**POLYAMIDE (PA) 66, HEAT STABILIZED 25% GLASS FIBER REINFORCED MOLDING COMPOUND** — **WSS-M4D1016-A1**

**POLYAMIDE (PA) 66, HEAT STABILIZED 25% GLASS FIBER REINFORCED MOLDING COMPOUND, 75% PCR AND/OR PIR CONTENT** — **WRS-M4D1016-A2**

## 1. SCOPE

The materials defined by these specifications are thermoplastic injection molding compound based on a 25% glass fiber reinforced, heat stabilized, and polyamide 66. Material with recycled content should be used whenever feasible

## 2. APPLICATION

These specifications were released originally for material used for fan and shroud.

### 2.1 LIMITATIONS

- This material absorbs and retains moisture. Part design and tolerances must accommodate changes in part dimensions and physical properties due to moisture absorption or loss in the service/assembly environment.
- This material does not contain UV stabilizers, long term exposure to direct sunlight will cause chalking and loss of gloss.

## 3. REQUIREMENTS

### 3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements for Production Materials (WSS-M99P1111-A).

3.1.1 Many 4D resin specifications prior to 2011, identified certain requirements with the symbol (s), which indicated that the mean and +/- 3 sigma values were to be reported. The specification minimum, maximum or range was established using 3 sigma data. For 2011 and beyond, refer to Table 1 for number of samples required for each test to establish specification limits.

3.1.2 WSS-M4D1016-A1 is based on virgin materials.

3.1.3 WRS-M4D1016-A2 must contain 75% Post Consumer Recycled (PCR) and/or Post Industrial Recycled (PIR) content as defined by WRS-M99P42-A1. The remaining portion of the material can come from virgin sources.

3.1.4 The use of regrind is permitted for economic and environmental reasons with compliance as indicated in WSS-M99P1111-A.

3.1.5 Dry as molded:

All test values indicated herein are based on material and specimens with moisture content not exceeding 0.2% except where noted (Moisture Conditioned) (test according to ISO 15512 Method B/ASTM D6869).

| Date | Action | Revisions | Rev. 9 |
|---|---|---|---|
| 2015 02 16 | Revised | See Summary of Revisions | G. Kowalski, NA |
| 2013 07 04 | Revised | See Summary of Revisions | G. Kowalski, NA |
| 2011 04 13 | Activated | Activated A2 | V. Cerato, FOE |

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All test materials have to be sealed in moisture-proof containers and stored at 23 +/- 2 °C for at least 24 h immediately after processing. If the moisture content exceeds 0.2%, conditioning the material for a minimum of 16 h at 40 – 50 °C at a reduced pressure below 133 kPa.

Conduct tests in a controlled atmosphere of 23 +/- 2 °C and 50 +/- 5% relative humidity. Individual specimens shall not be removed from closed containers until immediately before testing.

3.1.6 Performance Criteria:

Parts using this specification shall meet the WSS-M15P50-B or latest for engine compartment and underbody applications performance requirements.

## 3.2 SAMPLE PREPARATION

Unless otherwise specified all tests shall be carried out on injection molded, one-end gated test specimens. The test specimens A and D shall be molded using molding conditions defined in ISO 1874-2. See Table 1 for the number of samples required.

Specimens shall be as follows:

| | |
|---|---|
| Specimen A | 150 minimum x 10 x 4.0 +/- 0.2 mm (ISO 527-2, Specimen Type 1A) |
| Specimen B | 355 x 100 x 1.0 +/- 0.1 mm (ISO 3795) |
| Specimen C | 145 x 60 x 3.2 +/- 0.2 mm |
| Specimen D | Center of Specimen A. 80 x 10 x 4.0 +/- 0.2 mm |
| Specimen E | 100 mm diameter x 3.2 mm |
| Specimen F | 80 mm diameter x 3.2 mm |
| Specimen G | 90 mm x 200 mm |
| Specimen H | 50 +/- 1 mm diameter x 3.2 +/- 0.2 mm |
| Specimen I | 100 mm x 150 mm, min |

## 3.3 MATERIAL PROPERTIES

| | | | A1 | A2 |
|---|---|---|---|---|
| 3.3.1 | Melt Temperature (ISO 11357, 10 °C/min heating rate) | | 250- 267 °C | |
| 3.3.2 | Glass Fiber Content (ISO 3451-4, test temperature 600 +/- 25 °C, test portion 2 to 2.5 g) | | 22.5 -29 % | |
| 3.3.3 | Density (ISO 1183, Method A) | | 1.23-1.45 g/cm$^3$ | |
| 3.3.4 | Tensile Strength at Break, (ISO 527-1 & ISO 527-2, Specimen A, 5 mm/minute test speed) | | 150 MPa min | 115 MPa min |
| 3.3.5 | Tensile Modulus (ISO 527-1 & ISO 527-2, Specimen A 1 mm/minute test speed) | | 7.5 GPa min | 6.0 GPa min |
| 3.3.6 | Impact Strength Notched Charpy (ISO 179-1eA, Specimen D) | | | |
| | 3.3.6.1 | At 23 +/- 2 °C | 5.0 kJ/m$^2$ min | |
| | 3.3.6.2 | At -40 +/- 2 °C | 3.0 kJ/m$^2$ min | |

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