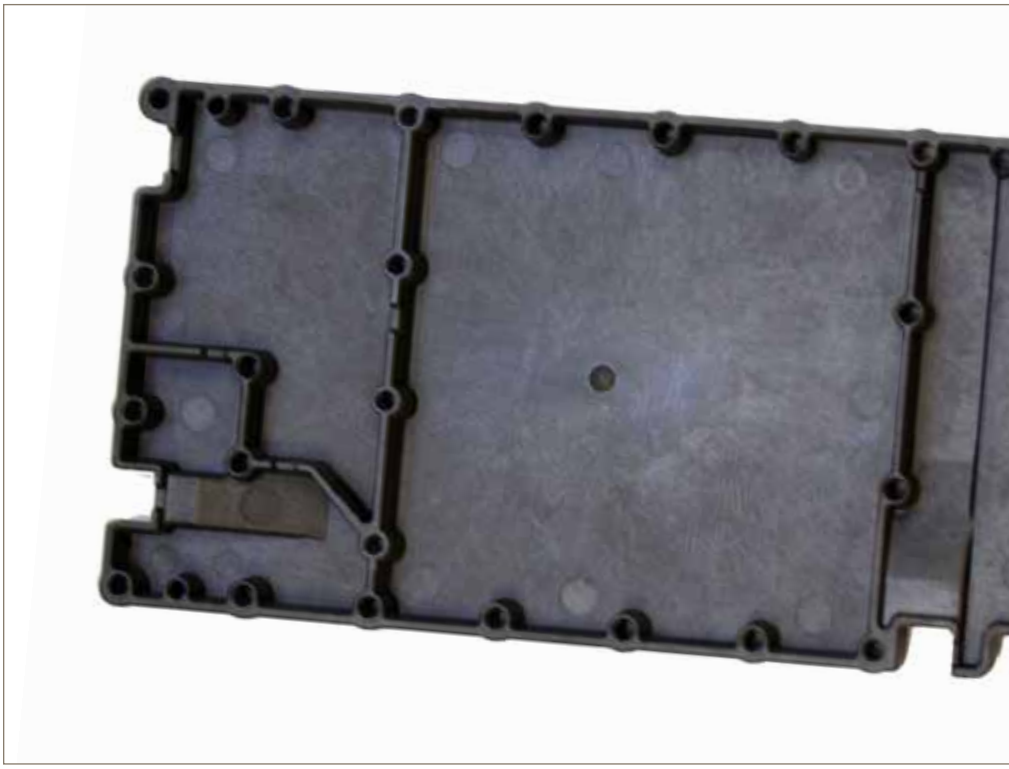
PREMIER™ PEI-140

Military Grade Conductive Plastic for EMI Shielding

Customer Value Proposition:

Parker Chomerics PREMIER™ PEI-140 military grade, electrically conductive plastic, can provide up to a 65% cost reduction by eliminating secondary operations such as assembly, machining, painting/plating and the logistics that accompany these processes. The use of a conductive plastic in lieu of conductive plating or painting of plastic parts eliminates the resulting long supply chain and associated transportation costs. The excellent shielding effectiveness, high temperature performance, low smoke generation, chemical resistance and UL 94V-0 flammability rating allows for conversion of metal housings to plastic without loss of performance. With a weight savings of 50 - 75% over aluminum, using PEI-140 for military man-portable and aerospace electronic housing applications is an attractive and effective design option. This lightweight material housing option will result in greater readiness in the case of the soldier and fuel savings for aircraft and vehicle mounted applications.



Product Features:

- High performance shielding over 70 dB, 800 MHz to 18 GHz
- Stable electrical and shielding properties for applications requiring continuous use at 170°C
- Short term high temperature capability of 180°C
- Lightweight
- High strength
- High Tensile strength
- High Flexural Strength
- UL 94 V-0 flammability rating
- Meets Commercial aircraft avionic smoke density compliance requirements
- Allows for precision tolerance on parts
- Single source supply chain
- Elimination of secondary operations
- Recyclable
- RoHS & WEEE compliant
- Globally available as pellets or parts

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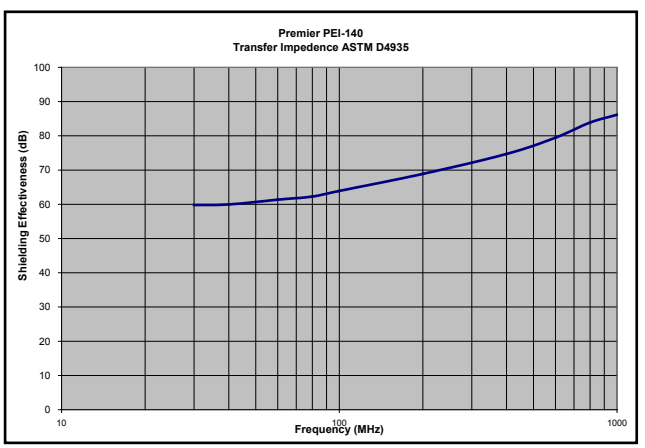
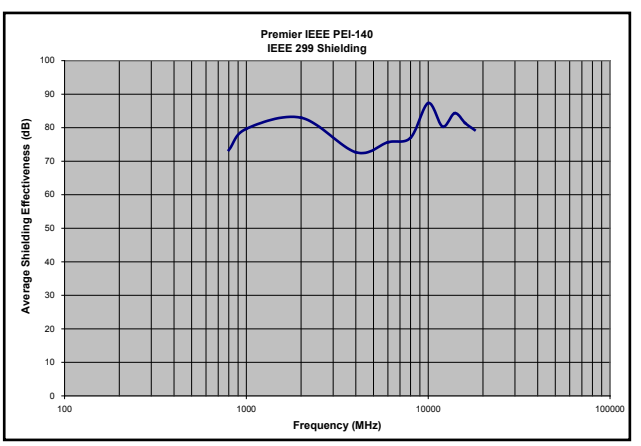
PREMIER™ PEI-140 Properties

Table 1 - Typical PEI-140 Properties

	Value	Test Method	Nominal Value (English)	Unit	Nominal Value (SI)	Unit
Shielding Effectiveness	Average from 800 to 18,000 MHz - Thickness 0.07 in (1.8 mm)	IEEE 299 (Modified)	80	dB	80	dB
	Average from 30 to 1000 MHz - Thickness 0.07 in (1.8 mm)	ASTM D4935	72	dB	72	dB
Physical	Specific Gravity	ASTM D792	1.61	--	1.61	--
	Mold Shrinkage 0.125 in (3.2 mm)	ASTM D995	0.0035	in/in	0.35	%
Mechanical	Tensile Modulus	ASTM D638	2.1 x 10^6	psi	15.8	GPa
	Tensile Strength @ Break	ASTM D638	15,000	psi	103	MPa
	Tensile Elongation @ Break	ASTM D638	4.3	%	4.3	%
	Flexural Modulus	ASTM D790	1.1 x 10^6	psi	8.2	GPa
	Flexural Strength	ASTM D790	20,000	psi	138	MPa
Impact	Izod - Unnotched 73° F (23° C)	ASTM D256	4	ft-lb/in	210	J/m
	Izod - Notched 73° F (23° C)	ASTM D256	1.1	ft-lb/in	60	J/m
	Charpy Impact Notched 73° F (23° C)	ASTM D6110-05a	0.84	ft-lb/in	45	J/m
Thermal	Heat Deflection Temperature Under Load (HDTUL) @ 264 psi (1.82 MPa)	ASTM D648	363	F°	184	C°
	Thermal Conductivity	ASTM D5470	0.71	W/m-k	0.71	W/m-k
Electrical	Surface Resistance	MIL-DTL-83528	450	mOhm/sq	0.45	Ohm/sq
	Through Resistance	PRE-012	380	mOhm	0.38	Ohm
Flammability	UL 94 V-0 UL Flammability Rating	UL 94 V-0	0.07	in	1.8	mm
	Smoke Density 3.0 mm @ 4 minutes	BSS 7238/7239	MAX 110	Ds	MAX 110	Ds
	Limited Oxygen Index	ASTM D2863	41	%	41	%

ORDERING INFORMATION FOR PELLETS	
Part Number	**Specify Quantity Upon Order**
CP-PEI-140	55lb box or 1100lb gaylord
CK-PEI-140	25kg box or 500kg gaylord





PREMIER™ PEI-140

Product Features:

PREMIER™ PEI-140 is a custom blend of polyetherimide plus engineered filler for stable electrical, mechanical and physical performance at high continuous temperature exposures. It is filled with the production proven PREMIER proprietary filler system that is formulated for consistent shielding over a wide range of frequencies. Two elements of this technology make it unique in the marketplace: filler morphology and our proprietary dispersion agent.

Filler Morphology

A proprietary combination of fibers and powders provides unique EMI absorptive properties of nickel-plated carbon fiber, the conductivity of stainless steel, and the visual improvement of plated powder. The increase in EMI shielding performance is far beyond values expected from surface conductivity and EMI reflection alone.

Dispersion Technology

The fiber is treated with a unique dispersion agent. Upon molding, the agent provides complete fiber dispersion delivering the only commercially available homogeneous fully entangled fiber matrix within a molded part.

Fig 1 - Polymer burn-off of a PREMIER molded part reveals homogeneous fiber dispersion that is key to performance.

Technology Comparison

PREMIER is a more cost effective EMI shielding solution compared to conductive paint or plating. Costs are competitive and there is no long supply chain with associated transportation costs and secondary process yield losses. WIP is reduced. PREMIER requires fewer layers of tooling, process approval, design constraints and packaging requirements. PREMIER frees the design engineer from the manufacturing constraints of metal fabrication or die-casting by allowing the use of thermoplastic injection molding without the need for secondary operations. Housings are lighter, thinner and less costly.

Competitive Advantage

Cost Reduction - Up to 65% in total cost of ownership by eliminating secondary operations such as:

- Machining for tolerance control; PEI-140 can maintain flatness within 0.003" (0.076mm)
- Tapping for screws; PEI-140 uses thread forming screws or heat-staked inserts
- Plating or painting
- Multiple tools and fixtures; No need for machining jigs, painting/plating fixtures or assembly stations

Weight reduction - 50 to 75% compared to current metal-based solutions due to the significantly lower density vs. metals

Exceptional shielding - up to 85 dB without a gasket in high performance thermoplastic

High Temperature Performance - 340°F (170°C)

Smoke Density - Meets strict Avionics guidelines for optical smoke density tests at MAX 110 Ds, requirement to pass is 200 D's or less

Environmentally Friendly

At end of life PREMIER can be recycled using regrind procedures to comply with ever growing disposal concerns. Testing shows no ill effect on shielding up to 15% re-grind processed using standard industry practices. PREMIER complies with RoHS, WEEE, EPA, EU, and TCO specifications for ecological compatibility containing no halogenated compounds.

Injection Molding

Tooling is similar to 20% glass filled PEI thermoplastic. A hot material distribution system designed for filled PEI can be used to eliminate in-process scrap. Otherwise standard tool practices should be used. Pre existing tooling designed for filled PEI can be used to manufacture parts in PREMIER and Chomerics can provide EMI testing of molded parts for evaluation. Chomerics has complete EMI testing facilities for both near field and far field testing per MIL-STD or FCC protocol. Generally, 2 mm thick walls are desired However, localized areas of 1.5 mm thickness can be molded successfully. As with any design, material flow within the tool must be evaluated to ensure fill. Chomerics is ready and willing to assist in tool design using mold flow analysis. Chomerics can upon request design and manufacture the tool for you or work closely with current sources to supply the tool.

Processing Information

Description
A patented pelletizing process is used by Chomerics to make PREMIER pellets. These pellets standardize material handling during molding. No blending is required at the press. PREMIER injection molding integration onto any production floor is painless and seamless

PREMIER provides the only commercially available thermoplastic system with a homogenous dispersion of the fiber throughout the molded part, regardless of part geometry. This is the result of combining pelletizing with Chomerics unique proprietary fiber dispersion technology.

Unlike other filled materials, PREMIER's dispersion agent ensures the formation of a homogeneous fully entangled fiber matrix within the part avoiding resin rich or poor areas plus positive fiber retention within the part. Conductivity and shielding are consistent throughout the part, giving high part yields.

Application Guidelines
Table 2 should be used as a guideline for processing and drying. There are several principles used to achieve a quality part.

1. Higher back pressure is suggested to promote homogeneous fiber distribution, consistent shot size, and improved surface appearance
2. Screw speed should be adjusted so that the screw is rotating during the entire cooling cycle.
3. PREMIER materials are thermally conductive as well as electrically conductive. A small diameter nylon type nozzle tip will help eliminate tip freeze-off.
4. Residence time in the barrel should be kept as short as possible.
   Although not mandatory, hot runner systems with gate valves can be used for cost control through process scrap reduction and elimination of secondary de-gating.
5. Short fill times are recommended. Fast fill speeds will provide longer flow, fill thinner wall sections, give better knit line strength, and improve surface appearance..
6. For molding PEI-140, Chomerics recommends using only high temperature equipment capable of filling a glass filled Ultem part with a minimum wall thickness of 2 mm. Localized areas of 1.5 mm thickness can be molded successfully, depending on part geometry.

Table 2 - Processing Parameters

Drying Temperature	°F (°C)	300 to 325 (150 to 160)
Drying Time, Typical	hours	5 to 7
Drying Time, Maximum	hours	24
Suggested Maximum Moisture	%	0.02
Rear Temperature	°F (°C)	680 to 720 (360 to 385)
Middle Temperature	°F (°C)	690 to 730 (365 to 390)
Front Temperature	°F (°C)	700 to 740 (370 to 395)
Nozzle Temperature	°F (°C)	700 to 740 (370 to 395)
Processing (Melt) Temperature	°F (°C)	700 to 740 (370 to 395)
Mold Temperature	°F (°C)	190 to 240 (90 to 115)
Back Pressure	Psi (bar)	75 to 125 (5 to 8)
Screw Speed	inch/minute (cm/minute)	300 to 400 (760 to 1000) 95 to 130 rpm for a 1.0 inch (25.4 mm) screw
Clamp Pressure	tons/in2 (MPa/cm2)	4 to 6 (55 to 80)
Cushion	inch (mm)	0.4 to 0.5 (10 to 13)

Processing Benefits
- Hybrid-filler pellet system
- No dry blending
  - No weighing
  - High machine up time
- Processing similar to non-conductive systems
- Environmentally friendly and recyclable
- Global supply
- Revolutionary dispersion technology
- High EMI shielding at a lowcost
- Consistent high part yield

Parker Chomerics

ENGINEERING YOUR SUCCESS.