



POLYETHERIMIDE (PEI) MOLDING COMPOUND,

WSS-M4D716-B1

1. SCOPE

The material defined by this specification is a long term high heat resistant thermoplastic injection molding compound based on polyetherimide (PEI). This material exhibits high dimensional stability and excellent electrical properties. This material is self-extinguishing (SE) without flame retardant additives.

2. APPLICATION

This specification was released originally for material used for the fuse box and headlamp reflectors.

2.1 LIMITATIONS

This material does not contain UV stabilizers, long term exposure to direct sunlight will cause chalking and loss of gloss.

No metallized regrind is allowed.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification is part of the Ford Co-Managed Buy (CMB) agreement. Tier 1 Molders who are participating under the CMB agreement must use one the following approved sources (deviations require approval from Raw Materials Purchasing and Materials Engineering):

The approved source for this specification is Sabic Ultem AUT200.

Molders not on the CMB program or regions without CMB are required to use materials listed on the Ford Approved Source List (ASL), and are encouraged to use the CMB sources listed above. Only the sources identified on the Approved Source List can be used when this specification is listed on the drawing, CAD file, or other documents. The list of approved sources is located within Ford at www.mats.ford.com or available externally through a Ford Materials Engineer

3.2 CONDITIONING AND TEST CONDITIONS

All test values are based on material conditioned for not less than 24 h prior to testing in a controlled environment of 23 +/- 2 °C and 50 +/- 5% relative humidity. Testing of the material should occur in the conditioning environment or soon after removal.

3.3 INFRARED SPECTROPHOTOMETRY AND/OR THERMAL ANALYSIS

IR spectra and thermograms from initial material approval shall constitute the reference standard and shall be kept on file at the designated material laboratory. The material supplier shall ensure that all future material supplied to the specification shall produce IR spectra and thermograms that correspond to the reference standard when tested under the same conditions.

Date	Action	Revisions	Rev. 00
2016 01 20	Released		



Documents

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Document Sharing Hub



3.4 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

- 3.4.1 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.
- 3.4.2 This specification is based on virgin material and does not allow the addition of recycled content (PIR/PCR).
- 3.4.3 Performance Criteria:
Parts approved to WSS-M4D716-B1 must comply with all the requirements of, WSS-M5P8-Latest and must fulfill applicable SDS/CDS requirements.
- 3.4.4 As specified in WSS-M99P1111-A, paragraph 3.2, Ford Materials Engineering may request a Control Plan and Certificate of Analysis (CoA) containing lot testing requirements which must include, but are not limited to:

Melt Flow Rate
Tensile Modulus
Impact Strength, Notched Charpy at 23°C
Flexural Modulus

3.5 SAMPLE PREPARATION

All tests shall be carried out on production materials manufactured from the production process unless correlation to a non-production process has been reviewed and approved by Ford Materials Engineering.

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 7391-2. See Tables 1 and 2 for the number of samples required.

Specimens shall be as follows:

Specimen A	150 minimum x 10 x 4.0 $\pm$ 0.2 mm (ISO 527-2, specimen type 1A)
Specimen B	355 x 100 x 1.0 $\pm$ 0.1 mm
Specimen C	145 x 60 x 3.2 $\pm$ 0.2 mm
Specimen D	80 x 10 x 4.0 $\pm$ 0.2 mm (may be cut from the center of Specimen A)
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 $\pm$ 1 mm diameter x 3.2 $\pm$ 0.2 mm
Specimen I	100 mm x 150 mm, min

3.6 MATERIAL PROPERTIES

- 3.6.1 Density
(ISO 1183, Method A) 1.24 - 1.33 g/cm³
- 3.6.2 Tensile Strength at Yield
(ISO 527-1 & ISO 527-2, Specimen A,
50 mm/minute test speed) 100 MPa min
- 3.6.3 Elongation at Yield
(ISO 527-1 & ISO 527-2, Specimen A,
50 mm/minute test speed) 5% min



3.6.4	Tensile Modulus (ISO 527-1 & ISO 527-2, Specimen A 1 mm/min test speed)	2.0 GPa min
3.6.5	Flexural Modulus (ISO 178, Specimen D, 64 mm support span, 2 mm/min test speed)	2.8 GPa min
3.6.6	Impact Strength, Notched Charpy (ISO 179-1/1eA, Specimen D)	
3.6.6.1	At 23 +/- 2 °C	2.0 kJ/m ² min. Complete Break
3.6.6.2	At -40 +/- 2 °C	3.0 kJ/m ² min. Complete Break

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. Test specimens must be reviewed by Materials Engineering.

3.6.7	Heat Deflection Temperature (ISO 75-1 & ISO 75-2, Specimen D, flatwise, Bath – silicone oil, 0.34 +/- 0.1 mm deflection. At 1.80 MPa)	180 °C min
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All specimens dry as molded. If not tested immediately after molding, specimens must be stored in a sealed, moisture-proof container filled with silica gel.

3.6.8	Vicat Softening Temperature (ISO 306, Method B50, Specimen D, Bath - silicone oil)	136 °C min
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3.6.9	Heat Aging Performance (ISO 188/ASTM D573, 150 +/- 50 air changes/h, 1000 h at 180 +/- 2 °C. After heat aging test specimens are to be conditioned in a desiccator for 3 - 5 h at 23 +/- 2 °C. Unaged property values shall be determined at the time of the aged properties determination)	
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3.6.9.1	Tensile Strength at Yield Change (Test Method per para 3.6.3)	+/- 25%
3.6.9.2	Impact Strength, Notched Charpy Change (Test Method per para 3.6.6.1, specimens to be notched before heat aging)	+/- 25%

3.6.10	Determination of the Fogging Characteristics of Automotive Materials Photometric (SAE J1756, Specimen F, 3 h at 100 °C heating, 21 °C cooling plate, post-test conditioning 16 h)	
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Fog Number	90 min
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Formation of clear film, droplets or crystals is cause for rejection)

