GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16607

Polypropylene Homopolymer – Glass Fiber Reinforced, Chemically Coupled, Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of injection moldable, glass fiber reinforced, chemically coupled, heat stabilized polypropylene homopolymer.

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

1.3 Applicability. Typical applications include fan shrouds, under hood parts, and brackets.

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.

ISO 75-1	ISO 294	ISO 1183	ISO 11359-1
ISO 75-2	ISO 294-4	ISO 1873-2	ISO 11359-2
ISO 75-3	ISO 527-1	ISO 3167	ISO 11469
ISO 179/1eA	ISO 527-2	ISO 3451-1	
ISO 188	ISO 1133	ISO 4577	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14270	GMW16853
GMW3059	GMW3232	GMW14444	
GMW3205	GMW3235	GMW15634	

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.

Note: For each product, the requirements to Table 1 shall be documented by certification statement according to GMW3013. The color shall be specified on drawings, in material specifications and otherwise.

3.2 Requirements on Test Specimens.

3.2.1 Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294 with the conditions for injection molding from ISO 1873-2. Test methods and specimen dimensions are also to be in accordance with ISO 1873-2. Test methods and specimen dimensions are also to be in accordance with ISO 1873-2 with the following additions:

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

3.2.2 All tests shall be performed on specimens 40 h minimum after molding and immediately following a conditioning period of 24 h minimum in a controlled atmosphere per GMW3221, Code A, unless otherwise specified. All tests shall be performed on unannealed specimens. In addition, test specified at temperatures below or above +23 °C ± 2 °C shall be conducted at the specific temperature using specimens conditioned at specified temperature for 4 h minimum.

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3.2.3 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.

3.2.4 The values specified in Table 1 shall be met by test specimens in natural or black. For integrally colored grades where other additive systems (e.g., stabilizer) are used, the impact values shall not decrease more than 10% from the specified minimum value.

3.3 Chemical Requirements. All parts manufactured from molding compounds shall be resistant to the media they contact at their place of use.

3.4 Compound Properties. See Table 1. The following are also required for full specification approval. The minimum number of lots per test required is one (1) in natural:

- Tensile Modulus
- Poisson's Ratio
- Stress Strain Curve at +23 °C, +85 °C, -30 °C.

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

Table 1: Compound Properties (Black or Natural)

Property	Test Method	Units	Nominal Glass Fiber Filler Percentage				
			10%	20%	30%	40%	50%
ISO Symbol	ISO11469	-	>PP-GF10<	>PP-GF20<	>PP-GF30<	>PP-GF40<	>PP-GF50<
Ash	ISO 3451-1, Method A, at +800 °C	% by mass	10 ± 2	20 ± 2	30 ± 3	40 ± 3	50 ± 3
Density	ISO 1183, Method A	g/cm³	Target Range 0.97 ± 0.03	Target Range 1.05 ± 0.03	Target Range 1.15 ± 0.03	Target Range 1.24 ± 0.03	Target Range 1.34 ± 0.03
Melt Flow Rate (MFR) 230/2.16	ISO 1133	g/10 minutes	Target Range 3 to 9	Target Range 3 to 9	Target Range 3 to 9	Target Range 3 to 9	Target Range 3 to 9
Melt Volume Flow Rate (MVFR) 230/2.16	ISO 1133	cm³/10 minutes	Report Results	Report Results	Report Results	Report Results	Report Results
Tensile Modulus	ISO 527-1 ISO 527-2	MPa	2500 to 3800	3800 to 5000	5200 to 7200	8000 to 11 000	10000 to 13000
Tensile Strength at Break	ISO 527-1 ISO 527-2, Specimen 1A, 5 mm/minute	MPa	≥ 40	≥ 55	≥ 65	≥ 80	≥ 90
Tensile Strength at Break after Heat Aging Note 1	ISO 527-1 ISO 527-2	% Retention	≥ 85				
Charpy Impact Strength Unnotched at +23 °C	ISO 179/1eU	kJ/m²	≥20	≥ 35	≥ 40	≥ 45	≥ 45

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