GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16196

Polypropylene Copolymer - Glass Fiber Reinforced, Heat Stabilized, Weatherable, Blow Molding Grade

1 Scope

1.1 Material Description. This standard covers the properties of glass filled, heat stabilized, weatherable, blow molding grade polypropylene copolymer compounds. Materials certified to this material specification may have additional characteristics, e.g., paintable. Possible additional characteristics are defined in GMW3013.

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

1.3 Applicability. Typical applications include the following: assist step/running boards.

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 E831	ISO 188	ISO 1133	ISO 3451-1
ISO 75	ISO 294	ISO 1183	ISO 11469
ISO 178	ISO 527-1	ISO 1873-2	SAE J1686
ISO 179/1eA	ISO 527-2	ISO 3167	SAE J1976

2.2 GM Standards/Specifications.

GMW3013	GMW3059	GMW3221	GMW14650

2.3 Additional References.

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

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 Test Specimens. Reference GMW3221.

3.2 Requirements on Delivery. Important physical, mechanical, and thermal properties that characterize the material are summarized in Table 1 and Table 2.

Note: The requirements to Table 1 and Table 2 shall be documented for self certification of the product according to GMW3013. The color shall be specified on drawings in material specifications and otherwise.

3.2.1 Requirements on Test Specimens. 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.

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.

The values specified in Table 1 and Table 2 shall be met by test specimens in natural or black. For colored grades where other pigment and additive systems (e.g., stabilizer) are used, the impact values shall not decrease more than 10% from the specified minimum value.

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

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3.3 Requirements on Materials. See Table 1 and Table 2.

3.4 Performance Requirements. Requirements such as flammability, fogging or resistance to odor shall be specified on part drawings or in component specifications.

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

3.5 Compound Properties. The following are also required for full specification approval. The minimum number of lots per test required is one in natural: Tensile Modulus, Poisson's Ratio, Stress - Strain Curve at +23 °C, +85 °C, -30 °C; Differential Scanning Calorimetry (DSC) Curve.

Table 1: Compound Properties (Natural and Black)

Property	Standard	Unit	15% Glass Fiber	20% Glass Fiber
ISO Symbol	ISO 11469		>PP/PE-GF15<	>PP/PE-GF20<
Ash	ISO 3451-1, Method A	% by mass	13 to 18	17 to 23
Density	ISO 1183, Method A	g/cm^3	0.95 to 1.03	1.00 to 1.06
Tensile Strength at Yield	ISO 527-1, ISO 527-2, Specimen A, test speed 5 mm/minute	MPa	≥ 32	≥ 43
Flexural Modulus	ISO 178, 80 mm x 10 mm x 4 mm specimen, test speed 2 mm/minute, 64 mm span	MPa	2000 to 3600	2800 to 4400
Tensile Modulus	ISO 527-1/2, specimen 1A, 1 mm/minute test speed	MPa	2200 to 3800	3600 to 4800
Notched Charpy Impact at +23 °C	ISO 179/1eA	kJ/m^2	≥ 11	≥11
Notched Charpy Impact at -30 °C	ISO 179/1eA	kJ/m^2	≥ 4	≥ 5
Deflection Temperature Under Load, 1.8 MPa, Method A	ISO 75 (reference SAE J1686), flatwise	°C	≥ 75	≥ 108
Shrink, 48 h after Molding, Longitudinal	ISO 294, plaque size 100 mm x 150 mm x 3 mm	%	0.2 to 0.6 Note 1	0.2 to 0.4 Note 1
Shrink, 48 h after Molding, Transverse	ISO 294, plaque size 100 mm x 150 mm x 3 mm	%	0.6 to 1.0 Note 1	0.7 to 0.9 Note 1
Coefficient of Linear Thermal Expansion (CLTE), longitudinal	ASTM E831 (TMA) from -30 °C to 110 °C	10^{-6} mm/mm/°C	≥ 55	≥ 30
CLTE, Transverse	ASTM E831 (TMA) from -30 °C to 110 °C	10^{-6} mm/mm/°C	≥ 160	≥ 155
Melt Volume-Flow Rate (MVR) 230/2.16	ISO 1133	cm^3/10 minutes	1.5 to 2.5 Note 2	1.0 to 2.0 Note 2

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