



Polyamide 66 – Heat Stabilized, Impact Modified, Colorable for Fuel Caps

1 Scope

1.1 Material Description. This standard covers the properties of a heat stabilized, impact modified, colorable polyamide 66 (nylon 66), which is used in injected form for fuel caps. This material will not have to be formally color developed. Specific color approvals will be entered into MATSPC by the GM Materials Engineer.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PA66-I<.

1.3 Applicability. Typical applications include fuel caps.

2 References

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

2.1 External Standards/Specifications.

ASTM D6869	ISO 294	ISO 3146	SAE J1976
ISO 75	ISO 527	ISO 4892-1/2	SAE J2527
ISO 179	ISO 1183	ISO 11357-3	
ISO 179/1eA	ISO 1873-2	ISO 11469	
ISO 188	ISO 1874-2	ISO 15512	

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14335
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3 Requirements

3.1 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 1873-2.

3.1.1 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 Method B, or GMW14335). Immediately after molding, specimens shall be sealed in moisture-proof containers and stored at $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ 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 $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, 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.

3.2 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.

3.2.1 Compound Properties (Natural, Black and Integrally Colored). See Table 1 and Table 2. The following are also required for full standard approval. The minimum number of lots per test required is one (1) 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, + 110 °C)
- Shear Modulus Curve.
- Differential Scanning Calorimetry (DSC) Curve.
- Infrared Spectroscopy Curve. See GMW3013 for the test procedures.

3.3 Performance Requirements. Performance requirements shall be specified on part drawings or in component specifications.

Table 1: Compound Properties (Natural and Black)

Property	Standard	Units	Range
Density	ISO 1183	g/cm ³	1.05 to 1.11
Tensile Modulus	ISO 527	MPa	1750 to 2350
Tensile Strength at Yield	ISO 527	MPa	≥ 40
Strain at Break	ISO 527	%	≥ 40
Tensile Strength at Break after Heat Aging ^{Note 1}	ISO 188 ISO 527 1000 h at 110 °C	% Retention	≥ 75
Notched Charpy Impact Strength at +23 °C at -30 °C	ISO 179/1eA	kJ/m ²	≥ 45 ≥ 15
Notched Charpy Impact Strength after Heat Aging ^{Note 1}	ISO 188 ISO 179/1eA 1000 h at 110 °C	% Retention	≥ 75
Melting Temperature	ISO 3146 or ISO 11357-3	°C	250 to 270
Heat Deflection Temperature under Load 1.8 MPa	ISO 75	°C	≥ 50

Note 1: Specimens tested for Tensile Strength at Yield to ISO 527 and Notched Charpy Impact Strength to ISO 179 at +23 °C ± 3 °C after heat aging 1000 h ± 5 h at +110 °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.

Table 2: Compound Properties (Colorable)

Property	Standard	Units	Value
Weather-Ometer Resistance ^{Note 1}	SAE J2527, 1250 kJ/m ²		ΔE < 3.0 No objectionable defects allowed.
Weather-Ometer Resistance ^{Note 1}	ISO 4892-1/2, 1500 kJ/m ²		ΔE < 3.0 No objectionable defects allowed.
Natural Weathering ^{Note 1}	SAE J1976, Procedure A 2 years in Arizona		ΔE < 3.0 No objectionable defects allowed.
Notched Charpy Impact Strength at +23 °C	ISO 179/1eA	kJ/m ²	≥ 45

Note 1: Visual evaluation of the test panel by the responsible GM Materials Engineer shall override measured values in cases of disagreement.

ΔE = Delta (Color Change)

4 Manufacturing Process

Not applicable.