



Polyamide 6 - 35% Glass Fiber Reinforced, Heat Stabilized, Impact Modified, Oil Resistant

1 Scope

1.1 Material Description. This standard covers the properties of a 35% by mass glass fiber reinforced, heat stabilized, impact modified, oil resistant Polyamide 6 (Nylon 6) which is used in injected form for molded components.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PA6-I-GF35<.

1.3 Applicability. Typical applications include the following: Oil Pans.

2 References

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

2.1 External Standards/Specifications.

ASTM D4485	ISO 188	ISO 1183	ISO 16396-2
ASTM D6869	ISO 294	ISO 3451	SAE J300
ASTM E831	ISO 294-3/4	ISO 11359-2	
ISO 75	ISO 527	ISO 11469	
ISO 179/1eA	ISO 527-1/2	ISO 15512	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14335
GMW3059	GMW14270	

2.3 Additional References.

ASTM International Service Liquid 105 (SL105) per ASTM D4485 or SAE J300

3 Requirements

Materials approved to this specification shall meet the standard requirements of GMW3013.

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 16396-2. Test methods and specimen dimensions are also to be in accordance with ISO 16396-2.

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 Method B, or GMW14335). Immediately after molding, per ISO 16396-2, specimens shall be sealed in moisture proof containers and stored at $+23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for at least 24 h. 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 other than $+23\text{ }^{\circ}\text{C}$ shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

3.1.1 Chemical Requirements. All parts manufactured from molding compounds shall be resistant to the media they contact at their place of use.

3.1.2 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1. The values specified in Table 1 shall be met by test specimens in natural, black or in a standard sampled color if natural or black are not available. The color shall be specified on drawings, in material specifications and otherwise.

Note: For each product, the requirements to Table 1 shall be documented by the Plastic Submission Template according to GMW3013.

3.2 Compound Properties. See Table 1. The following are also required for full specification approval. The minimum number of lots per test required is one in natural.

- Poisson's Ratio.
- Stress Strain Curve at multiple temperatures: -30 °C, +23 °C, +85 °C, +110 °C, +150 °C, conditioned at +23 °C/50% Relative Humidity (RH) (see GMMPD tab on Plastics Submission Template for test details).
- Coefficient of Linear Thermal Expansion (CLTE) data (see GMMPD tab on Plastics Submission Template for test details).
- Differential Scanning Calorimetry (DSC) Curve.
- Fourier Transform Infrared Spectroscopy (FTIR) Curve.
- Mold Shrinkage.

See the Polyamides tab on the Plastics Submission Template for the test procedures.

3.3 Integrally Colored Properties Requirements. Any integrally colored resin (other than generic black) must submit three lots of Table 1 properties to demonstrate performance. These colors are not intended for interior color matched components; they are typically for part identification.

3.4 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.

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

3.6 Property Retention after Oil Soak. Prepare 20 samples for tensile strength per ISO 527 and 20 samples for notched Charpy impact per ISO 179/1eA. A temperature controlled pot (typically stainless steel, approximately 30.5 cm × 30.5 cm, 23 L) is filled with ASTM International Service Liquid 105 (SL105) per ASTM D4485 or SAE J300 to fill line and temperature is set to +150 °C. Completely immerse 15 samples of each type in SL105 at +150 °C. Remove five specimens of each type after each duration, 1000 h, 3000 h, and 5000 h. Allow specimens to cool to room temperature. When cool, the specimens shall be wiped clean with a clean, dry cloth. Place the specimens in moisture-proof bags or desiccators for conditioning per 3.1. Test the control specimens and each set of oil aged specimens immediately after the conditioning period. Record results and report percent retention as required in Table 1.

Table 1: Compound Properties (Natural and Black)

Property	Standard	Units	Value
Ash	ISO 3451	%	33 to 37
Density	ISO 1183	g/cm ³	Target Range 1.35 to 1.41
Moisture Content	ISO 15512 Method A or Method B or GMW14335	%	≤ 0.2
Tensile Modulus	ISO 527-1/2	MPa	8500 to 11600
Tensile Stress at Break	ISO 527-1/2	MPa	≥ 150
Tensile Stress at Break after Heat Aging ^{Note 1}	ISO 188 ISO 527	% Retention	≥ 90
Tensile Stress at Break after Exposure to Oil After 1000 h After 3000 h After 5000 h	Test per 3.6 SL105 at +150 °C ISO 527	% Retention	≥ 100 ≥ 97 ≥ 95