GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW17387

Polyolefin Alloy – 1800 MPa Flexural Modulus, Weather Resistant, Thermoformable/Blow-Moldable

1 Scope

1.1 Material Description. This standard covers the properties of a nominal 1800 MPa flexural modulus polyolefin alloy, exterior weather resistant, high flow, and thermoformable/blow-moldable 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-M13<.

1.3 Applicability. Typical applications include tonneau cover skins and truck bed liners.

2 References

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

2.1 External Standards/Specifications.

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

2.2 GM Standards/Specifications.

GMW3059	GMW14650	GMW14698	GMW16847
GMW3221	GMW14688		

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. The values specified in Table 1 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.

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

3.1.2 Requirements on Materials. See Table 1 and Table 2. A minimum of six (6) lots shall be tested to Table 1. A minimum of one (1) 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 versus Strain Curve at 23 °C
- Multiaxial Impact Curves

3.2 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.

3.3 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 Materials Engineer for details.

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Table 1: Compound Properties (Black or Natural)

Properties	Standard	Unit	Values
Mineral Filler Content (Ash)	ISO 3451-1, Method A at +600 °C	% by mass	11 to 15
Density	ISO 1183, Method A	g/cm³	0.98 to 1.02
Melt Flow Rate (MFR) 230/2.16	ISO 1133	g/10 minutes	0.3 to 1.0
Melt Volume Flow Rate (MVR) 230/2.16	ISO 1133	cm³/10 minutes	0.5 to 1.2
Flexural Modulus	ISO 178, 80 mm × 10 mm × 4 mm specimen, 2 mm/minute test speed, 64 mm support span	MPa	1600 to 2400
Tensile Modulus	ISO 527-1/2, Specimen 1A, 1 mm/minute test speed	MPa	1600 to 2400
Tensile Stress at Yield	ISO 527-1/2, Specimen 1A, 50 mm/minute test speed	MPa	≥ 24
Multiaxial Impact Strength at +23 °C	ASTM D3763, Specimen C, 2.2 m/s impact velocity	J at maximum load	≥ 18 All failures must be ductile
Multiaxial Impact Strength at 0 °C	ASTM D3763, specimen C, 2.2 m/s impact velocity	J at maximum load	≥ 20 All failures must be ductile
Multiaxial Impact Strength at +23 °C	ISO 6603-2/40/20/C. Sample to be either square 60 mm × 60 mm minimum, or circle 60 mm diameter minimum. Sample thickness to be 2 mm ± 0.1 mm.	J at maximum load	≥ 18 All failures must be ductile Type YD or YS
Multiaxial Impact Strength at 0 °C	ISO 6603-2/40/20/C. Sample to be either square 60 mm × 60 mm minimum, or circle 60 mm diameter minimum. Sample thickness to be 2 mm ± 0.1 mm.	J at maximum load	≥ 15 All failures must be ductile Type YD or YS
Notched Charpy Impact at +23 °C	ISO 179/1eA	kJ/m²	≥ 45
Notched Charpy Impact at -30 °C	ISO 179/1eA	kJ/m²	≥ 1
Vicat Softening Temperature (VST)/B/50	ISO 306, 50 N load, 50 °C/h heating rate	°C	≥ +70
Heat Deflection Temperature (HDT) Method A	ISO 75-1, ISO 75-2, ISO 75-3	°C	≥ +55
Coefficient Linear Thermal Expansion (CLTE), longitudinal, +23 °C to +80 °C for ISO 11359; -30 °C to +100 °C for ASTM E831 and ASTM E228	ISO 11359, ASTM E831 or ASTM E228	1/K	≤ 92 × 10^{-6}

YD: Yielding (zero slope at maximum force) followed by deep drawing.
YS: Yielding (zero slope at maximum force) followed by (at least partially) stable cracking.

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