GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW15890

Polypropylene - Long Glass Fiber Reinforced, Heat Stabilized

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose/Material Description. This standard covers the properties of heat stabilized, long Glass Fiber (GF) reinforced Polypropylene (PP). These resins may be impact modified. It covers injection molding types for manufacturing of technical parts requiring high structural stiffness.

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

1.3 Applicability. Typical applications include the following: Floor console and instrument panel carriers and battery covers.

1.4 Remarks. The classification into groups is according to the different ranges of glass fiber content. The code letter "E" at the end indicates that these Types are impact modified.

2 References

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

2.1 External Standards/Specifications.

ASTM D3012	ISO 179-1/1eU	ISO 527-2	ISO 11359-2
ISO 75-1	ISO 188	ISO 1183	ISO 11469
ISO 75-2	ISO 294	ISO 3451-1	ISO 19069-2
ISO 75-3	ISO 527-1	ISO 11359-1	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14270	GMW15634
GMW3059	GMW3232	GMW14444	GMW16853
GMW3205	GMW3235	GMW14650	

2.3 Additional References.

Plastic Submission Template

3 Requirements

3.1 Requirements on Test Specimens. Materials approved to this specification shall meet the requirements of GMW3013.

Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 19069-2. Test methods and specimen dimensions are also to be in accordance with ISO 19069-2.

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 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. The values specified in Table 1 shall be met by four typical interior colors

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(black, gray, tan/neutral, and either red or blue) for approval to the specification and by test specimens in specific colors as required during color development. These test specimens may be produced using generic colorants in the four colors or by specific colors required by a GM program. See the Polypropylene tab on the Plastic Submission Template (contact specification owning group named in Section 6 for access) and GMW3013 for test details and parameters.

3.1.1 Chemical Requirements. All parts manufactured from molding compounds shall be resistant to the media contacted at the place of use.

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 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.

3.4 Compound Properties (Natural, Black and Integrally Colored). See Table 1. The following are also required for full approval. The minimum number of lots per test required is one unless otherwise specified. See the Polyamide tab on the Plastic Submission Template (contact specification owning group named in Section 6 for access) and GMW3013 for test details and parameters.

- Poisson's Ratio
- Stress/strain data points and curves at the following temperatures: -30 °C, +23 °C, +85 °C, +100 °C

Note: See GMMPD tab on Plastic Submission Template for test details (contact specification owning group named in Section 6 for access).

- Coefficient of Linear Thermal Expansion (CLTE) data

Note: See GMMPD tab on Plastic Submission Template for test details (contact specification owning group named in Section 6 for access).

- Differential Scanning Calorimetry (DSC) curve
- Fourier Transform Infrared (FTIR) spectroscopy curve
- Mold shrinkage

3.5 Initial Source Approval. No shipments shall be made by any supplier until representative initial production samples have been approved by the appropriate Materials Engineering department(s) as meeting the requirements of this specification.

3.6 Performance Requirements. Performance requirements, e.g., flammability, fogging or resistance to odor shall be specified on part drawings or in component specifications. All parts manufactured from these materials shall be resistant to the media contacted, such as aliphatic and aromatic hydrocarbons, fuels, lubricants, oils, greases and alcohols, at the places of use.

All finished parts for Interior applications shall meet the requirements according to GMW14444.

All finished parts for Exterior applications shall meet the requirements according to GMW14650.

3.7 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.

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Table 1: Compound Properties (Black or Natural)

Property	Standard	Unit	Type					
			20	20E	30	30E	40	50
International Organization for Standardization (ISO) Symbol	ISO 11469	-	>PP-GF20<	>PP-GF20E<	>PP-GF30<	>PP-GF30E<	>PP-GF40<	>PP-GF50<
Ash	ISO 3451-1, Method A at +600 °C	% by Mass	20 ± 2	20 ± 2	30 ± 3	30 ± 3	40 ± 3	50 ± 3
Density	ISO 1183, Method A	g/cm^3	1.04 ± 0.03	1.04 ± 0.03	1.12 ± 0.03	1.12 ± 0.03	1.22 ± 0.03	1.33 ± 0.03
Average Glass Fiber Length (cutting length)		mm	Target Range: 9 to 13					
Tensile Modulus	ISO 527-1, ISO 527-2	MPa	≥ 4300	≥ 3600	≥ 6300	≥ 5400	≥ 8300	≥ 10 500
Tensile Strength at Break	ISO 527-1, ISO 527-2	MPa	≥ 75	≥ 65	≥ 95	≥ 75	≥ 105	≥ 115
Tensile Strength at Break after heat aging 1000 h ± 5 h at +140 °C ± 3 °C Note 1	ISO 527-1, ISO 527-2	% Retention	≥ 80 Note 2					
Charpy Impact Strength at +23 °C	ISO 179-1/1eU	kJ/m^2	≥ 30	≥ 35	≥ 45	≥ 47	≥ 40	≥ 45

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