GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17446

Polyamide 6 - Glass Fiber Reinforced, Impact Modified, Heat Stabilized, Ultraviolet (UV) Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of glass fiber reinforced, impact modified, heat stabilized, ultraviolet (UV) stabilized Polyamide 6 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: seat levers.

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 294	ISO 1874-2	ISO 11469
ISO 75	ISO 527-1/2	ISO 3451	ISO 15512
ISO 179/1eA	ISO 1183	ISO 3795	SAE J1545
ISO 188			

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW3417	GMW14335
GMW3059	GMW3232	GMW14162	GMW15634
GMW3205	GMW3235	GMW14334	GMW16853

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 Tables 1 and 2. The following are also required for full standard approval. The minimum number of lots per test required is one (1) 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
			30%
Property	**Standard**	**Units**	**Value**
ISO Symbol	ISO 11469		>PA6-I-GF30<
Ash	ISO 3451	%	27 to 33
Density	ISO 1183	g/cm^3	Target Range 1.30 to 1.40
Moisture Content	ISO 15512, Method A or B, or GMW14335	%	≤ 0.2
Tensile Modulus	ISO 527-1/2	MPa	7500 to 11 000
Tensile Stress at Break	ISO 527-1/2	MPa	≥ 130
Tensile Strain at Break	ISO 527-1/2	%	≥ 2.0
Tensile Stress at Break after Heat Aging Note 1	ISO 188 ISO 527-1/2	% Retention	≥ 75
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eA	kJ/m^2	≥ 9.5 ≥ 5
Notched Charpy Impact after Heat Aging Note 2	ISO 188 ISO 179/1eA	% Retention	≥ 75
Heat Deflection Temperature (HDT) under Load, HDT-A, 1.8 MPa	ISO 75	°C	≥ 195
Flammability	GMW3232 or ISO 3795 All reporting shall be in accordance with GMW3232	mm/minute	Self-Extinguishing (SE) or ≤ 100
Emission Testing of Interior Materials: For initial approval, test 1 lot in black.	GMW16853		
- Odor	GMW3205	Rating	≥ 6
- Fogging	GMW3235	mg	Requirements, see GMW16853
- Emissions	GMW15634 Volatile Organic Compound (VOC) value Semi Volatile Organic Compound (SVOC) value	µg/g µg/g	Requirements, see GMW16853

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.

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