

Information About *Resin Designs*® Brand Electrically Conductive Materials

Long-term, reliable protection of sensitive circuits and components is important in today's delicate and demanding electronics applications. *Resin Designs*® shielding gaskets and *Resin Designs*® gel rope gaskets are designed to deliver by providing shielding and effective grounding of high-energy electromagnetic interference (EMI). *Resin Designs*® conductive gaskets provide dependable, cost-effective corrosion protection for aircraft skin and antennas. These products have the unique capability of wetting to and sealing a surface on contact. Moisture and electrolytes are displaced by the soft gel that stops galvanic corrosion of dissimilar metal surfaces. These products thus provide either EMI shielding or grounding along with sealing in a single product.

Gel Rope Gaskets

Resin Designs gel rope gaskets provide shielding against high levels of EMI, environmental and pressure sealing against water ingress and electrical grounding in a variety of electronics and communications applications. Extensive salt fog tests have shown that the *Resin Designs* silicone gel material provides an effective barrier against galvanic corrosion. Gel surrounds the conductive wire mesh of the *Resin Designs* gaskets and isolates the metal substrate-to-gasket contact points from corrosive elements. The unique wire mesh/silicone gel construction also ensures that the electrical resistance of the wire mesh will not increase significantly due to corrosion. The surface wetting action of the gel not only minimizes intermetallic corrosion between gasket and substrate, but also ensures dependable EMI shielding and environmental sealing over time.

Standard *Resin Designs* gaskets feature wire mesh made of *Monel*®, ideal for its EMI shielding and low cost.

Shielding Gaskets

The unique *Resin Designs* shielding gaskets provide shielding and effective grounding of high energy EMI. Extensive laboratory testing in salt fog and fluid resistance has shown that *Resin Designs* gel gaskets provide an effective barrier against corrosion. This patented product made of soft silicone or fluorosilicone gel material conforms to irregular surfaces to protect them from corrosive elements. *Resin Designs* gel gaskets provide corrosion protection

Gel Rope Gaskets

Type

Precured gel with circular *Monel* wire mesh formed in a circular cross section

Physical Form

Knitted circular *Monel* wire mesh that is impregnated with a silicone gel and precured

Special Properties

EMI shielding, corrosion protection, environmental sealing against galvanic corrosion, pressure sealing, in a single easy-to-apply product, -40 to 150°C operating temperature

Potential Uses

Shielding and effective grounding of high energy EMI

Shielding Gaskets

Type

Precured gel with *Monel* wire cloth precision cut to shape supplied with protective release film

Physical Form

Woven *Monel* wire cloth that is impregnated with a standard silicone, high-performance silicone or fluorosilicone gel

Special Properties

Electromagnetic interference (EMI) shielding, corrosion protection, environmental sealing, pressure sealing, in a single easy-to-apply product; -40 to 125 or 150°C operating temperature

Potential Uses

Shielding and effective grounding of high energy EMI

Conductive Gaskets

Type

Precured gel with aluminum wire cloth precut to fit all common antenna sizes, supplied with protective release film

Physical Form

Woven aluminum alloy wire cloth impregnated with a high-performance, nonhazardous crosslinked fluorosilicone gel sealant

Special Properties

Electrical grounding; reduced installation time with precured gel sealant; no cure required; easy removal and repair; cost effective

Potential Uses

Corrosion-protected grounding for aircraft skin and antennas

at temperatures between -40 and 150°C. Gel gaskets can also withstand differential pressures up to 30 psi at room temperature.

Resin Designs gaskets consist of a woven *Monel* wire cloth (30 or 60 mesh) that is impregnated with a standard silicone, high-performance silicone, or fluorosilicone gel for applications that require resistance to solvents and fuels. The conductive *Monel* cloth is an alloy of nickel and copper, which conforms to material specification QQ-N-281 class A, or AMS-4730. Sheet stock is available in standard sizes of 7 x 8, 7 x 15 and 23 x 23 inch sheets. Custom sheet sizes are



PRODUCT INFORMATION

Resin Designs® Brand Product	Description	Features
Gel Rope Gaskets		
EMI-CSI-M3 EMI Gel Rope Gaskets	Commercial-grade, precured silicone gel with <i>Monel</i> circular knit rope	Pressure sealing, precured gel; standard wire sizes from 0.063" to 0.250"; operating service temperatures -40 to 150°C
Shielding Gaskets		
EMI-FS-M2 Shielding Gaskets	Shielding, grounding and environmental sealing; fluorosilicone; 60 mesh <i>Monel</i> wire cloth	Pressure sealing; precured fluorosilicone gel for resistance to solvents and fuels; wets and seals most surfaces on contact; standard size of 24" x 24" and custom sizes available upon request; protects at temperatures between -40 and 150°C
EMI-FS-M5 Shielding Gaskets	Shielding, grounding and environmental sealing; fluorosilicone; 30 mesh <i>Monel</i> wire cloth	Pressure sealing; precured fluorosilicone gel for resistance to solvents and fuels, wets and seals most surfaces on contact; standard size of 24" x 24" and custom sizes available upon request; protects at temperatures between -40 and 150°C
EMI-TGSI-M2 Shielding Gaskets	Shielding, grounding and environmental sealing; high-performance silicone; 60 mesh <i>Monel</i> wire cloth	Pressure sealing; precured high performance silicone gel, wets and seals most surfaces on contact; standard size of 24" x 24" and custom sizes available upon request; protects at temperatures between -40 and 150°C
EMI-TGSI-M5 Shielding Gaskets	Shielding, grounding and environmental sealing; high-performance silicone; 30 mesh <i>Monel</i> wire cloth	Pressure sealing; precured high performance silicone gel, wets and seals most surfaces on contact; standard size of 24" x 24" and custom sizes available upon request; protects at temperatures between -40 and 150°C
Conductive Gaskets		
GND-FS-A1 Grounding Gaskets	GND conductive gaskets for electrical grounding and corrosion prevention; 16 x 18 mesh aluminum alloy wire cloth	Cost effective corrosion protection; reduced installation time; supplied precut to fit all common antenna sizes; precured fluorosilicone gel to withstand aviation fuels and other liquid contaminants; metal mesh incorporated for electrical bonding

<i>Resin Designs®</i> Brand Product	Potential Uses	Application Methods
Gel Rope Gaskets		
EMI-CSI-M3 EMI Gel Rope Gaskets	Electromagnetic interference (EMI) shielding and DC grounding, environmental sealing against galvanic corrosion	Cold-applied without any special surface preparation or adhesive, the gel’s self-healing characteristic eliminates the need to fuse the ends together to form a gasket
Shielding Gaskets		
EMI-FS-M2 Shielding Gaskets	Shielding and effective grounding of high energy EMI; stops galvanic corrosion of dissimilar metal surfaces for up to 1000 hours in salt spray; seals up to 30 psid pressure	Cold-applied without any special tools or cure time; gaskets are precision cut and supplied with protective release films
EMI-FS-M5 Shielding Gaskets		
EMI-TGSI-M2 Shielding Gaskets		
EMI-TGSI-M5 Shielding Gaskets		
Conductive Gaskets		
GND-FS-A1 Grounding Gaskets	Corrosion protection for aircraft skin and antennas; metal mesh provides electrical bonding that dissipates static charges and lightning strikes	Remove the release film from both sides, then cold-apply the precured gel gaskets to bare metal; no special tools, cure time or special coating are necessary

TYPICAL PROPERTIES

Specification Writers: Please contact your local Resin Designs sales office or your Global Resin Designs Connection before writing specifications on this product.

Resin Designs® Brand Product	DC Resistance						Shielding Effectiveness			
	Initial, mΩ maximum	After Heat Aging 168 hr at 150°C, mΩ maximum	After Thermal Cycling -55 to 125°C, 5 cycles, mΩ maximum	After High Temperature Endurance 48 hr at 156°C, mΩ maximum	After Humidity Cycling, MIL-STD-202, Method 106, mΩ maximum	After Salt Fog, 500 hr, mΩ maximum	Initial, 10 to 100 MHz, dB minimum	Initial, 100 to 1000 MHz, dB minimum	After Salt Fog, 1000 hr, 10 to 100 MHz, dB minimum	After Salt Fog, 1000 hr, 100 to 1000 MHz, dB minimum
Gel Rope Gaskets										
EMI-CSI-M3 EMI Gel Rope Gaskets	5	5	5	5	–	–	90	70	80	70
Shielding Gaskets										
EMI-FS-M2 Shielding Gaskets	3	3 ¹	3 ²	3 ³	–	–	90	90	80	80
EMI-FS-M5 Shielding Gaskets	3	3 ¹	3 ²	3 ³	–	–	90	90	80	80
EMI-TGSI-M2 Shielding Gaskets	3	3	3	3	–	–	90	90	80	80
EMI-TGSI-M5 Shielding Gaskets	3	3	3	3	–	–	90	90	80	80
Conductive Gaskets										
GND-FS-A1 Grounding Gaskets	1	1 ¹	1 ²	1 ³	1	1	–	–	–	–

¹168 hr at 175°C.

²-55 to 150°C, 5 cycles.

³48 hr at 187°C.

Resin Designs® Brand Product	Mechanical Strength, lb minimum	Sealing Performance, 30 psig for 1 min	Flammability, UL 94	Fluid Resistance, Maximum Weight Change											
				<25%											
				Hydraulic Fluid, <i>Skydrol</i> ® 500, 35 min at 85°C	Lubricating Oil, MIL-L-23699, 35 min at 120°C	Diluted Cleaning Fluid, MIL-C- 87937B, Type II, 35 min at 65°C	Deicing Fluid, MIL-A-8243, 35 min at 65°C	Hydraulic Fluid, MIL-H-5606 35 min at 85°C	<i>Coolanol</i> ® 25, 30 min at 175°C	Lubricating Oil, MIL-L- 7808, 35 min at 120°C	<i>Cee Bee</i> ® Brand Cleaner, 35 min at 65°C	Aviation Fuels, JP-5/JP-4 (MIL- T-5624), JET A, 35 min at 25°C	IPA 25% by Volume in Mineral Spirits, 25 min at 25°C	Gasoline, MIL-G-3056, Type I, 25 min at 25°C	Propylene Glycol, Type II, 25 min at 25°C
Gel Rope Gaskets															
EMI-CSI-M3 EMI Gel Rope Gaskets	3	No Leaks	HB	Pass	Pass	Pass	–	–	–	–	–	–	–	–	–
Shielding Gaskets															
EMI-FS-M2 Shielding Gaskets	3	–	–	Pass	Pass	Pass	Pass	Pass	Pass	Pass	–	Pass	Pass	Pass	–
EMI-FS-M5 Shielding Gaskets	3	–	–	Pass	Pass	Pass	Pass	Pass	Pass	Pass	–	Pass	Pass	Pass	–
EMI-TGSI-M2 Shielding Gaskets	3	–	–	Pass	Pass	Pass	–	–	–	–	–	–	–	–	–
EMI-TGSI-M5 Shielding Gaskets	3	–	–	Pass	Pass	Pass	–	–	–	–	–	–	–	–	–
Conductive Gaskets															
GND-FS-A1 Grounding Gaskets	2	–	–	Pass	Pass	–	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

also available up to 24 x 96 inches. Custom gasket shapes can be readily designed and precision stamped to customer specifications.

Conductive Gaskets

Resin Designs conductive gaskets provide dependable, cost-effective corrosion protection for aircraft skin and antennas – protection so good that corrosion repair costs and downtime are significantly reduced.

Supplied ready-to-use, the precured gel gaskets are cold-applied to bare metal for easy, one-step installation. The installation requires no special tools, no cure time and no additional coatings. Gaskets are precision cut and supplied with protective release films.

Resin Designs conductive gaskets are fabricated using an aluminum wire cloth impregnated with a high-performance, nonhazardous crosslinked fluorosilicone gel sealant. The

gaskets are supplied precut to fit all common antenna sizes. Extensive laboratory and flight tests have shown that *Resin Designs*' conductive gel gaskets provide an effective barrier against corrosion. The gel sealant provides excellent interfacial sealing and has been formulated to withstand aviation fuels and other liquid contamination. The aluminum wire cloth incorporated in the gasket provides electrical bonding that dissipates static charges and lightning strikes. Gel gaskets have been flight tested in both supersonic and subsonic trials with up to 12 months between inspections.

Unlike conventional sealants, the gel gasket remains soft and pliable throughout its service life. No special tools are required to remove the antenna or the gasket during antenna inspection, minimizing the risk of damaging the aircraft skin during antenna maintenance. Aircraft skin exposed to the gel sealant is easily prepared for aircraft painting with industry-standard cleaning procedures and solvents.

Table I: *Resin Designs* Gel Rope Gasket Dimensions (Refer also to Figure 1.)

Nominal Size ²	Gasket Diameter (A) ¹ , inch (mm)		Wire Mesh Diameter (B) ¹ , inch (mm)	
	Min.	Max.	Min.	Max.
1.6 [.063]	2.0 [.078]	2.2 [.087]	1.7 [.068]	1.9 [.075]
2.4 [.094]	3.0 [.119]	3.3 [.130]	2.8 [.109]	3.0 [.119]
3.2 [.125]	3.5 [.136]	4.2 [.166]	3.5 [.136]	4.0 [.156]
4.0 [.156]	4.8 [.188]	5.2 [.204]	4.3 [.171]	4.7 [.185]
4.8 [.188]	5.2 [.204]	6.0 [.235]	5.1 [.200]	5.6 [.219]
6.4 [.250]	6.8 [.269]	7.6 [.300]	6.6 [.260]	7.1 [.281]

¹Wire mesh and gasket diameters are actual dimensions under no compression load.

²Nominal size is wire mesh diameter compressed under a 4-oz load.

Figure 1. Gasket and Mesh Design

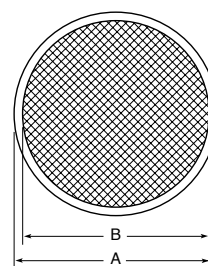


Figure 2. Optimized Gel Rope Gasket Design

Tolerances of +0.003 inch (0.07 mm)

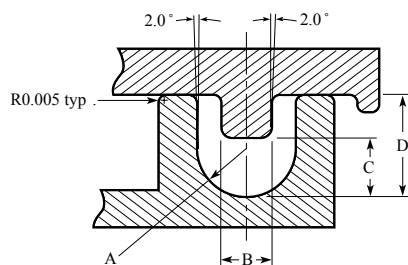


Figure 3. One-Piece Design

The gel rope gasket eliminates the need for a two-piece environmental seal and wire mesh gasket.

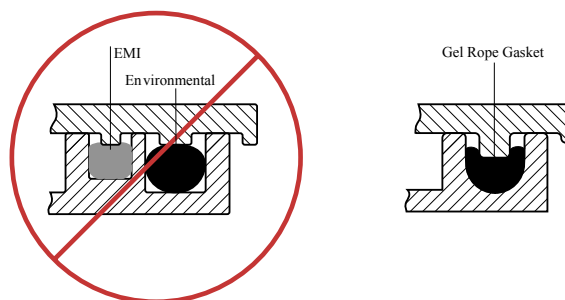


Table II: Gel Rope Gasket Design Dimensions (Refer also to Figure 2.)

Rope Gasket Size Nom. Diameter, inch (mm)	Required Groove Dimensions, inch (mm)			
	A	B	C	D
0.063 (1.6)	0.039 (0.99)	0.040 (1.02)	0.048 (1.22)	0.083 (2.11)
0.094 (2.4)	0.061 (1.55)	0.063 (1.60)	0.075 (1.91)	0.130 (3.30)
0.125 (3.2)	0.078 (1.98)	0.080 (2.03)	0.096 (2.44)	0.166 (4.22)
0.156 (4.0)	0.093 (2.36)	0.096 (2.44)	0.115 (2.92)	0.199 (5.05)
0.188 (4.8)	0.109 (2.77)	0.112 (2.84)	0.135 (3.43)	0.233 (5.92)
0.250 (6.4)	0.140 (3.55)	0.144 (3.66)	0.172 (4.37)	0.298 (7.57)

INSTALLATION

Resin Designs Gel Rope Gasket Materials

The *Resin Designs* gel rope gasket sticks easily in both hot and cold environments, without any special surface preparation or adhesive. Because the gel in the gasket is precured, there is no delay due to a lengthy cure cycle, and no heating or special tools are needed for installation. The gel's self-healing characteristic eliminates the need to fuse the ends together to form a gasket.

The *Resin Designs* gel rope gasket offers environmental sealing and EMI protection when the gasket is installed in a housing with the recommended tongue and groove design. In order to perform properly, the gel gasket must be placed in the groove. Figure 2 shows a sketch of an optimized design of the tongue and groove (protrusion) for gel gaskets. Table II provides the required groove dimensions for each rope gasket size.

This design ensures that the gasket stays in the groove after opening of the housing cover and that excellent sealing is achieved. This design also prevents overcompression of the gasket during installation.

In order to seal, the gasket has to be under compression. Typical compression should be 20 to 40 percent of the gel gasket outside diameter. The optimized groove dimensions provide for the recommended compression. The level of compression determines sealing performance.

To install:

- Clean dirt from tongue and groove.
- With a sharp tool (such as a scissors) cut the gel gasket perpendicular to the axis of the gasket (see Figure 4).
- Press one end of the gasket into the groove. Important: Start the installation on the straight section of the groove, not on the curved section.
- Continue pressing the gasket into the groove, clockwise or counterclockwise, working from one end to the other.

Figure 5. Shielding Effectiveness of Gel Rope Gaskets, Initial and After 1000 hr Salt Fog Test

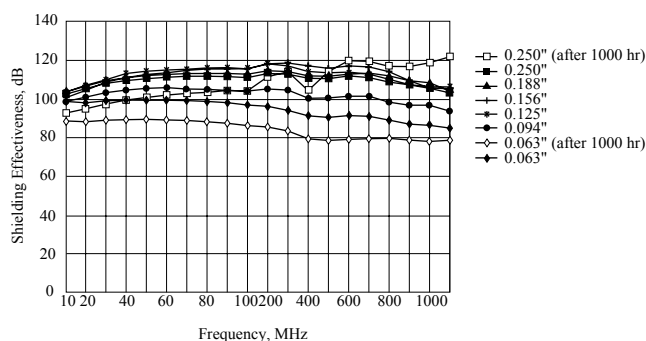
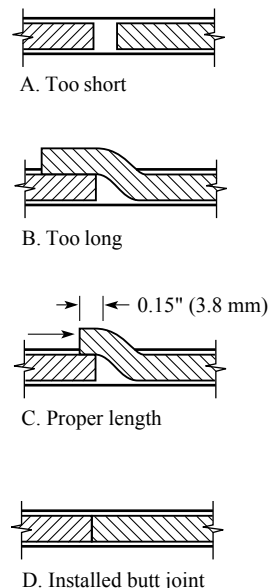


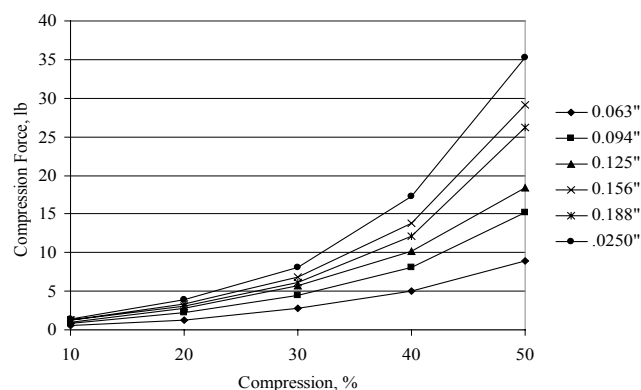
Figure 4. Gel Rope Gasket Installation



The drawings (A–D) in Figure 4 show four typical installation scenarios during gel gasket installation:

- 4A shows a gasket cut too short, resulting in an installation that will produce a poor seal.
- 4B shows a gasket cut too long. If the overlap is too long the gasket will buckle up. To correct this, cut a small section of the gasket at one of the ends and create a new butt joint.
- 4C shows the proper length of gasket just before installation. The small overlap (0.15" max.) is necessary to create a butt joint under axial compression. Compress the end of the gasket in the direction of the arrow and press it into the groove to create the butt joint.
- 4D shows the correct installation and butt joint.

Figure 6. Compression Deflection Curves¹ of Gel Rope Gaskets



¹Designs of rectangular groove should provide for 20 to 40% compression of the gasket diameter. The optimized tongue and groove design dimensions already provide for the recommended compression.

Product Nomenclature and Packaging – Gel Rope Gaskets

Part Numbering System

EMI - XX - XX - XXXX - XXXX

Nominal Rope Gasket Diameter – Standard Reel Length

0063 = 0.063 inch (1.6 mm)	– R500 = 500 ft (152 m) or R1500 = 1500 ft (457 m)
0094 = 0.094 inch (2.4 mm)	– R200 = 200 ft (61 m) or R1000 = 1000 ft (305 m)
0125 = 0.125 inch (3.2 mm)	– R200 = 200 ft (61 m) or R750 = 750 ft (228 m)
0156 = 0.156 inch (4.0 mm)	– R100 = 100 ft (30 m) or R500 = 500 ft (152 m)
0188 = 0.188 inch (4.8 mm)	– R125 = 125 ft (38 m) or R350 = 350 ft (106 m)
0250 = 0.250 inch (6.4 mm)	– R150 = 150 ft (45 m) or R250 = 250 ft (76 m)

Metal Type

M3 = *Monel* circular knit rope

Gel Type

CSI = Commercial-grade silicone

Product Nomenclature and Packaging – Shielding Gaskets

Part Numbering System

EMI-XX-XX-XXXX

Gel Type

FS = Fluorosilicone

TGSI = High-performance silicone

Standard sheet gasket (M2 and M5 gaskets)

Refers to standard and custom sheet gasket size examples:

6000 = 7 inch x 8 inch

6001 = 7 inch x 15 inch

6003 = 24 inch x 24 inch

Metal Type

M2 = *Monel* #60 (60-mesh woven *Monel* wire cloth; wire diameter 0.0075 inch nominal); *Monel* wire cloth thickness = 0.015 inch nominal; product thickness = 0.026 inch nominal

M5 = *Monel* #30 (30-mesh woven *Monel* wire cloth; wire diameter 0.011 inch nominal); *Monel* wire cloth thickness = 0.026 inch nominal; product thickness = 0.044 inch nominal

Custom sheet gasket (M2 and M5 gaskets)

Refers to a Resin Designs specification control drawing.

Gaskets are die-cut at the factory to a specific customer requirement.

Product Nomenclature and Packaging – Conductive Gaskets

Part Numbering System

GND-FS-A1-YY-xxxxxxxxxxxx

Antenna model number

Antenna manufacturer code

Aluminum 5154, 24"x 36" mesh woven wire cloth, wire dia. 0.010" nominal, product thickness 0.032" nominal

Gel Type

FS = Fluorosilicone

Notes:

Resin Designs supplies precut gaskets for most industry-standard antennas. Upon request, Resin Designs will quote on any gasket drawing a customer supplies. For nonstandard gasket shapes, Resin Designs' quotation may include a non-recurring engineering charge.

Templates of existing and proposed gasket shapes are available upon request and should be used for checking form and fit prior to ordering gaskets.

STORAGE AND SHELF LIFE

Because these are precured materials, there is no special storage condition or usage date required. The product should be stored in the original packaging under normal warehouse conditions to maintain the integrity of the packaging materials.

LIMITATIONS

These products are neither tested nor represented as suitable for medical or pharmaceutical uses.

SAFE HANDLING INFORMATION

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND MATERIAL SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE MATERIAL SAFETY DATA SHEET IS AVAILABLE ON THE RESIN DESIGNS WEBSITE AT WWW.RESINDESIGNS.COM, OR FROM YOUR RESIN DESIGNS REPRESENTATIVE, OR DISTRIBUTOR.

HEALTH AND ENVIRONMENTAL INFORMATION

To support customers in their product safety needs, Resin Designs has an extensive Product Stewardship organization and a team of Product Safety and Regulatory Compliance (PS&RC) specialists available in each area.

For further information, please see our website, www.resindesigns.com, or consult your local Resin Designs representative.

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that Resin Designs' products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

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Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

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