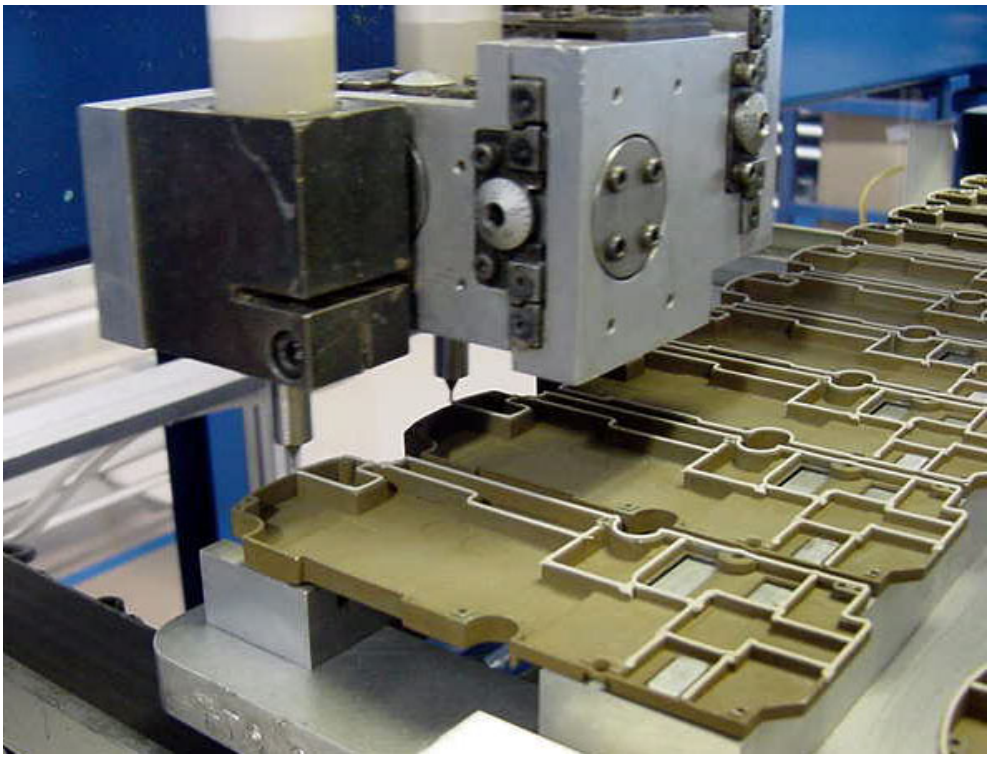
Form-in-Place
Application Design Guide



The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

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Definitions

Form-in-place (FIP)

FIP is the process of robotically dispensing an elastomer material onto a substrate.

PARPHORM™

A non-conductive FIP elastomer used for environmental applications.

General

FIP technology allows dispensing of precisely positioned gasket beads from small to large sections. The accuracy for gasket location is within .003". With the dispensing being primarily software driven, FIP technology permits; rapid prototyping, design changes with nominal cost and short lead times for full production scale up. FIP technology is a cost effective EMI solution offering more than 75 dB shielding effectiveness from 200 MHz to 10 GHz with a potential space savings of 50%.

Prototypes

Prototyping* can be done for quantities from 1 to 100, with standard lead times of less than 2 weeks. In most cases, no tooling is required and a lot charge will be applied to the order. In the case that tooling is required; there may be an additional tool charge. No charges are applied for programming. With Chomerics prototype equipment, in most cases (depending on the bead path) no bead geometry is required. The standard prototype equipment is 2D allowing for only one plane to be dispensed on at a time. 3D bead paths can be prototyped as well, on our production equipment. In these cases, a 3D geometry file is required. All 3D file formats are acceptable (i.e. .prt, .iges, .stp, .x_t).

*All Prototype samples request should be submitted through the Chomerics Application Department

Services

Chomerics is a full service supplier for shielding enclosures. Services include:

- Application/Design support
- Supply chain management
- Source and lead sub-suppliers for all project components. This includes castings, machined housings, plastic covers, painting/plating operations and assembly components.
- Prototype dispensing
- Production dispensing

Chomerics also supplies our FIP materials to customer who planning on dispensing the material themselves. In these cases Chomerics will work with the customer to determine the appropriate equipment and provide initial application/process support.

Material Selection

Chomerics offers a variety of FIP materials to meet the customer's application needs. A full list Chomerics FIP materials and properties is given in the FIP Material Selector Guide. The following questions will help in selecting the proper FIP material.

1.) What is the application? Environmental, EMI Shielding or both?
   a. For an environmental seal only, one of the PARPHORM materials should be selected.
   b. For an EMI shielding application, one of the conductive FIP materials (CHOFORM®) should be selected.
   c. In the case where both an environmental and EMI gasket is required, one of the corrosion resistant FIP materials (Ni/C, Ag/Al, Ag/Ni) should be selected.

2.) What is the substrate made from? (Plastic or metal)

   2a. Can the substrate handle a temperature of 140 - 150° C for 30 minutes?
   - There are two types of curing systems used in both FIP and PARPHORM materials. The two types are detailed below.

   2b. What is the substrate plated with?
   - Certain materials are not compatible with certain plated surfaces, due to poor adhesion properties.

   2c. Is the substrate painted?
   - Can the paint handle 150 °C. If not, a moisture cure material should be selected.

3.) Has the bead size been determined? Each material has a minimum and maximum allowable bead size. This is limited by the particle size of the conductive filler. Certain materials are designed for small < 1.0mm bead sizes and others have been designed for larger bead sizes > 1.0mm.

Thermal Cure Materials

- Thermal cure materials are cured at 140 – 150 °C (depending on material) for a minimum of 30 minutes.
- Thermal cured materials have the benefit of allowing the testing and shipping of product the same day the parts are dispensed. Thermal cured materials also offer better properties. In particular, the adhesion properties of thermal cured materials are typically double that of a moisture cured material.

Moisture Cure Materials

- Moisture cure materials are cured at room temperature (22 °C, 50 % Rh) for a minimum of 24 hours.
- Moisture cure materials have the benefit of being dispensed onto low temperature substrates such as plated plastic, metal parts with external cosmetic (low temperature) paint, conductive painted surfaces & conductive plastic.

Application/Design Guidelines

Bead Size Selection

- The desired bead compression is 20 – 30 %. It is not recommended to exceed 40%.
- CHOFORM materials have a typical height-to-width ration of 85%.
- If an application requires a taller bead and has limited width, a “double bead” can be used to increase the height-to-width ratio. Double bead sizes vary by material. CHOFORM Engineering can work with the customer to determine double bead size.

Bead Tolerances

The standard bead height and width tolerances are listed in the tables below.

Bead Height	Tolerance	Start/Stop
.018 - .034	± .004	Additional ± .006
.035 - .062	± .006	Additional ± .006

Bead Width	Tolerance	Start/Stop
.022 - .040	± .006	Additional ± .006
.035 - .062	± .006	Additional ± .008

Bead Path Selection

The ideal bead path design is a path that isolates all internal compartments from each other. The number of starts/stops will impact the cost. Chomerics Process and Application Engineers will work with the customer to determine to optimal bead path. Typically all internal ribs are dispensed first, followed by the closing perimeter bead(s). (See figure 1.0 for a typical bead path design.)

- Start
- Stop

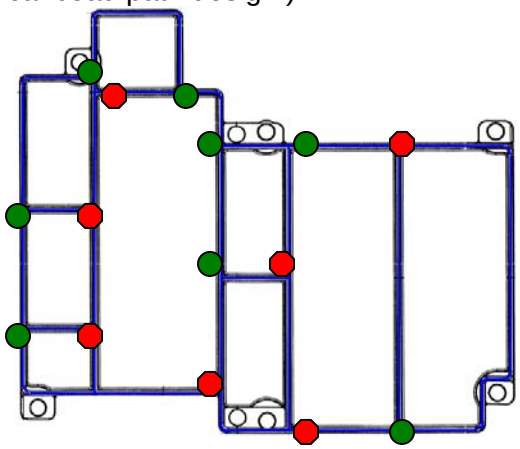


Figure 1.0 Bead Path Example

When the gasket path, starts or stops next to a parts feature such as a pin, a wall or a hole, there is a need for a start/stop gap allowance. Figure 1.1 & 1.2 shows the typical tolerance for these cases.

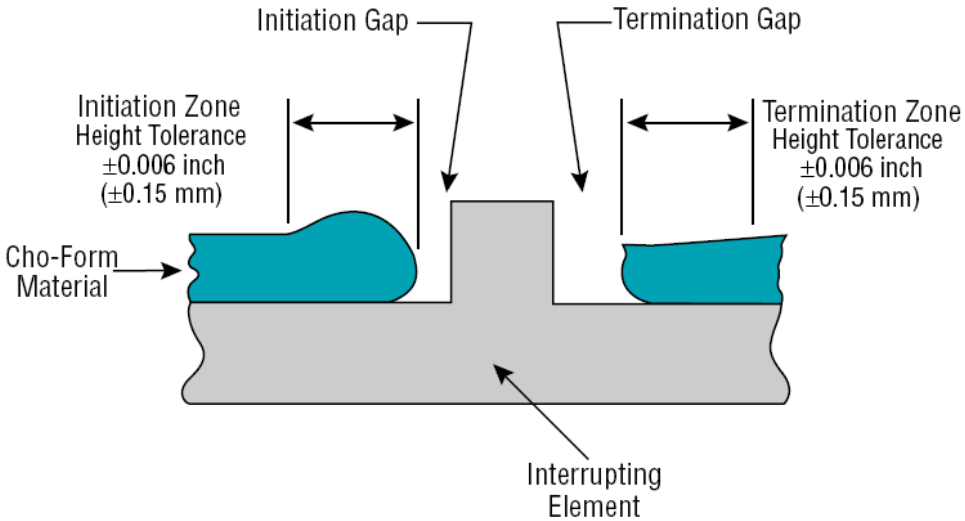


Figure 1.1 Initiation/Termination Zone Tolerances

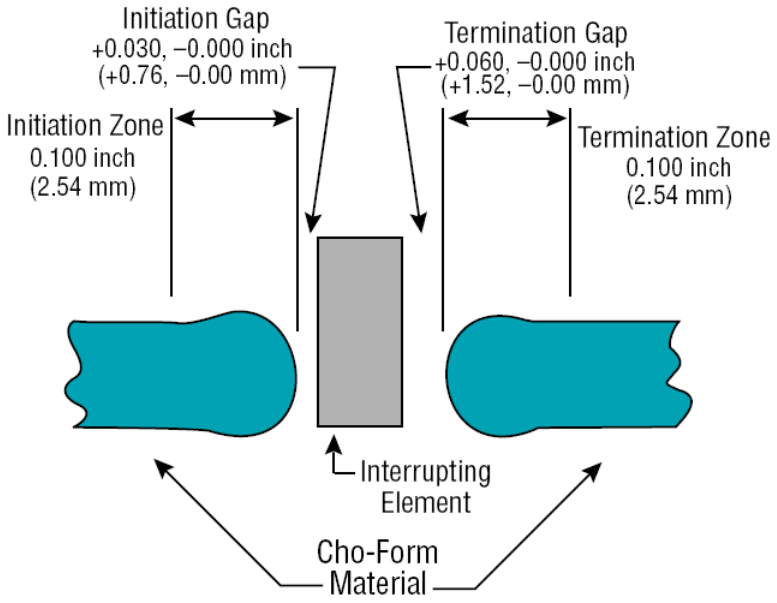
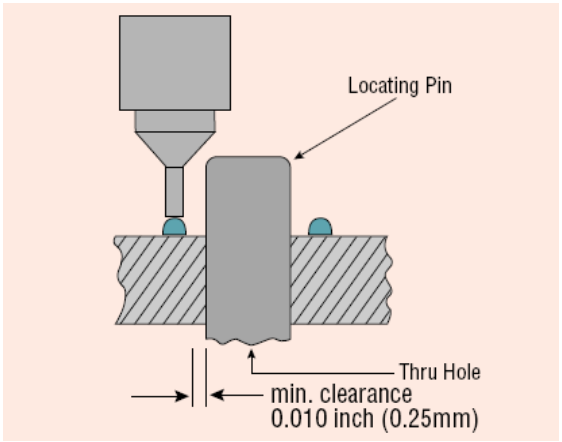
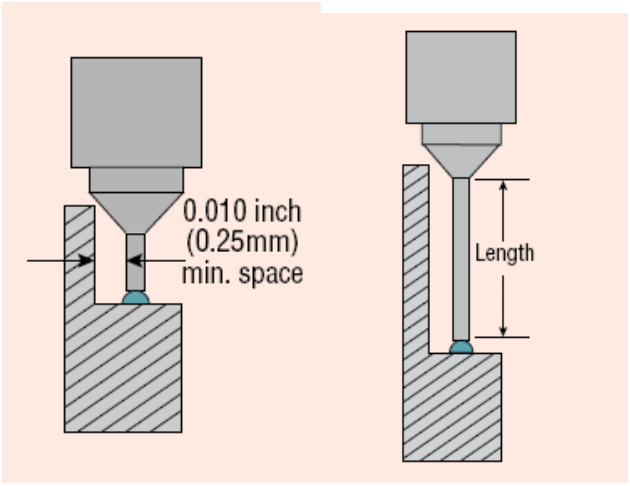


Figure 1.2 Initiation/Termination Gap Tolerances

Z-Height Obstructions

Z-Height obstructions are critical to the dispense process. The length of the dispense tip impacts the speed at which the material can be dispensed. In some cases the reduction in dispense speed will be cost prohibited.



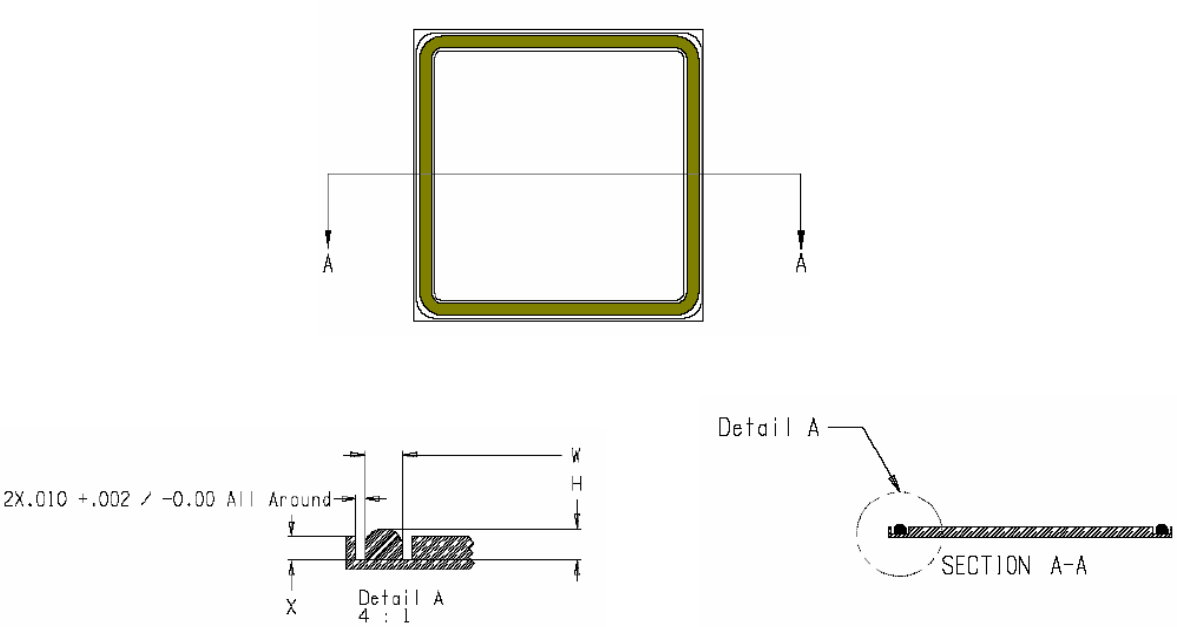


Gasket on a Rail

The minimum rail width that can be dispensed on is .025” with a .018” X .022” gasket. Any smaller than .025” will result in gasket overhang.

Gasket in a Groove

In the case where the gasket will be dispensed in a groove, use the table 1.0 below as a guide for groove design.



Groove Depth in"	Groove Depth mm	Bead Width in"	Bead Height in"	Bead Width mm	Bead Height mm
X ± .002"	**X ± .051mm**	**"W"**	**"H"**	**"W"**	**"H"**
0.014	0.36	0.022	0.019	0.56	0.47
0.016	0.40	0.025	0.021	0.64	0.54
0.019	0.49	0.030	0.026	0.76	0.65
0.022	0.57	0.035	0.030	0.89	0.76
0.026	0.65	0.040	0.034	1.02	0.86
0.029	0.73	0.045	0.038	1.14	0.97
0.032	0.81	0.050	0.043	1.27	1.08
0.034	0.86	0.052	0.045	1.32	1.14
0.035	0.89	0.055	0.047	1.40	1.19
0.039	0.99	0.062	0.052	1.57	1.32
0.047	1.18	0.073	0.062	1.85	1.58

Table 1.0 FIP Groove Design Guidelines

*Groove depth dimensions are based on 25% nominal gasket compression. Standard tolerances will apply to gasket dimensions.

Bulk Material Ordering Information		
Material	**Size**	**Part Number**
1117	300 cc (Plastic Cartridge)	19-26-1117-V300
1122V	300 cc (Plastic Cartridge)	19-26-1122-V300
5506 (FIP-C)	30 cc (Syringe)	19-26-5506-V030
5506 (FIP-C)	300 cc (Aluminum Cartridge)	19-26-5506-V300
5508 (HC-FIP-C)	300 cc (Aluminum Cartridge)	19-26-5508-V300
5513 Cho-Form 2.1)	925 gram (2: 6 fl. oz. Semco Cartridges)	19-26-5513-0850
5513 Cho-Form 2.1)	1845 gram (2: 12 fl. oz. Semco Cartridges)	19-26-5513-1845
5515 (Cho-Form 4.0)	500 gram (12 fl. oz. Semco Cartridge)	19-26-5515-0500
5518 (Cho-Form 3.0)	1700 gram (2: 12 fl. oz. Semco Cartridges)	19-26-5518-1700
5519	850 gram (Aluminum Cartridge)	19-26-5519-0850
5519	2000 gram (Aluminum Cartridge)	19-26-5519-2000
5526	850 gram (Aluminum Cartridge)	19-26-5526-0850
5528 (Cho-Form 5.0)	800 gram (Plastic Cartridge)	19-26-5528-0800
5528 (Cho-Form 5.0)	850 gram (Aluminum Cartridge)	19-26-5528-0850
5528 (Cho-Form 5.0)	2500 gram (Aluminum Cartridge)	19-26-5528-2500
5538	650 gram (Aluminum Cartridge)	19-26-5538-0650
5541	650 gram (Aluminum Cartridge)	19-26-5541-0650
5541	700 gram (12 fl. oz. Semco Cartridge)	19-26-5541-0700
5541	2000 gram (Aluminum Cartridge)	19-26-5541-2000
5545 (FIP-X)	300 cc (Aluminum Cartridge)	19-26-5545-V300
5550	575 gram (12 fl. oz. Semco Cartridge)	19-26-5550-0575
5550	600 gram (Aluminum Cartridge)	19-26-5550-0600

Table 1.1 Bulk Material Ordering Information

Global Parker-Chomerics FIP Dispense Locations

Parker Chomerics can dispense FIP gaskets and manage your supply chain in any one of our 12 Global Application Centers. All locations can provide a turn key solution to metallic and polymeric part supply.

If your logistics require a different location contact our Application Engineering Department for the nearest Authorized Parker Chomerics Distributor-Applicator.

Global Chomerics Central Sales Offices

REGION	LOCATION	TELEPHONE	FAX	E-MAIL
AMERICAS	Woburn, MA, (Headquarters)	+1 781-935-4850	+1 781-933-4318	chomailbox@parker.com
	Cranford, NJ, Tecknit	+1 908-272-5500	+1 908-272-2741	
	Millville, NJ , Silver Cloud	+1 856-825-6900	+1 856-825-6969	
	Fairport, NY, Webster Plastics	+1 585-425-7000	+1 585-425-7238	
EUROPE	Grantham, UK, Tecknit	+44 1476 590600	+44 1476 591600	chomerics_europe@parker.com
	High Wycombe UK, Northern Europe	+44 1494 455 400	+44 1494 455 466	
	Paris, France, Southern Europe	+33 1 34 32 39 00	+33 1 34 32 58 00	
ASIA PACIFIC - CHINA	Hong Kong (ASEAN, India, Korea)	+852 2260 8225	+852 2786 3446	chomerics_ap@parker.com
	Beijing, India, Korea	+86 10 6788 4650	+86 10 6788 4649	
	Shanghai	+8621 2899 5000	+8621 2899 5146	
	Shenzhen	+86 755 8974 8558	+86 755 8974 8560	
JAPAN	Tokyo	+81 3 6408 2369	+81 3 5449 7202	--