



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-GF35-I<.

1.3 Typical Applications. 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 D6869	ISO 188	ISO 527-1/2	ISO 11359-2
ASTM E831	ISO 294	ISO 1183	ISO 11469
ISO 75	ISO 294-3/4	ISO 1874-2	ISO 15512
ISO 179/1eA	ISO 527	ISO 3451	

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14335
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2.3 Additional References.

- ASTM Service Fluid 105 (SF105)
- TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

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.

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 $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ 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.

3.2.1 Compound Properties (Natural, Black and Integrally Colored). See Table 1. The following 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; Differential Scanning Calorimetry (DSC) Curve; and 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.

3.4 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 x 30.5 cm, 23 L) is filled with ASTM Service Fluid 105 (SF105) to fill line and temperature is set to 150 °C. Completely immerse 15 samples of each type in the ASTM SF105 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 3.2. 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 B or GMW14335	%	≤0.2
Tensile Modulus	ISO 527-1/2	MPa	8500 to 11 500
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	Test per 3.4 SF105 at 150 °C ISO 527	% Retention	≥100 ≥100 ≥100
After 1000 h			
After 3000 h			
After 5000 h			
Tensile Strain at Break	ISO 527-1/2	%	≥3.0
Tensile Strain at Break after Exposure to Oil	Test per 3.4 SF105 at 150 °C ISO 527	% Retention	≥85 ≥80 ≥75
After 1000 h			
After 3000 h			
After 5000 h			
Notched Charpy Impact Strength	ISO 179/1eA	kJ/m ²	≥17 ≥12
At +23 °C			
At -30 °C			
Notched Charpy Impact after Exposure to Oil	Test per 3.4 SF105 at 150 °C ISO 179/1eA	% Retention	≥80 ≥70 ≥60
After 1000 h			
After 3000 h			
After 5000 h			
Notched Charpy Impact after Heat Aging ^{Note 2}	ISO 188 ISO 179/1eA	% Retention	≥75

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