GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW8752

Polyamide 6 - Mineral/Glass Fiber Reinforced, Heat Stabilized

1 Scope

1.1 Material Description. This specification describes material types of mineral/glass fiber reinforced Polyamide 6 (nylon 6), which are used in injected form for molded components.

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

1.3 Applicability. Typical applications include engine covers, and air cleaner housings for high temperature applications.

1.4 Remarks. The classification into groups is according to the different ranges of mineral/glass fiber content.

2 References

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

2.1 External Standards/Specifications.

ASTM E831	ISO 294-4	ISO 1874-2	ISO 3795
ISO 75-2	ISO 527	ISO 3146	ISO 15512
ISO 179/1e/A	ISO 960	ISO 3167	ISO 11359-2
ISO 294-3	ISO 1183	ISO 3451	ISO 11469

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14335	GMW16853
GMW3059	GMW3232	GMW15634	
GMW3205	GMW3235		

3 Requirements

Materials approved to this specification shall meet the requirements of GMW3013, **General Requirements for Handling of Technical Terms of Delivery for Plastics.**

3.1 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1. The color shall be specified on drawings, in material specifications, and otherwise. 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.

3.2 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294-3, and ISO 294-4 with the conditions for injection molding from ISO 1874-2. Test methods and specimen dimensions are also to be in accordance with ISO 1874-2 with the following additions:

- Use ISO 3167, Type A, thickness 4 mm, for tensile and flexural properties.

Test values indicated in Table 1 are based on material with moisture content of 0.2% maximum (dry as molded) as tested per ISO 960, Method A. Immediately after molding, as per ISO 1874-2, specimens shall be sealed in moisture-proof containers and stored at +22 °C ± 3 °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.

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3.3 Requirements on Parts. Parts of this material type shall have a water content at delivery, when tested per GMW14335, of at least:

- 1.5% by mass for material types reinforced up to 20% by mass.
- 1.0% by mass for material types reinforced over 20% by mass.

Deviations from this shall be specifically indicated on the part drawings.

3.4 Chemical Requirements. All parts manufactured from molding compounds shall be resistant to the media they contact, such as aliphatic and aromatic hydrocarbons, fuels, lubricants, oils, greases and alcohols, at their places of use.

3.5 Compound Properties (Natural and Black). See Table 1.

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

Table 1: Compound Properties (Natural and Black) [Note 1]

			M15-GF10	M20-GF10	M25-GF15
	Standard	**Unit**	**Value**	**Value**	**Value**
ISO Symbol	ISO 11469		>PA6-(MD15+GF10)<	>PA6-(MD20+GF10)<	>PA6-(MD25+GF15)<
Ash	ISO 3451 +950 °C	% by mass	22 to 28	27 to 33	36 to 44
Moisture Content	ISO 15512 Method A, Method B, or GMW14335	%	≤ 0.2		
Density	ISO 1183	g/cm^3	Target Range 1.28 to 1.40	Target Range 1.31 to 1.39	Target Range 1.4 to 1.52
Tensile Modulus	ISO 527	MPa	5500 to 8000	6800 to 10 000	7000 to 12 000
Stress at Break	ISO 527	MPa	≥ 75	≥ 90	≥ 105
Stress at Break after Heat Aging	ISO 527	% Retention	≥ 75		
Strain at Break	ISO 527	%	≥ 2		
Charpy Notched Impact Strength	ISO 179/1eA	kJ/m^2			
• at +22 °C			≥ 3.5	≥ 2	≥ 3
• at -30 °C			≥ 2.5	≥ 2	≥ 2
Charpy Notched Impact Strength after Heat Aging	ISO 179/1eA	% Retention	≥ 75		
Melting Temperature	ISO 3146 Method C or Method A 10 K/minute	°C	Target Range 215 to 225	Target Range 215 to 225	Target Range 215 to 225

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