



**POLYPHENYLENE SULFIDE (PPS) MOLDING COMPOUND,
IMPACT MODIFIED, HIGHER MODULUS**

WSS-M4D1063-A1

**POLYPHENYLENE SULFIDE (PPS) MOLDING COMPOUND,
IMPACT MODIFIED, LOWER MODULUS**

WSS-M4D1063-A2

1. SCOPE

The materials defined by these specifications are flexible, thermoplastic polyphenylene sulfide injection molding compounds. The materials are useful in applications where flexible, high impact nylon has insufficient heat resistance.

2. APPLICATION

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This specification was released originally for higher temperature clips and fasteners.
This specification was released originally for higher temperature cable ties, the lower modulus allows hand assembly.

2.1 LIMITATIONS

These material are not applicable for mold in color, weatherable parts.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification requires the use of approved sources. Only the sources identified on the Ford Approved Source List (ASL) 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. 0
2017 09 15	Released		

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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 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
Impact Strength, Notched Charpy at 23 °C
Tensile 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 25137-2. 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
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

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3.6.1	Melt Temperature, °C (ISO 11357, 10 °C/min heating rate)	274 to 284	276 to 286
3.6.2	Density, g/cm ³ (ISO 1183, Method A)	1.23 to 1.25	1.14 to 1.18



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3.6.3 Tensile Strength at Break (ISO 527-1 and ISO 527-2, Specimen A, 50 mm/minute test speed)	35 MPa min	35 MPa min
3.6.4 Elongation at Break (ISO 527-1 and ISO 527-2, Specimen A, 50 mm/minute test speed)	10 % min	0.5% min
3.6.5 Tensile Modulus (ISO 527-1 and ISO 527-2, Specimen A, 1 mm/minute test speed)	2.1 GPa min	1.4 GPa min
3.6.6 Flexural Modulus (ISO 178, Specimen D, 64 mm support span, 2 mm/minute test speed)	2.0 GPa min	1.4 GPa min
3.6.7 Impact Strength, Notched Charpy (ISO 179-1/1eA, Specimen D)		
3.6.7.1 At 23 +/- 2 °C, Report Break Type	6 kJ/m ² min	3 kJ/m ² min
3.6.7.2 At -40 +/- 2 °C Report Break Type	3 kJ/m ² min	2.5 kJ/m ² min
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.		
3.6.8 Heat Deflection Temperature at 1.8 MPa, (ISO 75-1 and ISO 75-2, Specimen D, flatwise, Bath – silicone oil, 0.34 +/- 0.1 mm deflection.)		90 °C min
3.6.9 Heat Aging Performance (1000 h at 215 +/- 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)		
3.6.9.1 Tensile Strength at break, Change (Test Method per para 3.6.3)		- 25 % max
3.6.9.2 Impact Strength, Notched Charpy (Test Method per para 3.6.7.1, specimens to be notched before Heat Aging)		- 25 % max