GM WORLDWIDE ENGINEERING STANDARDS	**Material Specification**	**GMW16984**

Polypropylene Copolymer – Glass Fiber Reinforced, UV Stable, Chemically Coupled, Heat Stabilized

1 Scope

1.1 Material Description. This specification covers the properties of injection moldable, glass fiber reinforced; ultraviolet (UV) stable, chemically coupled, heat stabilized polypropylene copolymer.

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

1.3 Typical Applications. Typical applications include: Buttons, supports 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.

ASTM D3012	ISO 179/1eU	ISO 527-1/2	ISO 3451-1
ISO 75-1	ISO 188	ISO 1133	ISO 4577
ISO 75-2	ISO 294	ISO 1183	ISO 11359-1/-2
ISO 75-3	ISO 294-4	ISO 1873-2	ISO 11469
ISO 179/1eA	ISO 527-1	ISO 3167	

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW3417	GMW15634
GMW3059	GMW3232	GMW14162	GMW16853
GMW3205	GMW3235	GMW14444	

2.3 Additional References.

TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

3.1.1 Materials approved to this specification shall meet the requirements of GMW3013, General Requirements for Handling of Technical Terms of Delivery for Plastics.

3.1.1.1 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 to be in accordance with ISO 1873-2 with the following additions: ISO 3167, Type A, thickness 4 mm, for tensile and flexural properties.

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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 ± 3 °C shall be conducted at the specific temperature using specimens conditioned at specified temperature for 4 h minimum.

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 and Table 2. 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, and Stress Strain Curve at multiple temperatures, e.g., + 23 °C, + 85 °C, -30 °C. Also refer to GMW3013 for test procedures and parameters.

3.5 Performance Requirements. Performance requirements, e.g., flammability, fogging or resistance to odor, shall be specified on part drawings or in component specifications. All finished parts for interior applications shall meet the requirements according to GMW14444.

Table 1: Compound Properties (Black or Natural)

Property	Test Method	Units	Type and Requirements			
			T1	T2	T3	T4
ISO Symbol	ISO 11469	-	>PP/PE-GF5<	>PP/PE-GF10<	>PP/PE-GF20<	>PP/PE-GF30<
Ash	ISO 3451-1, Method A, at +600 °C	% by mass	5 ± 1	10 ± 2	20 ± 2	30 ± 2
Density	ISO 1183, Method A	g/cm³	Target Range 0.94 ± 0.02	Target Range 0.97 ± 0.02	Target Range 1.05 ± 0.02	Target Range 1.14 ± 0.02
Melt Flow Rate (MFR) 230 °C/2.16 kg	ISO 1133	g/10 minutes	Report Results	Report Results	Report Results	Report Results
Or Melt Volume Flow Rate (MVFR) 230 °C/2.16 kg		cm³/10 minutes	Report Results	Report Results	Report Results	Report Results
Tensile Modulus	ISO 527-1, ISO 3167, 4 mm thick, Type A bar 1 mm/minute	MPa	1600 to 2400	2400 to 3600	3600 to 4800	5100 to 6200
Tensile Strength at Break	ISO 527-1/2, specimen 1A, 5 mm/minute	MPa	≥ 25	≥ 35	≥ 50	≥ 60

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