

## NYLON 66/6 - 33% GLASS FIBER REINFORCED, UV STABLE, HEAT STABILIZED

### GMP.PA66/6.004

**1 SCOPE.** This specification covers the properties of a 33% glass fiber reinforced, UV stable, heat stabilized, Nylon 66/6 copolymer and/or blend, pellet form, injection molding compound.

**1.1 APPLICATIONS.** Typical applications include the following: Brackets.

## 2 REFERENCED STANDARDS.

|            |            |            |
|------------|------------|------------|
| GM1002M    | ISO 294/1  | ISO 3795   |
| GM9538P    | ISO 527    | ASTM D789  |
| ISO 75     | ISO 960    | ASTM D4019 |
| ISO 178    | ISO 1183   | SAE J1545  |
| ISO 180/1A | ISO 3146   | SAE J1639  |
| ISO 188    | ISO 3451/4 | SAE J1885  |

## 3 REQUIREMENTS.

**3.1** Materials approved to this specification shall meet the standard requirements in GM1002M.

**3.2 COMPOUND CERTIFICATION.** Material supplier must certify molding compound properties to the specific GM Test Sampling Plan approved for their material.

**3.3 COMPOUND PROPERTIES (NATURAL AND BLACK).** See Table 1.

**3.4 COMPOUND PROPERTIES (INTEGRALLY COLORED).** See Table 2.

**4 TEST PROCEDURES.** Tests shall be conducted using the latest issue of the test methods indicated. Suitable

precautions should be taken to ensure that applicable safe limits are not exceeded when conducting test procedures, processes, and/or handling the materials required by this specification.

**4.1** Test specimens shall be injection molded per ISO 294/1, as described in SAE J1639, unless otherwise specified.

**4.2** All test values indicated herein are based on material with moisture content of 0.2% maximum (ISO 960, Method A; ASTM D789). Immediately after molding, specimens shall be sealed in moisture proof containers and stored @  $23 \pm 2^\circ\text{C}$  for at least 24 h. All tests shall be performed on unannealed specimens immediately after their removal from the containers in a controlled atmosphere of  $23 \pm 2^\circ\text{C}$  and  $50 \pm 5\%$  RH unless otherwise specified.

### 4.3 COLORFASTNESS EVALUATION PROCEDURE.

The color of each test specimen shall be measured per SAE J1545, CIELAB color space,  $10^\circ$  observer, illuminant D65, specular included, sphere geometry, before and after exposure.

**4.4** A shear modulus plotted curve, as defined in SAE J1639, shall be provided with each GMP certification package. The temperature range @  $5^\circ\text{C}$  intervals is  $-50$  to  $+210^\circ\text{C}$ .

**5 GENERAL INFORMATION.** This standard was originated by the Plastics Committee in April 1992. The latest revisions include:

| Rev | Date  | Description   |
|-----|-------|---------------|
| A   | 3/97  | ASTM to ISO   |
| B   | 12/97 | Added Natural |

**TABLE 1 - COMPOUND PROPERTIES (NATURAL AND BLACK)**

| Properties                                    | Test Values                   | Test Methods                                           |
|-----------------------------------------------|-------------------------------|--------------------------------------------------------|
| Glass Fiber Reinforcement (NOTE 1)            | 30 - 35%                      | ISO 3451/4                                             |
| Moisture Content as Received (NOTE 1)         | .20% max                      | ISO 960, Method A, B, C, or D; ASTM D789 or ASTM D4019 |
| Density (NOTE 1)                              | 1.35 - 1.43 g/cm <sup>3</sup> | ISO 1183, Method A                                     |
| Melt Point (NOTE 1)                           | 230 - 242°C                   | ISO 3146, Method C                                     |
| Flexural Modulus (NOTE 1)                     | 7200 MPa min                  | ISO 178, Reference SAE J1639                           |
| Tensile Strength at Break (NOTE 1)            | 160 MPa min                   | ISO 527, 5 mm/minute                                   |
| Notched Izod Impact Strength after Heat Aging | 75% min retention of original | ISO 1881000 h @ 140°C, Reference SAE J1639             |
| Deflection Temperature Under Load (NOTE 1)    | 194°C min                     | ISO 75, test flatwise, Reference SAE J1639             |
| Flammability                                  | SE or < 100 mm/minute         | ISO 3795/SAE J1639                                     |
| Notched Izod Impact                           |                               | ISO 180/1A, Reference SAE J1639                        |
| @ $+23 \pm 2^\circ\text{C}$                   | 9.2 kJ/m <sup>2</sup> min     |                                                        |
| @ $-40 \pm 2^\circ\text{C}$                   | 5.0 kJ/m <sup>2</sup> min     |                                                        |

NOTE 1: These properties are statistically derived.

## GENERAL MOTORS ENGINEERING STANDARDS

## Materials and Processes - Plastics

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**TABLE 2 - COMPOUND PROPERTIES (INTEGRALLY COLORED)**

| Properties                                                         | Test Values                                            | Test Methods                                                                                                     |
|--------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Notched Izod Impact<br>@ +23 ± 2°C<br>@ -40 ± 2°C                  | 6.0 kJ/2 <sup>3</sup> min<br>3.0 kJ/m <sup>2</sup> min | ISO 180/1A, Reference SAE J1639                                                                                  |
| Colorfastness to Light (NOTE 2)<br>Color Change<br>Surface Defects | ΔE - 3.0 max<br>No objectionable defects allowed       | 601.6 kJ/m <sup>2</sup> exposure to interior xenon arc apparatus per SAE J1885. Measure color as defined in 3.3. |

NOTE 2: For UV stable/weatherable material used in safety related components, impact strength retention after weathering should be considered in design.