Choke & SMD Power Choke

Used for prevention of common mode noise on signals and power lines for computer-related products.

- High impedance for common mode noise and low impedance for differential mode signal.
- Large rated current available.
- Wide-band or sharp-type impedance curve available.
- SMD or DIP types available.

# **Ferrites**

#### Multilayer Chip Beads (FBM Type)

Ordering Code, Shape & Dimensions

**Electrical Characteristics** 

Features, FBM-11 Type Vs FMB-10 Type

FBM-11-1608 Type, Typical Electrical Characteristics Curve FBM-10-1608 Type, Typical Electrical Characteristics Curve FBM-11-2012 Type, Typical Electrical Characteristics Curve FBM-10-2012 Type, Typical Electrical Characteristics Curve FBM-11-3216 Type, Typical Electrical Characteristics Curve FBM-10-3216 Type, Typical Electrical Characteristics Curve

-3225

FBM-11-4516 Type, Typical Electrical Characteristics Curve -4532

High Current Type, Typical Electrical Characteristics Curve FBM-11-1005 Type, Typical Electrical Characteristics Curve Packaging Reliability Test

# Multilayer Chip Inductors (FLM Type) Ordering Code, Shape & Dimensions

Ordering Code, Shape & Dimensions FLM-1608 Type, Electrical Characteristics FLM-2012 Type, Electrical Characteristics FLM-3216 Type, Electrical Characteristics Packaging Reliability Test

#### **Ultra High Frequency Multilayer Chip Inductors (HLM Type)**

Features, Ordering Code, Shape & Dimensions HLM-1608 Type, Electrical Characteristics Characteristics Curve HLM-2012 Type, Electrical Characteristics Characteristics Curve

#### Wound Chip Beads (MBC Type)

Features, Applications
Ordering Code, Shape & Dimensions
Typical Electrical Characteristics Curve
Packaging

### **Wound Chip Inductors (FLC Type)**

Features, Applications Ordering Code, Shape & Dimensions FLC-322522 Type, Electrical Characteristics FLC-453232 Type, Electrical Characteristics Packaging Reliability Test

## **Ultra High Frequency Wound Chip Inductor (HLC Type)**

Features, Applications, Ordering Code, Shape & Dimensions Electrical Characteristics—> HLC-0805 Electrical Characteristics—> HLC-1008 Packaging

#### **Chip Bead Array**

Features, Applications, Ordering Code, Shape & Dimensions Electrical Characteristics, Typical Electrical Characteristics Curve Reliability Test

# **Common Mode Choke**

Features, Applications, Ordering Code, Ts1206 Series Xs1208, Xd0708 Series Xc1060, Xc1270 Series

#### **Smd Power Choke**

Features, Applications, Ordering Code, Shape & Dimensions Electrical Characteristics —> Bs43, Bs54 Electrical Characteristics —> Bs73, Bs75 Electrical Characteristics —> Bs105 Packaging

#### Wide Band Choke (SH Type)

Ordering Code, Shape, Dimensions & Characteristics

### Bead Cores (Radial Taping & Bulk Type)

Ordering Code, Shape, Dimensions & Characteristics

## **Bead Cores (Axial Taping Type)**

Ordering Code, Shape, Dimensions & Characteristics

Table 1 - FERRITE STANDARD CHARACTERISTICS MATERIALS

Property	Initial Permeability	Curie Temperature	Specific Gravity	Loss Factor @ FREQUENCY	Temp. Coef. of Initial Permiability 20-70°C
Unit		°C	g/cm <sup>3</sup>	10 <sup>-6</sup> MHz	10 <sup>-6</sup> °C
Symbol	μί	T <sub>c</sub>	d	1/µiQ	aµir
A6	1800±25%	>100	4.7	75 (0.5)	0-3
A5	1000±25%	>130	4.8	280 (1.0)	2-5
K5	850±25%	>130	4.8	260 (1.0)	3-6
K5B	700±25%	>140	4.8	250 (1.0)	0-7
K2A	350±25%	>150	4.7	60 (2.0)	15-40
КЗА	300±25%	>150	4.7	100 (2.0)	4-12
A17	300±25%	>300	4.6	90 (5.0)	0-7
A78	300±25%	>150	4.7	60 (2.0)	15-40
K1C	250±25%	>200	4.7	110 (2.0)	3-10
A8	200±25%	>250	4.7	35 (7.0)	19-32
A3	100±25%	>300	4.4	160 (2.0)	55-130
K8B	55±25%	>300	4.7	400 (2.0)	5.15

# Form-In-Place EMI/ RFI Shielded Gaskets (8000 Series)

MAJR Products Form-in-Place automated EMI/RFI gasketing is offered to facilitate the increasing demand for shielding of smaller profile and mechanically tight tolerance areas for a variety of metal and plastic housings. Our software driven automated gasket dispensing system delivers a custom programmed precise bead of conductive elastomer to narrow flanges or edges as small as 0.030 in (0.762 mm).



The conductive silicone or fluorosilicone elastomer bead is ideally placed on commercial or military compartmentalized enclosures, cellular handsets, pc cards, and a variety of other mechanically tight, real estate challenged, products. Quick prototyping and short to medium production runs is our specialty.

The robotic bead location holds a pattern positional accuracy to 0.003 in. (0.076 mm) in the X, Y, and Z axis dimensions; repeatability of each axis is 0.001 in. (0.025mm). The heated vacuum tooling plate bead dispense area for the X and Y axis is 17 inches by 14 inches respectfully. The Z axis dispense area has a range of 3.5 inches. If a bead is needed to be dispensed on a part that is over the travel dispense area of the machine, part rotation and dispensing of a second bead path, after the first bead path, can be done to complete the gasket.

The dispensed gasket can compensate for uneven surfaces in castings and molded parts to provide a consistent, highly reliable, seal. Our system offers technologically advanced features such as Mass Flow Calibration for reliable bead delivery, and an automatic targeting offset camera vision system with pattern recognition system for identification of local and global fiducials. The vision system compensates and corrects for part to part misalignment within the calibrated vision area. The bead dispense needle can be heated to improve flow of viscous materials along with the heated, vacuum tooling plate to enable an optimum bead to part environment within the enclosed dispensing area.

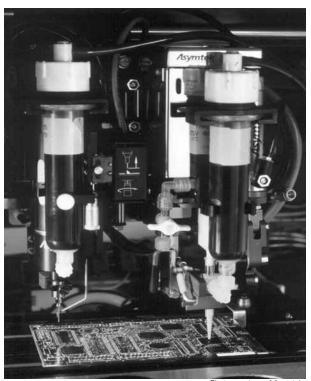


Photo courtesy of Asymtek

# **Shielding effectiveness**

Depending on the dispensed material, shielding effectiveness (attenuation) of our dispensed gaskets may exceed 80 dB from 100 MHz to 18 GHz. With increased cross sectional area shielding effectiveness will increase. Shielding effectiveness is also dependant on bead thickness between conductive substrates.

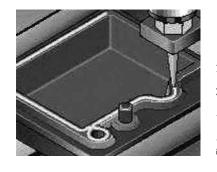
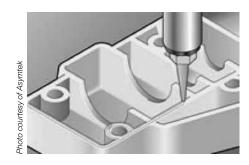


Photo courtesy of Asymtek

# Quality

With our ISO-9001:2008 commitment to continuous improvement,

we have document set-up and operational procedures for consistent and reliable form-in-place products. With our 3-axis coordinate measuring system used in conjunction with our form-in-place machine, your parts will be consistent and accurate with documented final QA test results.



## **Other Products**

For enclosures that do not need a conductive seal we offer a variety of non-conductive elastomer seals that provide exceptional environmental protection and dust sealing. These sealing compounds are dispensed in the same way as the conductive elastomers and exhibit excellent substrate adhesion, with low durometer "soft" but resilient material properties. Non-conductive materials available upon request.

## **Available Conductive Materials**

Materials Properties	Nickel Graphite (52)	Silver Glass (61)	Silver Nickel (65)	Silver Aluminum (63)	Silver Copper (62)	Pure Silver (66)
Volume Resistivity (Ohm-cm)	0.06	0.01	0.008	0.01	0.008	0.005
Durometer (Shore A)	65	70	75	68	70	65
Operating Temp. Range (°F)	-55 to +400	-55 to +400	-55 to +400	-55 to +400	-55 to +400	-55 to +400
Specific Gravity	2.29	1.82	3.58	1.86	3.58	4.20
Tack free	90	90	90	90	90	90
Handling time (Hr.)	12 to 24	12 to 24	12 to 24	12 to 24	12 to 24	12 to 24
Full Cure (Hr.)	72 to 144	72 to 144	72 to 144	72 to 144	72 to 144	72 to 144

The conductive particle filled materials are a one part electrically conductive room temperature curing elastomer. The extruded paste material cures rapidly when exposed to atmospheric moisture. When completely cured, the materials are highly resilient elastomers that exhibit superior adhesion to a variety of substrates and exhibit low volume resistivity.

# EMC Consulting (9000 Series)

MAJR Products offers Mechanical and EMC consulting services to our customers that need to bring their product from design concept through testing compliance to full production or any stage in between. We are always available by phone and email to assist in technical questions and design concerns. Telecom and on site consulting up to 2 hours is provided completely free to the customer and after that is available at an hourly fee or can be quoted per diem or by project. We can assist in meeting MIL-STD 461 and other military or commercial standards.

# Mechanical Engineering - Biography of Bill Spencer



Mr. Spencer is the Vice President of Mechanical Engineering at MAJR Products Corporation. He is responsible for overseeing the generation of all internal production drawings for manufacturing as well as the interpretation and conversion of customer drawings to mechanically sound renderings for that purpose. He oversees all product estimating for quotation of new parts and existing designs and acts as a mechanical interface with customers for EMI/RFI shielding design. He is responsible for calibration for ISO-9001 and documentation for job traveler and all drawing revisions for production.

Bill holds a B.S. degree in Mechanical Engineering from Penn State University and has been a Mechanical Engineer since 1975. He has experience in equipment design

and start-up and has been involved with shielding components since 1991. He has participated in anechoic chamber testing for EMI/RFI shielding for various honeycomb vent panels and has previously served as production manager for 13 years. Bill has literally taken thousands of paper concepts through to reality as viable Electromechanically sound shielding parts.

# Electrical / EMC Engineering - Biography of Michael Oliver



Mr. Michael J. Oliver is Vice President of Electrical / EMC Engineering at MAJR Products Corporation in charge of customer EMC design and consulting, new product development, and is the ISO-9001:2008 management representative. His expertise is in EMI/RFI shielding technology with a background in electronics, military shelter electrical EMC systems, and high power antenna / radome design.

Mr. Oliver has over 20 years of experience in Electromagnetic Compatibility/ Electromagnetic Environmental Effects for military and commercial products / systems. He holds three patents on EMC shielding and thermal management devices. He has authored numerous publications and white papers on the design and test of electromagnetic shielding products along with military antenna/radome test methodology

standards. He has performed open and anechoic chamber radiated tests to military standards utilizing various radiated test systems.

Mr. Oliver is a Senior Member of IEEE and currently serves on the EMC Society Board of Directors. He is Chairman of the IEEE EMC Pittsburgh Chapter, Co-Chairman of the SAE AE4 Electromagnetic Compatibility E³ Committee, and a member of the IEEE EMC Standards Advisory Coordination Committee (SACCom) and "dB society". Mr. Oliver is Chairman of the 2012 IEEE EMC Symposium to be held in Pittsburgh PA.



Notes





# Assembly and Sub-Assembly

areas below in choosing HSG as your manufacturing partner. us the flexibility that's needed to bring your specific design to market in a timely and complete fashion. Consider the and shipping of high quality product. Having the experience of working with customers in a variety of industries gives industries around the globe. We have developed the tools necessary for accurate fabrication, testing, inspection, packing Our company has been in manufacturing for over 30 years, providing products and services to customers in many Here at HSG we know that business success depends on finding the right partners, specifically the right manufacturer.

# Consulting

on-your-site consulting services to ensure that all your requirements are satisfied. know that good advice begins with the ability to listen and understand the client's problem. Because of this we offer requirements. While we have helped customers solve their electrical and mechanical design problems for years we With close to a century of combined manufacturing experience we can guide our customers through the most challenging

# Engineering and Design

to move from a design to the market. and willingness to work through challenging requirements is what you can expect from HSG when your product needs Our Engineering department has brought literally thousands of EMC and mechanical designs to life. The right experience

# **Quality Focus**

photos of parts in process during inspection are also available upon customer request. set-up verification and final inspection of product that leave our facility. Computer generated reports as well as digital quality reliability is reinforced with such in-house resources as a coordinate measuring machine (CMM) for machine throughout our operations, and we have been registered to ISO 9001:2008 since the second quarter of 2005. Moreover, You must have confidence that your supplier can provide a quality product. HSG applies Total Quality Management

# Areas of Core Competency

bending, punching as well as welding, soldering and other methods of joining. Metal Fabrication: Cutting (variety of methods including water jet machine), notching, drilling and fixturing, grinding,

joining, work stations for close tolerance hand work, gask-o-mat machines for fabric over foam gasket construction, Gasketing: Several presses for die-cutting of a wide variety of substrate materials for gaskets, mechanical and chemical

Konitting: Machines for knitting of fine metal wire, drawing of wire, mechanical and chemical joining of knitted mesh and thousands of dies and variety of other tooling.

ability to knit over wide variety of core materials.

prototyping all the way through high volume production runs. Water Jet Cutting: Cutting of a variety of substrates in thicknesses of up to 6" on a 4' by 8' bed for quick turn rapid

situations in which HSG has partially assembled, assembled or done value adds to hundreds of customer parts over Assembly and Value Add: Being in manufacturing with the above core competencies has led to a number of jobs and and non-conductive gasketing material directly on customer parts for quick turn or medium to large production runs. Form-In-Place Gaskets: Close tolerance form-in-place gasketing machine can deposit fine beads of both conductive

the years.

contact a HSG sales representative today! To find out more about our abilities to assist you with your design, compliance, quality, manufacturing and inspection Contact Us

SG Electronics and Fabrication



# Custom Fabrication

Utilizing the most up-to-date technology HSG promises quality provide our customers with a military-grade custom product. variety of other materials; HSG's custom fabrication options can With years of experience working with metals, plastics and a

product with a quick turn-around.

- Water-Jet cutting
- Metal cutting and forming
- PVC/Plastic/Lexan cutting
- Machining

Titanium

Brass

Steel

munimulA

Light gauge metal stamping

Polyvinyl Cholride(PVC) oilyroA Lexan/Polycarbonate

Other materials available

Customer supplied material Stainless Steel Commonly used material:

# Water Jet Cutting

nus 0.003 inches and a repeatability of 0.002 inches, making it a specifications for our system include an accuracy of plus or miof applications, as well as smaller requirements. Some more tank, allowing for cutting a variety of larger sizes for many types other softer types of materials. Our water jet has a 4' x 8' catcher are also very efficient at cutting neoprene, nylon, rubber and many Water jet cutters are not limited to cutting dense materials; they graphite, ceramics, aluminum, silicone, neoprene and wood. that our water jet can cut include (but are not limited to) plastic, at a thickness of up to 6 inches! Some of the other materials PSI), our water jet machine can cut through even stainless steel water and an abrasive at a high velocity and pressure (60,000 many different shapes, sizes and depths. Utilizing a stream of is capable of cutting into various types of materials to produce adaptability and ease of operation. Our FLOW water jet cutter growing machine tool processes in the world because of its tomer base. Water jet cutting technology is one of the fastest cutting, rapid prototyping and production services to our cus-HSG offers water jet cutting as one of a growing repertoire of



Sample Parts in Several Different Materials

can save you time and money! runs for our customers. Call one of our sales representatives with your drawing or specs and see if water jet cutting Due to that precision, repeatability and versatility HSG can produce a wide range of parts from prototyping to production

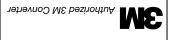
very precise piece of equipment.

# Router Cutting

is plus or minus 0.003 inches and has repeatability of 0.002 inches. from woods and plastics to a variety of metals and glass. Cutting is available in sizes of 1"x1" to 42" x 96". Accuracy HSG offers CMC Router cutting for prototyping and production services. Routers are used to cut more dense materials



# Conversion Services



have a custom tape or adhesive requirement HSG can help. size of the roll or the shape of the material that they need. If you need. Our conversion services let the customer determine the customers with the products that they want at the sizes they Being an authorized 3M converter allows HSG to provide it's

# Tape/Adhesives Services

adhesive within a few thousandths of an inch, allowing for ease of application and eliminating cutting and placing strips of rolled Die Cutting - For custom shapes to fit your most challenging applications HSG can die cut a tape or adhesive film

small as .50" to provide you with the ideal width for your application Slitting- HSG can provide custom sized rolls of tape and adhesive. We can slit down rolls over 60" wide to sizes as

# Foam/Rubber Services

HSG can die-cut, percision slit and waterjet a wide variety of rolled foams and rubbers to accomodate our customers'

requirements.

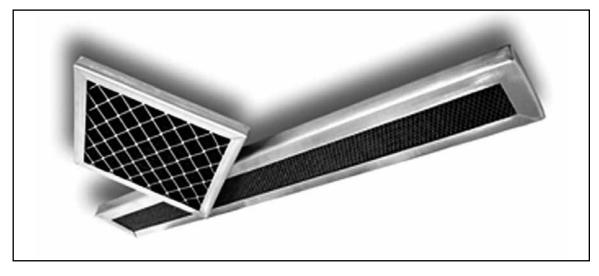
# Material types:

SlyniV Polyurethanes Fluorosilicones **EPDMs** Silicones **Neoprenes** 

More available



# Commercial Air Filters



HSG's commercial grade air filter is designed to be a cost effective solution for our customers while still providing the quality expected from a military grade manufacturer. This commercial air filter is different from other panels manufactured by MAJR Products Corp. in that its use is primarily for air filtration and flow, rather than EMI/RFI shielding.

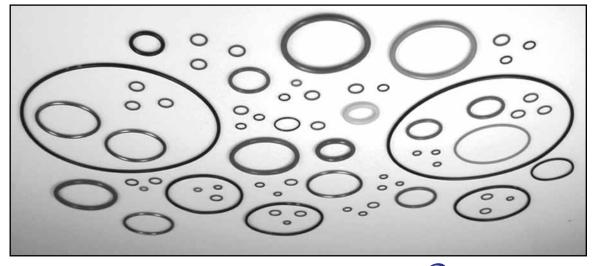
- Rugged frame
- Cost effective
- Migh air flow
- Replaceable filter media

# Standard Media Types for Metal Frame Filters

- Woven Wire Cloth Calendared wire cloth between a protective grill that can be used in wet or dry environments. The separate layer construction increased dust holding capability and is easily cleaned with a vacuum or mild detergent solution.
   Slit and Expanded Aluminum Easily cleaned media that can be provided oil coated
- or dry depending on its application. It's possible to calendar this media to fit different sizes of filter frame types.
- Polyester A synthetic media which is very durable. This media is flame retardant and mosture resistant. Polyester media has a high dust holding capacity
- Polyurethane A cost effective media that is light and flexible. This media is washable and available in a variety of thicknesses.
- Polypropylene Petroleum based and abrasion resistant. This media is also resistant to most acids, solvents and bleaches. Polypropylene material is also an FDA approved material.
- Fiberglass This is an economical media with increased density which allows for greater dust handling.

Our filters are custom made to your size and specification. Contact us today with your air filter requirement and see what HSG can do you for.

# sgniA-O

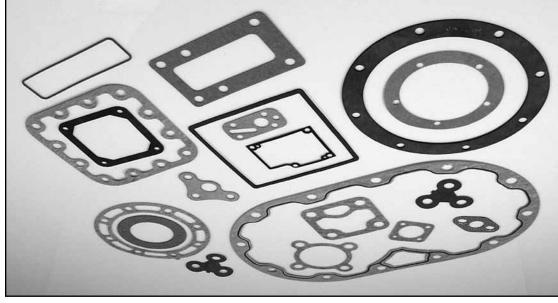


e-mail us for a quote on your specific application. O-rings can also be die-cut or water jet cut. Due to the wide range of sizes, call or adhesive joints are available. HSG's O-rings are available in a variety of materials. O-rings of all shapes, sizes and materials are available. Solid molded, vulcanized and

# Materials include:

- Silicones
- Neobrenes
- Porons
- Fluorosilicones
- Additional materials
- available upon request





- Common sealing applications

- prototyping and short runs Water Jet cutting for rapid
  - Quick turnaround
    - suna
- Short-to-medium production
- Lamination of protective films

  - gnisneqsib
  - Die cutting for automatic
  - Prototypes and customized
- - **Features**

Kapton Mylar • Thin Films Tapes • Porons

Neoprenes

• Silicones

• Foils

Corks

Rubber

Materials include:

of pressure sensitive adhesive materials applied.

HSG can custom-design a variety of die-cut gaskets

aerospace and medical applications. Configurations of any shape

and seals are used by a variety of electronic, telecommunication, that meet or exceed the most demanding standards. HSG's gaskets

or size are available with the option

# Electronics and Fabrication

A division of MAJR Products Corp

# HSG Electronics and Fabrication Products and Services

# Air Filters (commercial)

- Woven Wire Cloth
- Slit and Expanded Aluminum
- Foam
- o Polyfoam
- o Reticulated Foam
- \* Other materials are available

# nbou reduest.

# Conversion Services

- Tape/Adhesives
- o Die Cutting
- o Lamination
- o Slitting
- Foam
- o Die Cutting
- o Water jet Cutting

# **Custom Fabrication**

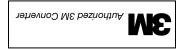
- Water jet cutting and router cutting
- Metal cutting and forming
- PVC/Plastic/Lexan cutting
- Machining
- Light gauge metal stamping

# Services Gasket Fabrication

- o Die Cutting
- o Water jet Cutting
- o Form-In-place
- o Vulcanization

# Type/Material

- o Silicones
- o Neoprenes
- o Porons
- o Closed and Open cell
- isua o
- O EDDW
- o High Temperature
- ₱67N º
- o Enclosure Gasketing
- **AM**3N
- **994**
- \* Other materials are available
- upon request.



# Electronics and Fabrication

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Fax: (814) 763-2952 Toll Free: (877) 625-7776 Phone: (814) 763-3211

A division of MAJR Products Corp email: sales@hsgelectrofab.com web: www.hsgelectrofab.com

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sasivias bna

palaisigard ago, i. Authorized 3M Converter

# Electronics and Fabrication

