POLYAMIDE (PA) 6, HEAT STABILIZED 30% GLASS FIBER REINFORCED MOLDING COMPOUND, INTERIOR **WSS-M4D664-B1**

POLYAMIDE (PA) 6, HEAT STABILIZED 30% GLASS FIBER REINFORCED MOLDING COMPOUND, INTERIOR, XX% PCR AND/OR PIR CONTENT **WRS-M4D664-B2**

(The specifications for a recycled version of this resin are under development. Contact Materials Engineering (FoE) for status)

1. SCOPE

The material defined by this specification is 30% glass fiber reinforced, heat and UV stabilized polyamide 6 molding compound for interior use. Materials with recycled content should be used whenever feasible.

2. APPLICATION

This specification was released originally for material used for interior functional parts.

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.

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-M4D664-B1 is based on virgin materials.

3.1.3 WRS-M4D664-B2 must contain XX% of recycled 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.

Date	Action	Revisions	Rev. 0
2011 10 10	Activated	Replaces WSK-M4D664-A2	V. Cerato, FOE

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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).

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 to 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 Materials used in interior applications must meet the requirements outlined in WSS-M99P2222-C1/Latest, *Performance, Vehicle Interior Environment Quality Material/Component Requirements*. Data must be included in material submission package.

3.1.7 Mold-in-color parts using this material must comply with all the requirements of WSS-M15P4-F or latest.

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 Tables 1 and 2 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 APPEARANCE

3.3.1 Weathering Resistance — Rating 4 min
(FLTM BO 116-01, 1203.2 kJ/m^2 exposure
Specimen C from smooth polished mold,
ISO 105-A02 / AATCC Evaluation Procedure 1)

Every 526.4J/m^2 remove the samples from the weatherometer and allow them to cool for one hour. Conduct a tactile evaluation and report any tackiness. Visually evaluate and report any spewing or other exudation.

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After exposure the material shall show no fading or color change in excess of the specified AATCC rating. In addition, there shall be no cracking, crazing or other deterioration.

Use black for initial approval and report the color house used.
See Table 2 for additional color durability submission requirements.

3.4 MATERIAL PROPERTIES

3.4.1	Melt Temperature (ISO 11357, 10 °C/min heating rate)	215 – 225 °C
3.4.2	Glass Fiber Content (ISO 3451-4, test temperature 600 +/- 25 °C, test portion 2 to 2.5 g)	27 - 33%
3.4.3	Density (ISO 1183, Method A)	1.34 – 1.40 g/cm^3
3.4.4	Tensile Strength at Break (ISO 527-1 & ISO 527-2, Specimen A, 5 mm/minute test speed)	150 MPa min
3.4.5	Tensile Modulus (ISO 527-1 & ISO 527-2, Specimen A, 1 mm/minute test speed)	8.5 GPa min
3.4.6	Impact Strength, Notched Charpy (ISO 179-1eA, Specimen D)	
3.4.6.1	At 23 +/- 2 °C	7.0 kJ/m^2 min Report Break Type
3.4.6.2	At -40 +/- 2 °C	5.0 kJ/m^2 min 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.

3.4.7	Heat Deflection Temperature (ISO 75-1 & ISO 75-2 Specimen D, flatwise, 0.34 +/- 0.1 mm deflection. At 1.80 MPa)	190 °C min

3.4.8 Heat Aging Performance
(ISO 188, except 150 +/- 50 air changes/h, 1000 h at 140 +/- 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)

3.4.8.1	Impact Strength, Notched Charpy Change (Test Method per para 3.4.6.1, specimens to be notched before Heat Aging)	+/- 25% max

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