



Polyolefin Alloy - Talc Filled, High Stiffness, High Impact, Interior Thermoplastic Olefin

1 Scope

1.1 Material Description. This specification describes material grades of polyolefin alloy, pellet form, injection molding compounds.

For the purpose of this specification, polyolefin alloy is defined as an alloy of polypropylene plastic and Ethylene Propylene (EP) or Ethylene Propylene Diene Monomer (EPDM) rubber.

The classification into groups is according to the different properties as described in Table 1.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PP+EP(D)M-M20 <.

1.3 Applicability. Typical applications include the following: Interior Trim.

2 References

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

2.1 External Standards/Specifications.

ASTM D3763	ISO 179/1eA	ISO 1133	ISO 6603-1/2
ASTM E831	ISO 188	ISO 1183-1	ISO 105-G02
ISO 75-1	ISO 294	ISO 1873-2	ISO 11359-2
ISO 75-2	ISO 527-1	ISO 3167	ISO 11469
ISO 75-3	ISO 527-2	ISO 3451-1	

2.2 GM Standards/Specifications.

GMW3013	GMW3232	GMW14334	GMW15634
GMW3059	GMW3235	GMW14444	GMW16172
GMW3205	GMW3417	GMW14688	GMW16853
GMW3221	GMW14162	GMW15520	

2.3 Additional References.

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

3 Requirements

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 1A, 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 integrally colored grades where other additive systems (e.g., stabilizer) are used, the impact values shall not decrease more than 10% from specified minimum value.

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

3.2 Emissions Testing of Interior Materials and Parts. For all Code E designated parts per GMW14444, reference GMW16853 for emissions testing of interior materials and parts.

3.3 Requirements on Delivery. Materials approved to this specification shall meet the requirements of GMW3013.

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

Note: For each product, the requirements to Table 1 and Table 2 shall be documented by Certification Statement according to GMW3013. The color shall be specified on drawings, in material specifications and otherwise.

The following are also required for full specification approval. The minimum number of lots per test required is one in natural:

- Poisson's Ratio
- Stress-Strain Curves at multiple temperatures: +23 °C, +85 °C, -30 °C
- Multiaxial Impact Curves at low temperature.

See GMW3013 Template for the test procedures.

3.4 Performance Requirements. Performance requirements: Proof of successful airbag deployments with written confirmation, e.g., signed Analysis, Developmental, Validation Plan and Report (ADVP&R), completed test report, etc.

Table 1: Compound Properties (Black or Natural)

Property	Standard	Units	T1, Class U UV Stable, Scratch Resistant (Default if no type is specified)	T1, Class P Paintable Version of T1 (No UV or Scratch Additives)	T2, Class U Higher Impact, UV Stable, Scratch Resistant	T2, Class P Paintable Version of T2 (No UV or Scratch Additives)	T3, Class U Low Density UV Stable, Scratch Resistant	T3, Class P Paintable Version of T3 (No UV or Scratch Additives)
Filler Content	ISO 3451-1 Method A	%	18 to 22	18 to 22	16 to 19	16 to 19	13 to 17	13 to 17
Density	ISO 1183-1	g/cm ³	1.01 to 1.05	1.01 to 1.05	1.01 to 1.03	1.01 to 1.03	0.95 to 1.01	0.95 to 1.01
Melt Flow Rate (MFR) 230/2.16		g/10 minimum	19 to 23	19 to 23	9 to 13.5	9 to 13.5	19 to 23	19 to 23
Melt Volume Flow Rate (MVR) 230/2.16	ISO 1133	g/10 minimum	22.1 to 26.7	22.1 to 26.7	11 to 15	11 to 15	Report Results	Report Results
Tensile Modulus at 23 °C	ISO 527-1 ISO 527-2 Specimen 1A, 1 mm/minute test speed	MPa	1600 to 2260	1600 to 2260	Report Results	Report Results	1600 to 2260	1600 to 2260
Tensile Stress at Yield	ISO 527-1, ISO 527-2 Specimen 1A, 50 mm/minute test speed	MPa	≥ 17	≥ 17	≥ 17	≥ 17	≥ 17	≥ 17
Tensile Elongation	ISO 527-1, ISO 527-2 Specimen 1A, 50 mm/minute test speed	%	Report Results	Report Results	Report Results	Report Results	Report Results	Report Results
Tensile Stress at Yield after Heat Aging (1000 h ± 5 h at 105 °C ± 3 °C) ^{Note 1}	ISO 527-1, ISO 527-2 50 mm/minute test speed	% Retention	≥ 100%	≥ 100%	≥ 100%	≥ 100%	≥ 100%	≥ 100%

Property	Standard	Units	T1, Class U UV Stable, Scratch Resistant (Default if no type is specified)	T1, Class P Paintable Version of T1 (No UV or Scratch Additives)	T2, Class U Higher Impact, UV Stable, Scratch Resistant	T2, Class P Paintable Version of T2 (No UV or Scratch Additives)	T3, Class U Low Density UV Stable, Scratch Resistant	T3, Class P Paintable Version of T3 (No UV or Scratch Additives)
Multiaxial Impact Strength at 23 °C	ASTM D3763, Specimen 100 mm diameter x 3.2 mm or 100 mm x 100 mm x 3.2 mm, 6.6 m/s speed	J at maximum load	≥ 18 All failures must be ductile	≥ 18 All failures must be ductile	≥ 18 All failures must be ductile	≥ 18 All failures must be ductile	≥ 18 All failures must be ductile	≥ 18 All failures must be ductile
Multiaxial Impact Strength at Cold Temperature	ASTM D3763, 100 mm diameter x 3.2 mm or 100 mm x 100 mm x 3.2 mm, 6.6 m/s speed	J at maximum load	≥ 20 at (minus) -30 °C All failures must be ductile	≥ 20 at (minus) -30 °C All failures must be ductile	≥ 24 at (minus) -40 °C All failures must be ductile	≥ 24 at (minus) -40 °C All failures must be ductile	≥ 20 at (minus) -30 °C All failures must be ductile	≥ 20 at (minus) -30 °C All failures must be ductile
Multiaxial Impact Strength at Cold Temperature after Heat Aging (1000 h ± 5 h at 105 °C ± 3 °C) ^{Note 1}	ASTM D3763, 100 mm diameter x 3.2 mm or 100 mm x 100 mm x 3.2 mm, 6.6 m/s speed	% Energy Retention	≥ 100% All failures must be ductile	≥ 100% All failures must be ductile	≥ 100% All failures must be ductile	≥ 100% All failures must be ductile	≥ 100% All failures must be ductile	≥ 100% All failures must be ductile
Multiaxial Impact Strength at 23 °C	ISO 6603-1/2, Specimen 60 mm diameter x 2 mm or 60 mm x 602 mm x 2 mm plaque, 4.4 m/s speed	J at maximum load	Report Results	Report Results	Report Results	Report Results	Report Results	Report Results
Multiaxial Impact Strength at Cold Temperature	ISO 6603-1/2, Specimen 60 mm diameter x 2 mm or 60 mm x 602 mm x 2 mm plaque, 4.4 m/s speed	J at maximum load	Report Results	Report Results	Report Results	Report Results	Report Results	Report Results