



PREMIER A2XX-ST - 100°C OPERATING TEMPERATURE EMI SHIELDING THERMOPLASTIC POLYMER SOLUTION

BENEFITS

- Stable electrical and shielding properties for applications requiring
 - Continuous Use of 100°C
 - Short term/Storage capability of 115°C
- High performance shielding - Up to 85 dB
- Lightweight and strong
 - Multiple grades for increased strength
 - Thin wall capability <0.8 mm
 - Low density compared to aluminum
- Abrasion and corrosion resistant
- Low system costs
 - Multiple fiber loadings for performance/cost optimization
 - Shortened design cycle
 - Shortened supply chain
 - Lower assembly costs through insert molding
- Environmentally acceptable (re-cycleable)
- Globally available

DESCRIPTION

A2xx-HT is a custom blend of polycarbonate (PC) and acrylonitrile-butadiene-styrene (ABS) engineered for stable electrical, mechanical and physical performance at continuous exposure to 100°C. It is filled with the production proven proprietary PREMIER Nickel plated Carbon (Ni-C) fibers. **Three elements of this technology make it unique in the marketplace; material, dispersion agent, and pelletizing.**

Fiber Material- Nickel plating provides a stable highly conductive surface for the fiber giving years of performance. The EMI absorptive properties of carbon fiber increase EMI shielding far beyond values expected based on surface conductivity and EMI reflection only.

Dispersion Technology – The Ni-C fiber is treated with a revolutionary dispersion agent Upon molding the unique agent provides complete fiber dispersion delivering the only homogeneous fully entangle fiber matrix within a molded part commercially available.

Pelletizing - The treated fiber bundle is jacketed within the polymer and cut to length. *Pelletizing optimizes the fiber aspect ratio maximizing electrical and shielding performance.* Pelletizing also results in a single component system for ease of molding. No separation of the fiber occurs during shipment and no dry blending at the press is required, thereby eliminating the problems (and downtime) caused by fiber nesting or clogging of injector ports.

Fiber Loading - The "XX" in A2XX-ST defines Ni-C fiber loading levels. By increasing fiber loading EMI shielding is increased however not all applications require the same level of shielding. Therefore, PREMIER is available in multiple levels of fiber loading to marry the desired amount of EMI shielding with the lowest possible material cost. Standard materials are A220-ST, A230-ST and A240-ST. Intermediate levels available upon request.

PREMIER's Ni-C fiber technology provides the only homogenous dispersion of high aspect ratio conductive fiber throughout an injection molded part regardless of part geometry available today.

Areas of restricted flow are no longer resin rich creating EMI leakage. Adjacent areas are not fiber rich creating weak mechanical seams and part breakage.



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

SHIELDING EFFECTIVENESS

As always the mechanical design of the application is paramount to obtaining the inherent shielding performance of a material. For applications that do not use an EMI shielding gasket at the seams or joints or have large openings, PREMIER at high fiber levels will perform comparable to aluminum housing. To optimize performance a tongue and groove design with a maximization of surface area is suggested for seams. Fifteen to twenty-five dB of shielding can be added to a typical PREMIER housing through the use of a fabric-over-foam gasket such as Chomerics Soft Shield 3500 series or a form-in-place conductive elastomer gasket such as Chomerics Cho-Form family of materials. Please contact Chomerics for test protocol and EMI design assistance.

Shielding Effectiveness - No Gasket Lap Seam

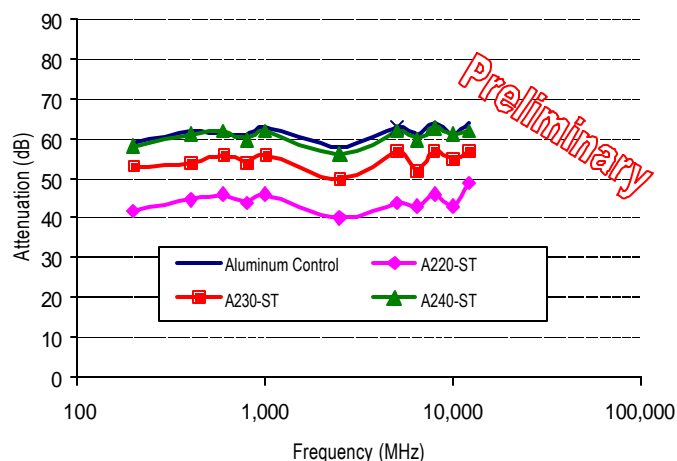


Table 1 A2XX-ST Typical Property Values

Property	Test Method	Units	A220-ST	A230-ST	A240-ST
<u>COMPOSITION</u>					
Polymer			PC/ABS	PC/ABS	PC/ABS
Fiber		Ni•C	Low	Medium	High
<u>ELECTRICAL</u>					
Surface Resistance Initial		O/square	4.00	0.30	0.20
Aged 168 hours @ 100°C		O/square	4.00	0.30	0.20
Aged 168 hours @ 115°C		O/square	4.00	0.50	0.50
Aged 168 hours @ 85°C & 90% RH		O/square	4.00	0.30	0.20
Bulk Volume Resistivity Initial		O•cm	40.00	5.00	3.00
Aged 168 hours @ 100°C		O•cm	40.00	5.00	3.00
Aged 168 hours @ 115°C		O•cm	40.00	6.00	5.00
Aged 168 hours @ 85°C & 90% RH		O•cm	40.00	5.00	3.00
<u>EMI SHIELDING EFFECTIVENESS</u>					
Far Field 800 MHz to 10 GHz	MIL-STD 285	dB	Graphed	Graphed	Graphed
Near Field 200 MHz to 6 GHz ¹	TP3375.02	dB	26	30	40
<u>MECHANICAL</u>					
Tensile Strength @ Break - Initial	ASTM D638	psi	11,800	14,000	15,000
Tensile Elongation @ Break	ASTM D638	%	1.15	0.80	0.70
Tensile Modulus	ASTM D638	psi x 10 ⁶	1.49	1.90	2.60
Flexural Strength	ASTM D 790	psi	17,000	22,000	24,000
Flexural Modulus	ASTM D 790	psi x 10 ⁶	0.79	1.30	1.81
RTP ²		°C	100	100	100
Izod Impact Unnotched	ASTM D4812	ft•lb/in	4.5	4.5	4.5
Izod Impact Notched	ASTM D4812	ft•lb/in	1.1	1.1	1.5
<u>THERMAL</u>					
Thermal Conductivity	D3763	W/MK	0.56	0.59	0.70
Heat Deflection Temp. @ 264 psi	ASTM 648	°F	256	247	242
Vicat Softening Point	D1525	°F	280	279	248
Coefficient of Linear Thermal Expansion	D696	in/in/°F x 10 ⁻⁶	2.8	1.9	1.5
<u>PHYSICAL</u>					
Specific Gravity	D792		1.20	1.31	1.39
Water Absorption	D570	%	N/A	N/A	N/A
Mold Shrinkage Inflow	D955	In/in	N/A	N/A	N/A
Mold Shrinkage Cross Flow	D955	In/in	N/A	N/A	N/A
¹ Tested with Cho-Seal® 1215 Conductive elastomer gasket (Ag/Cu filler). ² For Tensile Strength, Tensile Elongation, Tensile Modulus, Flexural Strength, Flexural Modulus; Tested at 168 hour exposure 100°C & 85°C/85%RH Longer exposure on test.					

APPLICATIONS

PREMIER A2XX-ST can be used on a variety of applications to shield RF receivers, transmitters, transceivers, microcontrollers, microprocessors, displays... Amongst other applications A2XX-ST is recommended for:

- Automotive in-the-cab applications, ECU's, sensors, connectors, multimedia, connectivity...
- Hand held electronics, wireless voice or data telecommunication, infotainment, testing equipment, PDA's...
- Military personnel electronics C³I, navigation, GPS, ruggedized computers, night vision...

TECHNOLOGY COMPARISON

PREMIER is a more cost effective EMI shielding solution as compared to conductive paint or plating. Premier costs are competitive plus there is no long supply chain with transportation costs and secondary process yield losses. WIP is reduced. PREMIER simplifies production start-up, fewer layers of tooling and process approval and design constraints and packaging requirements and...

Premier frees the design engineer from the manufacturing constraints of metal fabrication or dies casting by allowing the use of thermoplastic injection molding without the need for secondary operations. ECU's are lighter, thinner and less costly.

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 20% re-grind processed using standard industry practices. PREMIER complies with EPA, EU, and TCO specifications for ecological compatibility having no halogenated compounds.

INJECTION MOLDING

Tooling is similar to glass filled PC/ABS thermoplastic. Generally a hot material distribution system is used to eliminate in-process scrap otherwise standard tool practices are used. Generally, pre-existing tooling 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, 1 mm thick walls are desired however, localized areas (~6 mm²) of 0.5 to 0.8 thickness can be molded successfully. As with any design, material flow within the tool must be evaluated to insure 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.

Insert molding can be employed to eliminate secondary assembly. Insert or two shot molding can create a selectively conductive part. Post molding, Chomerics can perform value added services of silk screening, decal application, apply cosmetic paint, stake threaded inserts, mechanical assembly.... Colors in PREMIER can be made however, due to the Ni-C fiber, choices are limited.



INCREASED STRENGTH

PREMIER A2XX-ST can be made more durable by adding glass. Customization of the polymer blend does not adversely effect EMI shielding or conductivity. Tensile and flexural properties for several blends are shown in Table 2. Thru adding inexpensive glass filler tensile and flexural properties are increased without the need for the more costly conductive filler. To obtain more information on polymer blending contact Chomerics.

	Table 2			
	A220-ST	A225-ST	A220-ST5G	A225-ST5G
Tensile Strength @ Break (psi)	11,800	13,400	12,500	14,000
Tensile Modulus @ (psi X E6)	1.49	1.70	1.74	1.98
Flexural Strength (psi)	17,000	20,000	18,029	20,827
Flexural Modulus (psi X E6)	0.79	1.04	0.88	1.16

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