

# TECHNICAL DATA



TENCATE ADVANCED COMPOSITES

## MS-4A

### PRODUCT TYPE

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

### SHELF LIFE

6 months at 0°F (-18°C)

### PRODUCT DESCRIPTION

MS-4A is a carbon fiber/epoxy resin compression molding system based on standard modulus carbon fiber. MS-4A compression molding compound affords economical processing while providing good strength, stiffness, and moldability. MS-4A is available in fiber lengths ranging from 1/4" to 2" for custom applications.

### MS-4A PHYSICAL PROPERTIES

Fiber Length ..... 1 in.  
Density ..... 1.45-1.49 g/cc  
Thermal Expansion X,Y ..... 3.5-4.5 ppm/°F (6.3-8.1 ppm/°C)  
T<sub>g</sub> (by DSC) ..... 327°F (164°C) Post Cured at 350°F (177°C)

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

### MS-4A MECHANICAL PROPERTIES.

| Properties                       | Condition (RTD, ETD, ETW) | Method       | Results |         |
|----------------------------------|---------------------------|--------------|---------|---------|
| Tensile Strength 0°              | RTD                       | ASTM D3039   | 45 ksi  | 310 MPa |
| Tensile Modulus 0°               | RTD                       | ASTM D3039   | 9 Msi   | 62 GPa  |
| Compressive Strength 0°          | RTD                       | ASTM D3410   | 52 ksi  | 359 MPa |
| Compressive Modulus 0°           | RTD                       | ASTM D3410   | 8 Msi   | 55 GPa  |
| Flexural Strength 0°             | RTD                       | ASTM D790    | 93 ksi  | 641 MPa |
| Flexural Modulus 0°              | RTD                       | ASTM D790    | 7 Msi   | 48 GPa  |
| Notched Shear Strength           | RTD                       | ASTM D5379** | 22 ksi  | 152 MPa |
| Notched Shear Modulus            | RTD                       | ASTM D5379** | 2 Msi   | 14 GPa  |
| Bolt Bearing Str. (Single Shear) | RTD                       | ASTM D5961** | 141 ksi | 972 MPa |

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

### PROCESS PARAMETERS

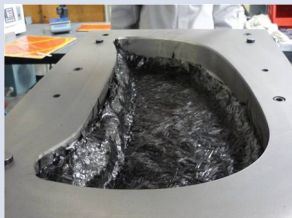
- \* Pre-weigh the desired amount of molding compound.
- \* Pre-heat molding compound in 160°F ± 10°F (71°C ± 8°C) oven for 10 minutes. Form mold charge to approximately fit cavity. Charge cavity with molding compound.
- \* Cure temperature: 280°F-310°F (138°C-154°C). Pinch pressure: 250 psi for 15-30 seconds. Close mold to 2,000 psi, hold for 30 minutes
- \* Post cure at 350°F/177°C for 1-2 hours for full properties.

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Revised 04/2014

All data given is based on representative samples of the materials in question. Since the method and circumstances under which these materials are processed and tested are key to their performance, and TenCate Advanced Composites USA, Inc. has no assurance of how its customers will use the material, the corporation cannot guarantee these properties.

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### BMC MOLDING GUIDELINES:

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

### TROUBLE SHOOTING:

#### 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

#### VOIDS:

- Check charge set-up, shape and weight
- Check mold surface temperature
- Check pre-heat 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 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 pre-heated, a pre-formed 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 or ~92.6 lb/ft<sup>3</sup>.

- A 3 lb bag of 1" material will measure out to a football shape when in a bag of ~12"x10"x5".

- This loosely calculates to a 10 to 1 ratio, however the bagged material is not rectangular in shape.

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