GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17263

Polyamide 66, Glass Fiber Reinforced, Impact Modified, Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of glass fiber reinforced, impact modified, heat stabilized polyamide 66 for injection molding.

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

1.3 Applicability. Typical applications include, but are not limited to, the following: connectors, beauty covers, and shift cable end caps.

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

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 3451
ISO 75	ISO 294	ISO 1183	ISO 11469
ISO 179/1eA	ISO 527	ISO 1874-2	ISO 15512

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14335

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 °C ± 3 °C for at least 24 h prior to test as specified in ISO 1874-2. All tests shall be performed on un-annealed 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 °C ± 3 °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. See GMW3013 for the test procedures.

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Table 1: Compound Properties (Natural and Black)

			Glass Fiber Reinforcement Percentage	
			15%	35%
Property	**Standard**	**Units**	**Value**	**Value**
ISO Symbol	ISO 11469		>PA66-I-GF15<	>PA66-I-GF35<
Ash	ISO 3451	%	13 to 17	33 to 38
Density	ISO 1183	g/cm^3	Target Range 1.15 to 1.30	Target Range 1.35 to 1.50
Moisture Content	ISO 15512, Method A or B or GMW14335	%	≤ 0.2	≤ 0.2
Tensile Modulus	ISO 527-1/2	MPa	4500 to 8500	7700 to 11 000
Tensile Stress at Break	ISO 527-1/2	MPa	≥ 78	≥ 130
Tensile Stress at Break after Heat Aging Note 1	ISO 188 ISO 527	% Retention	≥ 75	≥ 75
Tensile Strain at Break	ISO 527-1/2	%	≥ 2.0	≥ 2.0
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eA	kJ/m^2	≥ 6.0 ≥ 3.0	≥ 15.0 ≥ 10.0
Notched Charpy Impact after Heat Aging Note 2	ISO 188 ISO 179/1eA	% Retention	≥ 75	≥ 75
Heat Deflection Temperature under Load 1.8 MPa	ISO 75	°C	≥ 200	≥ 235

Note 1: 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 2: 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.

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