

PRODUCT DATA SHEET

DESCRIPTION

Toray MS-1A is a high performance carbon fiber/epoxy resin compression molding system based on high-modulus carbon fiber. MS-1A compression molding compound yields unparalleled stiffness and high strength. MS-1A is qualified for space applications.

PRODUCT TYPE

138°C (280°F) Cure High-Modulus Compression Molding System

SHELF LIFE

Out Life:	14 days at 25°C (77°F)
Frozen Storage Life:	6 months at -18°C (< 0°F)

Out life is the maximum time allowed at room temperature before cure.

TYPICAL PROPERTIES

Fiber Length	25.4 mm (1")
Density	1.5–1.55 g/cc
Thermal Expansion X,Y	0.18–0.5 ppm/°C (0.1–0.3 ppm/°F)
T _g (by DSC)	164°C (327°F) post cured at 177°C (350°F)
Outgassing (TML)	0.063%
Outgassing (CVCM)	0.00%

Actual molding technique and conditions, fiber length, and part geometry will affect properties obtained.



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MECHANICAL PROPERTIES

Property	Condition	Method	Typical Results	
Tensile Strength 0°	RTD	ASTM D 3039	289.6 MPa	42 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	131.0 GPa	19 Msi
Compressive Strength 0°	RTD	ASTM D 3410	282.7 MPa	41 ksi
Compressive Modulus 0°	RTD	ASTM D 3410	110.3 GPa	16 Msi
Flexural Strength 0°	RTD	ASTM D 790	462.1 MPa	67 ksi
Flexural Modulus 0°	RTD	ASTM D 790	89.6 GPa	13 Msi
Notched Shear Strength	RTD	ASTM D 5370*	131.0 MPa	19 ksi
Notched Shear Modulus	RTD	ASTM D 5370*	20.7 GPa	3 Msi
Bolt Bearing Str. (Single Shear)	RTD	ASTM D 5961*	365.4 MPa	53 ksi

All items are net molded coupons unless noted
 * Machine Molded
 All properties normalized to 52% fiber volume
 Above values derived after post cure of 177°C/350°F for 1–2 hours

BMC MOLDING GUIDELINES

1. Preweigh the desired amount of molding compound
2. Preheat the molding compound at 71°C ± 5.5°C (160°F ± 10°F) for 10 minutes
3. Form a mold charge to approximately fit the mold cavity
4. Place the charge in the mold cavity
5. Cure: 138–154°C (280–310°F). Pinch pressure 250 psi for 15–30 seconds
6. Close mold to 2000 psi for 15–30 minutes depending on part thickness
7. Post cure at 177°C (350°F) for 1–2 hours

TROUBLESHOOTING

BLISTERING OR BUBBLES:

- ▶ Check mold surface temperature
- ▶ Increase molding pressure
- ▶ Check for moisture in the material

CRACKS OR STRESS MARKS:

- ▶ Check mold surface temperature
- ▶ Check cure time
- ▶ Clean mold surface and re-apply mold release
- ▶ Check ejection pressure, slow down ejection

FLOW MARKS:

- ▶ Close press sooner after charge has been placed in the cavity
- ▶ Increase press closure speed
- ▶ Check mold surface temperature

RESIN STARVATION:

- ▶ Check material out time and staging temperature, keep charge material covered, and in plastic bags
- ▶ Adjust charge weight
- ▶ Clean mold surface and re-apply mold release

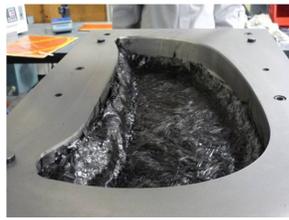
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VOIDS:

- ▶ Check charge set-up, shape, and weight
- ▶ Check mold surface temperature
- ▶ Check preheat time and temperature
- ▶ Check press closure time
- ▶ Clean mold surface and re-apply mold release

THICK PART—UNEVEN DISTRIBUTION OF MATERIAL

- ▶ Pre-consolidate thick sections
- ▶ Spread molding compound in measured increments
- ▶ Evaluate if press capacity is large enough for even pressure across part



GENERAL NOTES

Note that 25.4 mm, 12.7 mm, 6.35 mm (1", ½", and ¼") material will be slightly different with the longer chop length showing as bulkier than the shorter chop lengths. Generally, the material does not brick up (unless exposed to heat or warmth) and is typically free flowing as received once broken free of the packaging. Some centering or clumping is not uncommon; however, when cool, the material should crumble out of the packaging. The bulk volume of the uncured uncompressed material is ~5X that of the compressed/cured part.

When preheated, a preformed charge will shrink maybe 10% if no pressure of any kind is applied other than gravity.

It may debulk down 20–30% if pressure is applied, even hand pressure.

- ▶ The calculated cured density of the material is ~1.483 g/cc (~92.6 lb/ft³)
- ▶ A 1.36 kg (3 lb) bag of 25.4 mm (1") material will measure out to a football shape when in a bag of ~304.8 mm x 254 mm x 127 mm, (~12" x 10" x 5")
- ▶ This loosely calculates to a 10 to 1 ratio; however, the bagged material is not rectangular in shape

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