



ENGINEERING MATERIAL SPECIFICATION

Material Name

Specification Number

POLYAMIDE 12 (PA 12) COPOLYMER, AMORPHOUS
MOLDING COMPOUND, EXTERIOR

WSK-M4D890-A1

1. SCOPE

The material defined by this specification is a UV stabilised, amorphous molding compound based on a copolymer of polyamide 12 with partial aromatic content.

2. APPLICATION

This specification was released originally for material used as door lock IR receiver.

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 thermogram 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.

3.3 CONDITIONING AND TEST CONDITIONS

All test values indicated herein are based on material and specimens with moisture content not exceeding 0.2 % (test according to ISO 960, Method B).

All test materials immediately after processing have to be sealed in containers that are impermeable to water vapor. If the moisture content exceeds 0.2 %, condition the material for a minimum of 16 h at 40 - 50 C at a reduced pressure below 133 Pa.

Date	Release No.	Release/Revision
1993-12-01	EP00E10258833000	Released K. Gerhards

WP 3948-a

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3.4 MOLDING COMPOUND

- (s) 3.4.1 Glass Transition Temperature 155 - 165 C
(ASTM D 3418, DSC)

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 1.04 - 1.07 g/cm³
(ISO 1183, Method A)
- (s) 3.5.3 Tensile Strength at Yield, min 75 MPa
(ISO 527, 150 minimum x
10 x 4.0 +/- 0.2 mm specimen,
50 mm/min test speed)
- (s) 3.5.3.1 Elongation at Yield, min 6 %
(Test Method according
to para 3.5.3)
- (s) 3.5.4 Flexural Modulus, min 2.0 GPa
(ISO 178, 80 x 10 x 4.0 +/- 0.2 mm
specimen, 2 mm/min test speed,
64 mm support span)
- 3.5.5 Shear Modulus at 23 C 700 - 1050 MPa
(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)

Additionally, a Shear Modulus versus Temperature curve shall be plotted for - 50 to + 150 C temperature range, at 5 C minimum intervals. The plotted curve must be within tolerance range shown on page 7.



- (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 3.5 kJ/m2

3.5.6.2 At - 40 +/- 1 C 3.5 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 122 C

3.5.7.2 At 0.45 MPa 140 C

- 3.5.8 Heat Aging Performance
(ISO 188, except 150 +/- 50 air
changes/h, 1000 h at 110 +/- 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)

3.5.8.1 Tensile Strength at Max
Load Change +/- 25 %
(Test Method per para 3.5.3)

- 3.6 FOGGING
(FLTM BO 116-03, 3 h at 100 C)

Fog Number, min 90

Formation of clear film, droplets, or crystals is cause for rejection.

- 3.7 FLAMMABILITY
(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.