GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17385

Polyamide 6 - 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 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: 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 294	ISO 1183	ISO 3795
ISO 75	ISO 527	ISO 1874-2	ISO 11469
ISO 179/1eA	ISO 527-1/2	ISO 3451	ISO 15512
ISO 188			

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14335	GMW15634
GMW3059	GMW3232	GMW14444	GMW16853
GMW3205	GMW3235	GMW14270	

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

3.2 Emissions Testing of Interior Materials and Parts. For all Code E designated parts per GMW14444, reference GMW16853 for emissions testing of interior materials and parts.

3.3 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

3.4 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 +23 °C ± 2 °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 +23 °C ± 2 °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.

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3.4.1 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 (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.

Table 1: Compound Properties (Natural and Black)

			Glass Fiber Reinforcement Percentage			
			15%	**30%**	**35%**	**40%**
Property	**Standard**	**Units**	**Value**	**Value**	**Value**	**Value**
ISO Symbol	ISO 11469	-	>PA6-I-GF15<	>PA6-I-GF30<	>PA6-I-GF35<	>PA6-I-GF40<
Ash	ISO 3451	%	13 to 17	27 to 33	32 to 38	37 to 43
Density	ISO 1183	g/cm^3	Target Range 1.20 to 1.28	Target Range 1.30 to 1.40	Target Range 1.30 to 1.40	Target Range 1.35 to 1.50
Moisture Content	ISO 15512, Method A or B or GMW14335	%	≤ 0.2			
Tensile Modulus	ISO 527-1/2	MPa	5000 to 6500	7500 to 11 000	8200 to 11 000	9500 to 13 000
Tensile Stress at Break	ISO 527-1/2	MPa	≥ 100	≥ 130	≥ 133	≥ 145
Tensile Strain at Break	ISO 527-1/2	%	≥ 2.5	≥ 2.0	≥ 2.0	≥ 2.5
Tensile Stress at Break after Heat Aging Note 1	ISO 188 ISO 527	% Retention	≥ 75			
Notched Charpy Impact Strength At +23 °C At -30 °C	ISO 179/1eA	kJ/m^2	≥ 4 ≥ 3	≥ 9.5 ≥ 5	≥ 15 ≥ 10	≥ 18 ≥ 11
Notched Charpy Impact after Heat Aging Note 2	ISO 188 ISO 179/1eA	% Retention	≥ 75			
Heat Deflection Temperature under Load 1.8 MPa	ISO 75	°C	≥ 185	≥ 195	≥ 195	≥ 195
Flammability	GMW3232 or ISO 3795	mm/minute	Self-Extinguishing (SE) or < 100			

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