GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17179

Polyolefin Alloy - 1600 MPa Flexural Modulus, Weather Resistant, 12% Glass Filled, Low CLTE

1 Scope

1.1 Material Description. This standard covers the properties of a nominal 1600 MPa flexural modulus polyolefin alloy, weather resistant, low Coefficient of Linear Thermal Expansion (CLTE), pellet form, injection molding compound. For the purpose of this specification, polyolefin alloy is defined as an alloy of polypropylene plastic and EP (ethylene/propylene) or EPDM (ethylene/propylene diene monomer) rubber.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PP+EPDM-GF12<.

1.3 Applicability. Typical applications include the following: molded-in-color truck bed rails.

2 References

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

2.1 External Standards/Specifications.

ASTM D3763	ISO 294-1/2/3/4	ISO 1873-2	ISO 11359
ASTM E228	ISO 306	ISO 3167	ISO 11469
ASTM E831	ISO 527-1/2	ISO 3451-1	SAE J1545
ISO 75-1/2/3	ISO 1133	ISO 4892-1/2	SAE J1976
ISO 178	ISO 1183	ISO 6603-2	SAE J2527
ISO 179/1eA			

2.2 GM Standards/Specifications.

GMW3013	GMW3221	GMW14688	GMW16847
GMW3059	GMW14650	GMW14698	

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. 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 shall be met by test specimens in natural or black. The values specified in Table 2 shall be met by integrally colored test specimens. 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.

3.1.1 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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3.1.2 Requirements on Materials. See Table 1 and Table 2. A minimum of six lots shall be tested to Table 1. A minimum of one lot shall be tested to Table 2. The following are also required for full specification approval (the minimum number of lots per test required is one):

- Poisson's Ratio
- Stress vs. Strain Curve at 23 °C
- Multiaxial Impact Curves

3.2 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1 and Table 2. The color shall be specified on drawings, in material specifications and otherwise.

Note: The requirements to Table 1 shall be documented for self-certification of the product according to GMW3013.

3.3 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 Exterior applications shall meet the requirements according to GMW14650.

3.4 Additional Testing Requirements. Materials approved to this specification will be required to have basic material properties generated so warp analysis modeling can be conducted. See GM engineer for details.

Table 1: Compound Properties (Black or Natural)

Properties	Standard	Unit	Values
Glass Fiber Content (Ash)	ISO 3451-1, Method A at +600 °C	% by mass	9 to 15
Density	ISO 1183, Method A	g/cm³	0.95 to 1.01
Melt Flow Rate MFR 230/2.16	ISO 1133	g/10 minutes	12 to 21
Melt Volume-Flow Rate MVR 230/2.16	ISO 1133	cm³/10 minutes	13 to 25
Flexural Modulus	ISO 178, 80 mm x 10 mm x 4 mm specimen, 2 mm/minute test speed, 64 mm support span	MPa	1400 to 2300
Tensile Modulus	ISO 527-1/2, specimen 1A, 1 mm/minute test speed	MPa	1400 to 1800
Tensile Stress at Yield	ISO 527-1/2, specimen 1A, 50 mm/minute test speed	MPa	≥ 25
Multiaxial Impact Strength at +23 °C	ASTM D3763, specimen C, 2.2 m/s impact velocity	J at maximum load	≥ 7 All failures must be ductile
Multiaxial Impact Strength at +23 °C	ISO 6603-2/40/20/C/4.4. Sample to be either square 60 mm x 60 mm minimum, or circle 60 mm diameter minimum. Sample thickness to be 2 mm ± 0.1 mm.	J at maximum load	≥ 10 All failures must be ductile (type YD or YS)
Notched Charpy Impact at +23 °C	ISO 179/1eA	kJ/m²	≥ 10
Notched Charpy Impact at -30 °C	ISO 179/1eA	kJ/m²	≥ 3
Vicat Softening Temperature VST/A/50	ISO 306	°C	≥ +112
Heat Deflection Temperature (HDT), Method A (1.8 MPa)	ISO 75-1, ISO 75-2, ISO 75-3	°C	≥ +50
CLTE, longitudinal, +23 °C to +80 °C for ISO 11359; -30 °C to +100 °C for ASTM E831 and ASTM E228	ISO 11359 or ASTM E831 or ASTM E228	1/K	≤ 40 x 10^{-6}

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