



Polyamide 66 - 25% Glass Fiber Reinforced, Flame Retardant

1 Scope

1.1 Material Description. This standard covers the properties of a 25% by mass glass fiber reinforced, heat stabilized, flame retardant, polyamide 66 (nylon 66) which is used in injected form for molded components.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PA66-GF25<.

1.3 Applicability. Typical applications include engine covers and electrical components.

2 References

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

2.1 External Standards/Specifications.

ASTM D3801	ISO 188	ISO 1183	ISO 11469
ASTM D6869	ISO 294	ISO 1874-2	ISO 15512
ISO 75	ISO 527	ISO 3451	UL 94
ISO 179/1eA	ISO 527-1/2		

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14335
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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.

- Poisson's Ratio, Coefficient of Linear Thermal Expansion (CLTE).
- Mold Shrinkage, Stress Strain Curve at multiple temperatures (for example $-30\text{ }^{\circ}\text{C}$, $+23\text{ }^{\circ}\text{C}$, $\geq +120\text{ }^{\circ}\text{C}$.)
- 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	Value
Ash ^{Note 1}	ISO 3451	%	Target Range 22 to 35
Density ^{Note 2}	ISO 1183	g/cm ³	Target Range 1.31 to 1.65
Moisture Content	ISO 15512 Method A or B or GMW14335	%	≤ 0.2
Tensile Modulus	ISO 527-1/2	MPa	9000 to 12 000
Tensile Stress at Break	ISO 527-1/2	MPa	≥ 135
Tensile Stress at Break after Heat Aging ^{Note 3}	ISO 188 ISO 527	% Retention	≥ 75
Tensile Strain at Break	ISO 527-1/2	%	≥ 1.5
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eA	kJ/m ²	≥ 6.0 ≥ 4.0
Notched Charpy Impact after Heat Aging ^{Note 4}	ISO 188 ISO 179/1eA	% Retention	≥ 75
Heat Deflection Temperature under Load 1.8 MPa	ISO 75	°C	≥ 235
Flammability Rating at 0.8 mm	UL 94 ASTM D3801	Rating	Vertical Flammability Rating (V0)

Note 1: Wide ash content range due to differences in flame retardant additives. Material is to be 25% glass fiber ± 3% with the remainder of ash being flame retardant additive remnants.

Note 2: Wide density range and wide ash range due to differences in flame retardant additives.

Note 3: 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 4: 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.

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of bulk supplies.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.