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| GM | WORLDWIDE ENGINEERING STANDARDS | Material Specification | GMW17482 |

# Polyamide 66 - Fibrous Mineral Filled, Heat Stabilized

## 1 Scope

**1.1 Material Description.** This specification covers the properties of fibrous mineral filled, heat stabilized, polyamide 66 for injection molding.

**1.2 Symbols.** The material abbreviations according to ISO 11469 are shown in Table 1.

**1.3 Applicability.** Typical applications include, but are not limited to, the following: Lift gate hinges.

**1.4 Remarks.** The classification into groups is according to the different ranges of fibrous mineral content. Additional types may be added as necessary.

## 2 References

**Note:** Only the latest approved standards are applicable unless otherwise specified.

**2.1 External Standards/Specifications.**

| | | | |
|---|---|---|---|
| ASTM D6869 | ISO 294 | ISO 1183 | ISO 3795 |
| ISO 75 | ISO 527 | ISO 1874-2 | ISO 11469 |
| ISO 179/1eA | ISO 527-1/2 | ISO 3451 | ISO 15512 |
| ISO 188 | | | |

**2.2 GM Standards/Specifications.**

| | | | |
|---|---|---|---|
| GMW3013 | GMW3221 | GMW14335 | GMW15634 |
| GMW3059 | GMW3232 | GMW14444 | GMW16853 |
| GMW3205 | GMW3235 | | |

## 3 Requirements

**3.1 Requirements on Test Specimens.** Reference GMW3221.

**3.2 Emissions Testing of Interior Materials and Parts.** For all Code E designated parts per GMW14444, reference GMW16853 for emissions testing of interior materials and parts.

**3.3 Requirements on Delivery.** Important physical, mechanical and thermal properties that characterize the material are summarized in charts. The color shall be specified on drawings, in material specifications and otherwise. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 1874-2. All values indicated herein are based on material considered to be in the dry-as-molded state with moisture content of 0.2% maximum (ASTM D6869, ISO 15512, Method A or B, or GMW14335). Immediately after molding, specimens shall be sealed in moisture-proof containers and stored at 22 °C ± 3 °C for at least 24 h prior to test as specified in ISO 1874-2. All tests shall be performed on unannealed specimens immediately after their removal from the containers in a controlled atmosphere per GMW3221, Code A, unless otherwise specified. In addition, tests specified at temperatures below or above 22 °C ± 3 °C shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum. The minimum values specified in the property tables must be met by test specimens in natural, black, or in a standard sampled color if natural or black are not available.

**3.3.1 Compound Properties (Natural, Black and Integrally Colored).** See Table 1. The following tests are also required for full standard approval. The minimum number of lots per test required is one in natural: Poisson's Ratio, Coefficient of Linear Thermal Expansion (CLTE), Mold Shrinkage, Stress Strain Curve at multiple temperatures (for example -30 °C, 23 °C, +140 °C), Shear Modulus Curve. See GMW3013 for the test procedures.

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**Table 1: Compound Properties (Natural and Black)**

| | | | Fibrous Mineral Filler Percentage |
|---|---|---|---|
| | | | 40% |
| **Property** | **Standard** | **Units** | **Value** |
| ISO Symbol | ISO 11469 | - | >PA66-MF40< |
| Ash | ISO 3451 | % | 37 to 42 |
| Density | ISO 1183 | $g/cm^3$ | Target Range<br>1.47 to 1.55 |
| Moisture Content | ISO 15512, Method A or B or GMW14335 | % | ≤ 0.2 |
| Tensile Modulus | ISO 527-1/2 | MPa | 8550 to 15 650 |
| Tensile Stress at Break | ISO 527-1/2 | MPa | ≥ 100 |
| Tensile Strain at Break | ISO 527-1/2 | % | ≥ 2.0 |
| Tensile Stress at Break after Heat Aging Note 1 | ISO 188<br>ISO 527 | %<br>Retention | ≥ 75 |
| Notched Charpy Impact Strength<br>At +23 °C<br>At -30 °C | ISO 179/1eA | $kJ/m^2$ | <br>≥ 3.0<br>≥ 2.0 |
| Notched Charpy Impact after Heat Aging Note 2 | ISO 188<br>ISO 179/1eA | %<br>Retention | ≥ 75 |
| Heat Deflection Temperature under Load 1.8 MPa | ISO 75 | °C | ≥ 195 |
| Flammability | GMW3232 or<br>ISO 3795<br>All reporting shall be in accordance with GMW3232 | mm/minute | Self-Extinguishing (SE) or < 100 |
| Emission Testing of Interior Materials: For initial approval, test one (1) lot in black. | GMW16853 | | |
| - Odor | GMW3205-B3 | Rating | ≥ 6 |
| - Fogging | GMW3235-B-Y2-T2 | mg | Requirements see GMW16853 |
| - Emissions | GMW15634<br>VOC value<br>SVOC value | <br>µg/g<br>µg/g | <br>Requirements see GMW16853<br>Requirements see GMW16853 |

**Note 1:** Specimens tested for Tensile Stress at Break to ISO 527 after heat aging 1000 h ± 5 h at +140 °C ± 5 °C according to ISO 188, Method A (air oven method) shall have a minimum of 75% retention relative to unaged specimens tested concurrently.
**Note 2:** Specimens tested for Notched Charpy Impact per ISO 179/1eA after heat aging 1000 h ± 5 h at +140 °C ± 5 °C according to ISO 188, Method A (air oven method) shall have a minimum of 75% retention relative to unaged specimens tested concurrently. Charpy impact specimens shall be notched prior to aging.
**SVOC** Semi-volatile Organic Compound
**VOC** Volatile Organic Compound

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