



POLYPROPYLENE (PP) COPOLYMER COOLING AGENT RESISTANT MOLDING COMPOUND

WSS-M4D741-B2

1. SCOPE

The material defined by this specification is a thermoplastic injection molding compound based on polypropylene copolymer. This material is resistant to engine coolant.

2. APPLICATION

This specification was released originally for material used for overflow/degas bottles.

2.1 LIMITATIONS

- This material has low impact resistance at low temperatures.
- The material undergoes creep at elevated temperatures.
- Load limiters are required for fasteners and inserts may be necessary on outlets where clamping is required.

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):

Specification	North American Programs	European Programs
WSS-M4D741-B21	Lyondell Basell / Equistar Hostalen PP HP1886	TBD

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.

Date	Action	Revisions	Rev. 0
2017 05 31	Released		

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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.

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 The use of regrind is permitted, for economic / environmental reasons. Part manufacturers using this specification must complete DV and PV testing with the allowable amount of regrind and the maximum allowable regrind content must be specified on the engineering drawing. Any changes to what is specified on the drawing (no specific amount implies zero regrind) must be approved by Materials and PD Engineering through the formal Ford Motor Company process (SREA) or Engineering Notice.

3.4.4 Material must be processed per Global Manufacturing Standard W-IMMS - Control of Plastic Injection Molding Processes, located on the Ford Supplier Portal, STA Global Technical Services, Plastic Molding, https://web.qpr.ford.com/sta/Ford_GTS.html.

3.4.5 Materials requiring High Strain Rate, Creep or fiber oriented Tensile Modulus may be required to test to the requirements of WSS-M99D68-A1/Latest, *Thermoplastic Property Determination For CAE, High Strain Rate Tensile, Creep and Tensile Modulus*. Material Suppliers should be prepared to submit data upon request.

3.4.6 Performance Criteria:
Parts using this specification shall meet the appropriate performance specifications, WSS-M15P50-B/Latest.

3.4.7 Ford Materials Engineering may request a Control Plan and Certificate of Analysis (C of A) containing lot testing requirements which must include, but are not limited to:

Melt Flow Rate
Filler Content
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 1873-2. No annealing is allowed 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
Specimen C	145 x 60 x 3.2 +/- 0.2 mm
Specimen D	80 x 10 x 4.0 +/- 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 +/- 1 mm diameter x 3.2 +/- 0.2 mm
Specimen I	100 mm x 150 mm, min

3.6 MATERIAL PROPERTIES

3.6.1	Melt Flow Rate (ISO 1133 230 °C, 2.16 kg)	1.1-1.6 g/10 minutes
3.6.2	Density (ISO 1183, Method A)	0.876-0.924 g/cm ³
3.6.3	Tensile Strength at Yield (ISO 527-1 and ISO 527-2, Specimen A, 50 mm/minute test speed)	32 MPa min
3.6.4	Elongation at Yield (ISO 527-1 and ISO 527-2, Specimen A, 50 mm/minute test speed)	10 % min
3.6.5	Tensile Modulus (ISO 527-1 and ISO 527-2, Specimen A, 1 mm/minute test speed)	1.12 GPa min
3.6.6	Flexural Modulus (ISO 178, Specimen D, 64 mm support span, 2 mm/minute test speed)	1.22 GPa min
3.6.7	Impact Strength, Notched Charpy (ISO 179-1/1eA, Specimen D)	
3.6.7.1	At 23 +/- 2 °C	4.8 kJ/m ² min Report Break Type
3.6.7.2	At -40 +/- 2 °C	1 kJ/m ² min Report Break Type