



## POLYPROPYLENE COPOLYMER 10% MINERAL FILLED, MOLDING COMPOUND

WSS-M4D651-B2

### 1. SCOPE

The material defined by this specification is a thermoplastic polypropylene copolymer molding compound, 10% mineral filled for general purpose non-visible exterior use.

### 2. APPLICATION

This specification was released originally for material used for retainers, bumper to body.

#### 2.1 LIMITATIONS

Material approved to this specification is unlikely to contain UV stabilizers, therefore long term exposure to direct sunlight could cause chalking and loss of gloss. This material may not be suitable for under hood applications because it has not been tested against the relevant oil and chemical resistance requirements.

### 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). 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.

3.1.1 This specification is based on virgin materials, however materials with recycled content as defined by WRS-M99P42-A1 (post-consumer and/or post industrial recyclates and repolymerised recycled materials) should be used whenever technically feasible and following all materials and PV testing required by Ford Materials Engineering. The use of regrind is permitted, for economic/environmental reasons, with compliance as indicated in WSS-M99P1111-A.

3.1.2 Performance Criteria: Parts made of this material must fulfill all relevant SDS 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 1873-2. No annealing is allowed. See Table 1 for the number of samples required.

| Date       | Action    | Revisions                            | Rev 1          |
|------------|-----------|--------------------------------------|----------------|
| 2013 04 23 | Revised   | See Summary of Revisions for details | T. Nover, EU   |
| 2011 06 06 | Activated | Replaces WSK-M4D651-A2               | M. Corley, FoE |



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

|         |                                                                                                        |                                                |
|---------|--------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 3.3.1   | Mineral Filler Content<br>(ISO 3451-1, Method A,<br>1 hr at 650 +/- 50 °C,<br>test portion 2 to 2.5 g) | 8-14 %                                         |
| 3.3.2   | Density<br>(ISO 1183, Method A)                                                                        | 0.96-1.01 g/cm <sup>3</sup>                    |
| 3.3.3   | Tensile Strength at Yield<br>(ISO 527-1 & ISO 527-2, Specimen A,<br>50 mm/minute test speed)           | 21 MPa min                                     |
| 3.3.4   | Tensile Modulus<br>(ISO 527-1 & ISO 527-2, Specimen A,<br>1 mm/min test speed)                         | 1.6 GPa min                                    |
| 3.3.5   | Flexural Modulus<br>(ISO 178, Specimen D,<br>64 mm support span, 2 mm/min test speed)                  | 1.6 GPa min                                    |
| 3.3.6   | Impact Strength, Notched Izod<br>(ISO 180/1A, Specimen D)                                              |                                                |
| 3.3.6.1 | At 23 +/- 2 °C                                                                                         | 4 kJ/m <sup>2</sup> min<br>Report Break Type   |
| 3.3.6.2 | At -40 +/- 2 °C                                                                                        | 1.8 kJ/m <sup>2</sup> min<br>Report Break Type |
| 3.3.6.3 | At 0 +/- 2 °C                                                                                          | 3 kJ/m <sup>2</sup> min<br>Report Break Type   |

The test specimen must be conditioned for minimum of 6 hours at the above specified temperature prior to impact test. Low temperature testing shall be done within the cold chamber, if not possible, test may be conducted outside, but within 5 seconds.