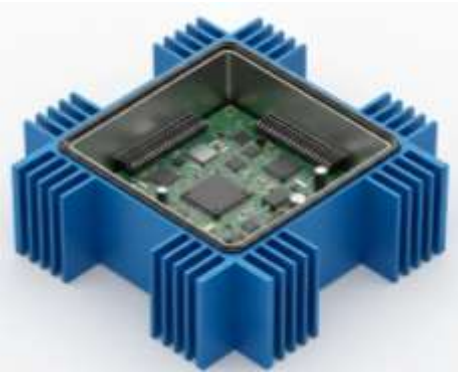
FIP

Forming and curing an EMI/non-EMI gasket in place using an automatic XYZ dispenser.

Common Substrates: Casting, Machining, Stamping, Injection parts.

Some Parameters

- Shielding 90-110 dB
- Bead width 0.3-2.5mm
- Bead height 0.3-1.7mm
- Bead profile:
- Curing: 150°C/30min | 120°C/120min | 25°C/24hours
- Dispend Velocity: typical 1 inch/sec
- Packaging: 30cc, 50cc, 300cc
- Curing Heat source: heat filament, IR
- Gasket colour: Dark grey, grey
- Surface pre-treatment: primer
- Nozzle size: dependent on bead
- Pressure: pneumatic, screw thread
- Machine to be vibration free
- In process tracking height and width by IR sensor
- Post checking; adhesion, resistivity, height, width



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Selection & Specifications

			Material#				
Parameter	**Test Method**	**Units of Measure**	**EF2111-20**	**EF2120-20**	**EF2121-10**	**EF2125-10**	**EF2310-10**
Characteristic	–	–	Super Soft	High Flow Rate	Super Soft	Superfine	Corrosion resistance
Conductive Particles	–	–	Ni/C	Ni/C	Ni/C	Ni/C	Ag/Al
Filler Material	–	–	Silicon Rubber	Silicon Rubber	Silicon Rubber	Silicon Rubber	Silicon Rubber
Curing Conditions	–	–	High Temperature Curing		Room Temperature Curing		
Curing Temperature	–	°C	150	150	25	25	25
Curing Time	–	–	30min	30min	24Hour	24Hour	12Hour
Hardness (after cured)	ASTMD2240	ShoreA	45	60	45	45	60
Tensile Strength	ASTMD412	PSI	150	150	150	120	130
Ductility	ASTMD412	/U	100	100	100	100	180
Density	ASTMD792	g/cm³	1.9	1.9	1.9	2.2	2.2
Volume resistivity	MIL-DTL-83528C	ohm-cm	0.04	0.03	0.04	0.04	0.008
Compression Ratio 70 hours @100 °C	ASTMD395-B	%	30	30	30	30	30
Operating Temperature	–	°C	-55~+125	-55~+125	-55~+125	-55~+125	-55~+125
Flame Retardant Grade	UL94	–	V-0	V-0	V-0	V-0	V-0
Shielding Effectivess (Avg. 200MHz - 18 GHz)	MIL-DTL-83528C	dB	>90	>90	>90	>90	>100
Adhesion Strength @bead size W1.1xH0.9xL10mm	QA-WI-054	N/cm	>10	>10	>10	>10	>10
Rebound force @30% compression @bead size W1.1xH0.9xL10mm	QA-WI-058	N/cm	20	43	21	14	35
Bead Size Recommended Min/Max value	Width x Height	mm	0.7*0.5 / 2.5*1.7	0.7*0.5 / 2.5*1.7	0.5*0.35 / 2.5*1.7	0.35*0.35 / 2.5*1.7	0.6*0.4 / 2.5*1.7
Effective Storage Time	–	Month	6	6	3	3	3
Storage Temperatures	–	°C	-30~-10	-30~-10	-30~-10	-30~-10	-30~-10

Ordering Code:
Material#-content size
Example : Material# - EF2111-20, content 30cc
Ordering code: EF2111-20-30

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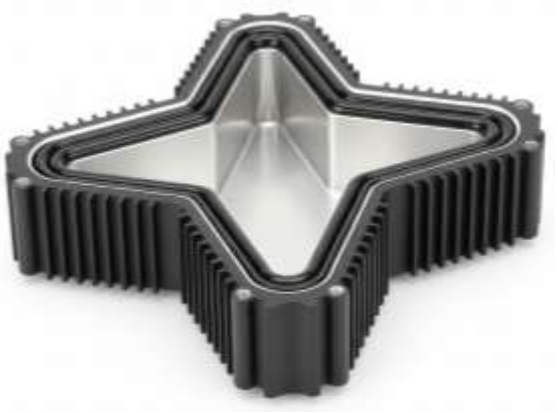
Descriptions and Explanations

FIP is ideal for modern electronics that require simple and efficient implementation of EMI shielding on metallic enclosures, particularly in automotive and telecommunications applications.

By utilizing automated programmable 3-axis or 4-axis robot-controlled dispensing systems, gasketing can be completed efficiently in minimal time. This method ensures high accuracy and repeatability in gasket placement. Adjustments to gasket position, bead height, or bead width can be easily made by simply modifying the program or code parameters. As a result, FIP gasketing has become an essential technique in modern electronics manufacturing and assembly for both electrically conductive and non-conductive gaskets—offering significant cost savings.

A key advantage of FIP gaskets is their exceptional shielding performance. A typical FIP gasket provides over 100 dB of shielding effectiveness across a frequency range of 200 MHz to 20 GHz, meeting more than 90% of current EMC requirements.



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Gasket beads range from a minimum height of 0.3 mm and width of 0.4 mm to a maximum height of 1.7 mm and width of 2.5 mm. With a minimum gasket width of 0.4 mm, the rib or wall thickness can be as thin as 0.6 mm. This allows for open flanges on ribs or walls, reducing casting material usage and saving space within the enclosure. As a result, the enclosure becomes lighter and more compact, enabling a smaller form factor for the assembled modules.

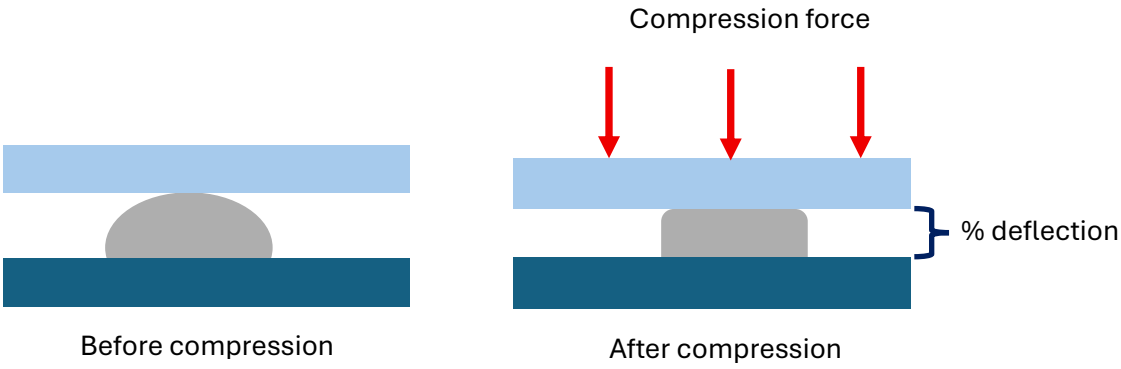

Diagram 1: Cross section - Compression – deflection of FIP gasket

FIP materials consist of silicone binders, making them highly compressible and requiring only a low closure force. A commonly reliable deflection ratio is about 35% (roughly one-third of the gasket bead height). Deflection below this level may lead to inadequate mating contact or an “open circuit,” especially when accounting for surface unevenness or enclosure warpage. Conversely, excessive deflection beyond 35% can damage the gasket. To prevent this, a limiting stopper of approximately 35% is typically incorporated into the enclosure plates.

FIP gasketing is compatible with a wide range of typical substrates, including commercial cast aluminum, zinc, and magnesium. It also performs well with common surface finishes such as chrome, nickel, and tin, as well as with conductive paint-coated plastics like ABS.

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Tolerances

The tolerance for FIP materials is roughly 15% of their width or height. For example, with a typical height of 0.9 mm, the tolerance would be ±0.14 mm.

Gasket **positional tolerances** largely depend on the capabilities of the robot or machine used.

Surface preparation is essential to ensure that no grease, oil, dirt, or release agents remain on the mating surface. Additionally, applying a layer of surface primer prior to gasketing is often recommended.

Issue of gasket lifting / delamination or displacement during closure: FIP gasket materials typically have an adhesion force of 4 to 10 N/cm on most industrial enclosure surfaces and treatments. This strong adhesion prevents the gasket from lifting or moving during closure of lid or cover of enclosure.

Notes on Cosmetic and other Mechanical Considerations:

The radius of curvature of the gasket track, start/stop/joining accuracy, and overall cosmetic quality are fully controllable through precise robot programming and coding. Careful attention during this process ensures high-quality gasket appearance.

Nozzle travel speed affects not only the time required to build a gasket track of a certain length but also influences the gasket's cross-sectional size and adhesion strength. The dispensing pressure—whether pneumatic or screw-thread type—determines the gasket profile and travel speed. Pneumatic pressure may fluctuate over time and with the volume of material remaining in the syringe or barrel.

The surface energy of the mating surface impacts adhesion strength, which may necessitate adjustments to travel speed and dispensing pressure. Additionally, the ambient temperature during dispensing plays a role in material flow characteristics.

Effect of Material Storage:
If FIP material is stored in a deep freezer or with dry ice, it is essential to thaw it for at least 8 hours at ambient temperature (15°C–30°C) before dispensing.

It is also recommended to centrifuge the syringes or barrels before use to remove any trapped air bubbles.

It is crucial to conduct tests and trial runs to evaluate the relationship between pneumatic pressure, speed, material type, and ambient temperature.