GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16605

Polypropylene Copolymer – Glass Fiber Reinforced/Mineral Filled, Chemically Coupled, Heat Stabilized

1 Scope

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

1.2 Symbols. The material abbreviation according to ISO 11469 is shown in Table 1.

1.3 Applicability. Typical applications include panels and brackets.

1.4 Remarks. The classification into groups is according to the different ranges of mineral and glass fiber content. Additional mineral/glass ranges will be added as they become necessary.

2 References

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

2.1 External Standards/Specifications.

ISO 75-1	ISO 188	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 179/1eU	ISO 1133	ISO 4577	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW3235	GMW15634
GMW3059	GMW3232	GMW14270	GMW16853
GMW3205			

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 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 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 -30 °C, +23 °C, +85 °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/Mineral Filler Percentage				
International Organization for Standardization (ISO) Symbol	ISO 11469	-	>PP/PE-(GF25+M10)<	>PP/PE-(GF20+M10)<	>PP/PE-(GF20+M15)<	>PP/PE-(M20+GF15)<	>PP/PE-(GF20+M20)<
Ash	ISO 3451-1, Method A, at +800 °C	% by mass	35 ± 3	30 ± 3	35 ± 3	35 ± 3	40 ± 3
Density	ISO 1183, Method A	g/cm³	Target Range 1.19 ± 0.03	Target Range 1.12 ± 0.03	Target Range 1.19 ± 0.03	Target Range 1.19 ± 0.03	Target Range 1.23 ± 0.03
Melt Flow Rate (MFR) 230/2.16	ISO 1133	g/10 minutes	Target Range 5 to 16	Target Range 5 to 16	Target Range 5 to 16	Target Range 5 to 16	Target Range 5 to 16
Melt Volume Flow Rate (MVR) 230/2.16	ISO 1133	cm³/10 minutes	Target Range 4 to 15	Target Range 4 to 15	Target Range 4 to 15	Target Range 4 to 15	Target Range 4 to 15
Tensile Modulus	ISO 527-1, ISO 3167, 4 mm thick, Type A bar 1 mm/minute	MPa	5200 to 6500	5200 to 6500	5200 to 6400	4900 to 6300	5400 to 6600
Tensile Strength at Break	ISO 527-1 ISO 527-2	MPa	≥ 50	≥ 50	≥ 45	≥ 40	≥ 50
Tensile Strength at Break after Heat Aging Note 1	ISO 527-1, ISO 527-2 specimen 1A, 5 mm/minute	% Retention	≥ 85				
Charpy Impact Strength Unnotched at +23 °C	ISO 179/1eU	kJ/m²	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20
Charpy Impact Strength Unnotched at -30 °C	ISO 179/1eU	kJ/m²	≥ 10	≥ 15	≥ 15	≥ 15	≥ 15

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