



ENGINEERING MATERIAL SPECIFICATION

Material Name

Specification Number

POLYPROPYLENE COPOLYMER, 22 % MINERAL FILLED, INTERIOR	WSK-M4D556-A
POLYPROPYLENE COPOLYMER, 22 % MINERAL FILLED, MEDIUM SCRATCH RESISTANT MOLDING COMPOUND, INTERIOR	WSK-M4D556-A3
POLYPROPYLENE COPOLYMER, 20 % MINERAL FILLED, HIGH SCRATCH RESISTANT MOLDING COMPOUND, INTERIOR	WSK-M4D556-A4
POLYPROPYLENE COPOLYMER, 24 % MINERAL FILLED, HIGH SCRATCH RESISTANT MOLDING COMPOUND, MULTI SPOT DECOR, INTERIOR	WSK-M4D556-A5

1. SCOPE

The materials defined by these specifications are colored 20 to 24 % mineral filled injection moulding compounds based on polypropylene copolymers. WSK-M4D556-A3, -A4 and -A5 materials are qualified to fulfil higher requirements for scratch resistance. WSK-M4D556-A5 material shows additionally multi spot decor effects.

2. APPLICATION

These specifications were released originally for materials used for various interior applications such as pillar trims, door bins, package tray side supports etc.

3. REQUIREMENTS

3.1 STATISTICAL PROCESS

Suppliers must conform to the requirements of Ford Quality System Standard Q-101. A mutually acceptable Control Plan as described therein is required for material/source approval. Appropriate statistical tools must be used to analyze process/product data so that variation in the final product is continuously reduced.

3.1.1 All requirements of this specification, identified by symbol (s), shall be met with data representing 3 sigma values.

3.2 INFRARED SPECTROPHOTOMETRY AND/OR THERMAL ANALYSIS

Ford Motor Company, at its option, may conduct infrared and/or thermal analysis of material/parts supplied to this specification. The IR spectra and thermograms established for initial approval shall constitute the reference standard and shall be kept on file at the designated material laboratory. All samples shall produce IR spectra and thermograms that correspond to the reference standard when tested under the same conditions.

Date	Release No.	Release/Revision
1993 12 01	EP00E10258833000	Revised all pages; Released A5 L. Rodigas
1992 08 08	EP00E10176303000	-A: Scratch cancl'd., A3 & A4 added L. Rodigas
1992 04 01	EP00E10176266000	Revised all pages L. Rodigas

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3.3 CONDITIONING AND TEST CONDITIONS

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 +/- 2 C and 50 +/- 5 % relative humidity for not less than 96 h prior to testing and tested under the same conditions unless otherwise specified.

3.4 MOLDING COMPOUND

- (s) 3.4.1 Melt Flow Rate
(ISO 1133, 230 C, 216 kg)

WSK-M4D556-A, A3 & A5
WSK-M4D556-A4

17 - 29 g/10 minutes
11 - 22 g/10 minutes

- (s) 3.4.2 Filler Content,
(ISO 3451/1, Method A, 30 minutes
at 800 +/- 50 C, test portion
1 to 2 g)

WSK-M4D556-A, A3 & A5
WSK-M4D556-A4

19 - 27 %
17 - 25 %

3.5 MOLDED TEST SPECIMEN

3.5.1 Preparation of Test Specimens

Unless otherwise specified all tests shall be carried out on injection molded one-end gated test specimens.

The following dimensions are required:

- A. 150 min x 10 x 4.0 +/- 0.2 mm (Tensile Bar, ISO 3167)
B. 120 x 10 x 4.0 +/- 0.2 mm

Specimens with shorter dimensions shall be cut from the center portion of the test specimen A and/or B. The specimens shall be prepared according to ISO 294. No annealing allowed.

- 3.5.2 Density (WSK-M4D556-A, A3, A4 & A5)
(ISO 1183, Method A) 1.02 - 1.11 g/cm³

- (s) 3.5.3 Tensile Strength at Yield, min 20 MPa
(WSK-M4D556-A, A3, A4 & A5)
(ISO R 527, 150 min x
10 x 4.0 +/- 0.2 mm specimen,
50 mm/minute test speed)



- (s) 3.5.4 Flexural Modulus, min
(ISO 178, 80 x 10 x 4.0 +/- 0.2 mm
specimen, 2 mm/minute test speed,
64 mm support span)

WSK-M4D556-A	2.0 GPa
WSK-M4D556-A3, A4 & A5	1.9 GPa

- 3.5.5 Shear Modulus at 23 C
(ASTM D 4065, forced constant
amplitude, fixed frequency of
1 Hz +/- 15 %, strain level below 1 %.
Specimen approx. 60 x 10 x 4.0 +/- 0.2 mm
cut from the center of specimen A.
Specimen length between clamps 35-40 mm
Soak time at each temperature interval -
3 minutes minimum)

WSK-M4D556-A & -A4	0.80 - 1.35 GPa
WSK-M4D556-A3	0.75 - 1.30 GPa
WSK-M4D556-A5	0.70 - 1.40 GPa

Additionally, a Shear Modulus vs. Temperature curve shall be plotted for - 50 to + 150 C temperature range, at 5 C minimum intervals. The plotted curves must be within tolerance ranges shown on pages 9 (-A), 10 (-A3), 11 (-A4) and 12 (-A5).

- (s) 3.5.6 Impact Strength, Izod, min
(ISO 180/1A, 80 x 10 x 4.0
+/- 0.2 mm specimen, 10 specimens
for each test)

- 3.5.6.1 At 23 +/- 2 C

WSK-M4D556-A, A3, A4 & A5	4.0 kJ/m2
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- 3.5.6.2 At - 40 +/- 2 C

WSK-M4D556-A	2.0 kJ/m2
WSK-M4D556-A3, A4 & A5	1.8 kJ/m2

- 3.5.6.3 At 10 +/- 2 C

WSK-M4D556-A	3.5 kJ/m2
WSK-M4D556-A3 & A5	3.0 kJ/m2
WSK-M4D556-A4	2.8 kJ/m2

The test specimens must be conditioned for minimum of 6 h at the above specified temperature prior to impact test. Low temperature testing shall be done within the cold box.



- (s) 3.5.7 Heat Deflection Temperature, min
(ISO 75, 120 x 10 x 4.0
+/- 0.2 mm specimen, 0.32 +/-
0.01 mm deflection)
- 3.5.7.1 At 1.80 MPa
- | | |
|------------------------|------|
| WSK-M4D556-A & A4 | 55 C |
| WSK-M4D556-A3, A4 & A5 | 52 C |
- 3.5.7.2 At 0.45 MPa
- | | |
|------------------------|-------|
| WSK-M4D556-A | 105 C |
| WSK-M4D556-A3, A4 & A5 | 102 C |
- 3.5.8 Heat Aging Performance
(WSK-M4D556-A, A3, A4 & A5)
(ISO 188, except 150 +/- 50 air
changes/h, 1000 h at 140 +/- 2 C.
Unaged property values shall be
determined at the time of the aged
properties determination)
- 3.5.8.1 Tensile Strength at Yield
Change
(Test Method per para 3.5.3) +/- 20 %
- 3.5.8.2 Impact Strength, Izod
Change, max
(Test Method per para 3.5.6.1,
specimens to be notched before
heat aging) - 15 %
- 3.6 FOGGING (WSK-M4D556-A, A3, A4 & A5)
(FLTM BO 116-03, 3 h at 100 C)
- Fog Number, min 80
- Formation of clear film or droplets is cause for rejection.
- 3.7 FLAMMABILITY (WSK-M4D556-A, A3, A4 & A5)
(ISO 3795)
- Burn Rate, max 100 mm/minute
- The specimen size required for material approval is 355 x 100 x 1.0
+/- 0.1 mm with a smooth surface.
- 3.8 WEATHERING RESISTANCE (WSK-M4D556-A, A3, A4 & A5)
- After exposure in accordance with 3.8.1 and 3.8.2 the material
shall show no fading or color change in excess of specified Gray
Scale Rating (AATCC Evaluation Procedure 1/ISO 105-A02).