AUTOMATED FORM-IN-PLACE EMI GASKET TECHNOLOGIES

INTRODUCTION

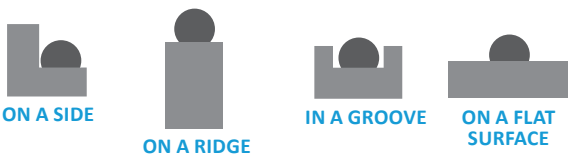
Laird form-in-place is an automated system for dispensing conductive elastomer EMI shielding and grounding gaskets onto metal or plastic substrates. Form-in-place is particularly well suited for cellularphones, PDAs, PC cards, telecom base stations, radios, and many other compartmentalized cast or plastic enclosures and packaged electronic assemblies.

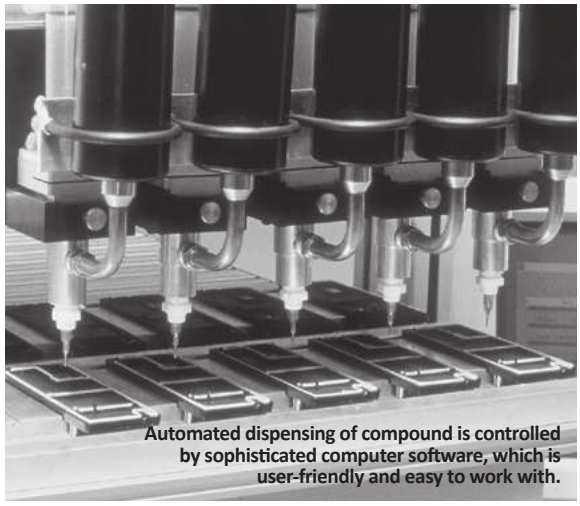
Utilizing programmable 3-axis CNC dispensing equipment, the compound is dispensed accurately onto the substrate and creates a secure bond during the curing process. The repeatable computer-controlled dispensing pattern insures consistency between parts and rapid part program changes. In addition, it supports all levels of volume – from prototyping to high-volume electronic component production – via the use of one or multiple dispensing heads. The system is programmed to apply custom gasket configurations onto parts, to form multiple levelson the part, and on slopes up to approximately 70°.

Laird RXP compounds are Room Temperature Vulcanizing (RTV) elastomers and HXP compounds are High Temperature Vulcanizing (HTV) elastomers, both filled with proprietary conductive particles. Dispensed gasket beads of RXP compounds may be handled in 3 hours, and are cured in 24 hours, under conditions of standard temperature and 50% Relative Humidity. Dispensed gasket beads of HXP compounds can be handled after the materials are cured in an oven. The compounds have a working compression range from 10% to 50% of the gasket height, with a recommended design compression of 30% against a mechanical compression stop. Our product is designed to support low closure forces and is compatible with plastic, metal, and plated or chromate finished substrates.

The required force to compress a given bead is a function of the compound and the gasket size; i.e. smaller gaskets require less force than larger gaskets. Please refer to our technical data for details. Gaskets are dispensed on substrates within a placement tolerance of ± 0.001 inches and gasket cross-sectional tolerances from ± 0.003 to 0.007 inches. Refer to Table 1 on page 39 for typical gasket dimensions and tolerances. As a normal course of equipment operations, starting points and termination ends of the gaskets will have profiles that are approximately 25% larger than the running gaskets.

TYPICAL APPLICATION FOR FORM-IN-PLACE GASKETS:





Automated dispensing of compound is controlled by sophisticated computer software, which is user-friendly and easy to work with.

FORM-IN-PLACE GASKETING FEATURES AND BENEFITS

- Form-in-place gasketing offers a total cost savings in the form of reduced raw materials, labor or assembly time
- Room temperature cure gasketing materials eliminate the need for costly heat curing systems, allowing the use of inexpensive plastic or metal substrates
- Single-component compounds eliminate the need for mixing ingredients, thereby shortening production cycles and eliminating related waste
- Easy to program operating system allows for quick part-to-part change-over, minimal tooling investment for new designs, and prototype development in 24 to 48 hours
- High shielding effectiveness: 85–100 dB up to 10 GHz
- The dispensing system supports prototyping and high volume production schedules in a space saving 4’ x 3’ [12 sq. ft.] (1,2 m x 0,9 m [1,1 sq. m]) footprint
- Form-in-place gaskets provide more critical packaging space for board level components and smaller package dimensions
- Excellent adhesion on a wide variety of metal and plastic substrates including:
  - aluminum and other casting alloys
  - stainless steel
  - nickel copper plating (on plastics)
  - copper, silver, and nickel filled paint (on plastics)
- Low compression force makes SN compounds an excellent selection where the mating surfaces lack mechanical stiffness

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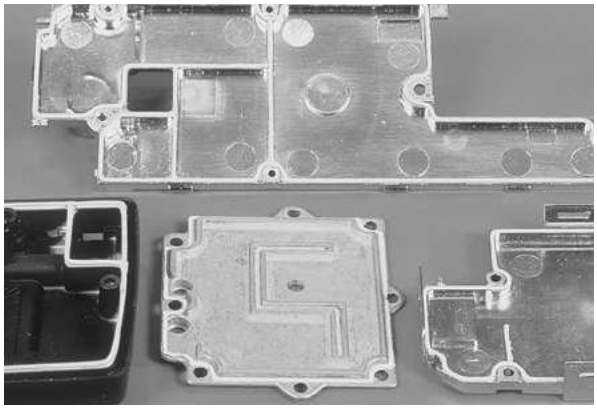

Laird form-in-place gasketing is ideal for hand held electronics applications.

PROGRAMMING SOFTWARE

Programming of the dispensing equipment can be facilitated utilizing part samples or part drawings. We also support the following CAD formats: AutoCAD®, DXF®, IGES®, Pro/ENGINEER®.

The software is user-friendly and includes several useful tools to simplify the path programming. These include scaling, symmetries, rotation, segment ends definition, and robotic dispensing instructions.

All production parameters are controlled by the software to include dispensing speed, start point, number of parts on the pallet, time needed to process one part, and automatic shut-down for cartridge reloading.

EXCEPTIONAL QUALITY

All material undergoes batch testing before application to guarantee superior mechanical and electrical properties. All dispensed products are manufactured to the exacting requirements of our ISO 9001 certified facility.

PACKAGING

To prevent damage to the substrate and gasket, and to facilitate handling, parts should be shipped in trays. Parts should be held securely to the tray to prevent movement during shipping, and packaged to avoid contact with each other. If required, Laird can design special packaging and trays to suit your specific part requirements. Store in the freezer prior to use.

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TABLE 1. TYPICAL BEAD DIMENSIONS

HEIGHT INCH(MM)	WIDTH INCH(MM)	MINIMUM LANDING AREA
0.014 ± 0.003 (0,4 ± 0,1)	0.015 ± 0.003 (0,4 ± 0,1)	0.020 (0,5)
0.015 ± 0.003 (0,4 ± 0,1)	0.020 ± 0.003 (0,5 ± 0,1)	0.025 (0,6)
0.020 ± 0.003 (0,5 ± 0,1)	0.024 ± 0.003 (0,6 ± 0,1)	0.029 (0,7)
0.027 ± 0.004 (0,7 ± 0,1)	0.030 ± 0.004 (0,8 ± 0,1)	0.036 (0,9)
0.030 ± 0.004 (0,8 ± 0,1)	0.034 ± 0.004 (0,9 ± 0,1)	0.040 (1,0)
0.040 ± 0.004 (1,0 ± 0,1)	0.048 ± 0.005 (1,2 ± 0,1)	0.055 (1,4)
0.045 ± 0.005 (1,1 ± 0,1)	0.059 ± 0.006 (1,5 ± 0,2)	0.067 (1,7)
0.055 ± 0.006 (1,4 ± 0,2)	0.075 ± 0.007 (1,9 ± 0,2)	0.084 (2,1)

TABLE 2. ACCELERATED CURE AT HIGHER TEMPERATURES

CONDITIONS	50%RELATIVE HUMIDITY, 0.024 IN. (0,6 MM) BEAD		
Temperature °F (°C)	73 (23)	140 (60)	185 (85)
Time for 98% Cure (Hr.)	12	2	1

TABLE 3. MATERIAL SPECIFICATIONS

	TEST METHOD	UNIT	SNC70-RXP	SNK55-RXP	SNL60-RXP	SNN60-RXP	SIL25-RXP	SNC70-HXP	SNK60-HXP	SNL70-HXP	SNN65-HXP	SIL35-HXP
Elastomer			Silicone	Silicone	Silicone	Silicone	Silicone	Silicone	Silicone	Silicone	Silicone	Silicone
Filler			Nickel/ Graphite	Silver/ Copper	Silver/ Aluminium	Silver/ Nickel	Non-conductive	Nickel/ Graphite	Silver/ Copper	Silver/ Aluminium	Silver/ Nickel	Non-Conductive
Color			Gray	Tan	Tan	Tan	White	Gray	Tan	Tan	Tan	Transparent
Electric Properties												
Volume Resistivity		ohm-cm	0.03	0.002	0.003	0.005	NA	0.03	0.004	0.005	0.005	NA
Shielding effectiveness	MIL-DTL-83528C											
200MHz to 10GHz	Para. 4.5.12	dB	>100	>90	>100	>100	NA	>90	>90	>90	>100	NA
Mechanical Properties												
Hardness	ASTM D2240	Shore A	70	55	60	60	25	70	60	70	65	35
Density (cured)	ASTM D792	g/cm3	2.5	3	2.1	3.9	1.2	2.5	3.1	2	3.84	1.1
Compression set	ASTM D395	%	15	10	10	15	<20(a)	15	10	10	10(b)	<20(b)
Adhesion strength (Al)	LT-FIP-CLE-03	N/cm2	150	200	140	180	220	>180	200	200	200	285
Compression deflection	LT-FIP-CLE-07											
at 20% compression		lb/in	1.5	1.2	1.9	1.7	See note (b)	3.2	1.5	2.3		See note (c)
at 40% compression		lb/in	6.9	5.2	8.3	6.4		11.5	7.3	10.5		
Temperature Range		°C	-50 to 125	-50 to 100	-50 to 125	-50 to 125	See note (b)	-50 to 150	-50 to 125	-50 to 125	-50 to 125	See note (c)
UL rating	UL-94		V0	V0	V0	V0	TBD	V0	V0	V0	V0	TBD
Curing requirements												
Curing conditions			15°C to 40°C, 50% relative humidity	15°C to 40°C, 50% relative humidity	15°C to 40°C, 50% relative humidity	15°C to 40°C, 50% relative humidity	23°C, 50% RH	120°C	120°C	120°C	120°C	120°C
Handling time			1 hour	1 hour	1 hour	1 hour	10-25 minutes					
Cure time			24 hours	24 hours	24 hours	24 hours	12hrs/mm thick	1 hour	1.5 hours	1 hours	1.5 hours	1 hour

(a) Test method ASTM D575
(b) Contact Laird Application Engineering for test data.