



Polypropylene Copolymer – Mineral Filled, UV Stabilized, Heat Stabilized

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose/Material Description. This specification describes the properties of injection moldable, mineral filled polypropylene copolymer, Ultraviolet (UV) stabilized, heat stabilized.

1.1.1 Types. The classification into groups is according to the different properties as described in Table 1 following 3.6.

- T4 has higher tensile modulus (stiffness) than T2
- T6 has higher tensile modulus (stiffness) than T2 and increased scratch resistance than T2 and T4
 - T6A has increased scratch resistance than T6B
 - T6C is paintable

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

1.3 Applicability. Typical applications include the following:

- Interior Trim Components

1.4 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

AATCC 23	ISO 179-1/1eA	ISO 1050	ISO 3795
ASTM D3012	ISO 188	ISO 1133	ISO 11359-2
ASTM E831	ISO 294	ISO 1183-A	ISO 11469
ISO 75-1	ISO 527-1	ISO 3167	ISO 19069-2
ISO 75-2	ISO 527-2	ISO 3451-1	

2.2 GM Standards/Specifications.

GMW3013	GMW3232	GMW14270	GMW16172
GMW3059	GMW3235	GMW14444	GMW16853
GMW3205	GMW3417	GMW14688	GMW17141
GMW3221	GMW14162	GMW15634	

2.3 Additional References. Not applicable.

3 Requirements

3.1 Material Requirements. Materials approved to this specification shall meet the requirements of GMW3013.

3.1.1 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294, using the injection molding conditions specified in ISO 19069-2. Test methods and specimen dimensions are also to be in accordance with ISO 19069-2 with the following additions:

- Use ISO 3167, Type 1A, thickness 4 mm, for tensile 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, black or in a standard sampled color if natural or black are not available. The values specified in Table 2 shall be met by four (4) interior colors (black, gray, tan/neutral and either red or blue) for approval to the specification. These test specimens may be produced using generic colorants in the four (4) colors or by specific colors required by a GM program.

3.1.2 Requirements on Delivery. 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 Plastic Submission Template (see GMW3013). The color shall be specified on drawings, in material specifications and otherwise.

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

3.3 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.

3.4 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:

- Interior Emissions report per GMW16853.
- Poisson's Ratio.
- Stress Strain Curve at multiple temperatures: -30 °C, +23 °C, +85 °C, +110 °C (see GM Material Property Database (GMMPD) tab on Plastic Submission Template (see GMW3013) for test parameters).
- Coefficient of Linear Thermal Expansion (CLTE) data (see GMMPD tab on Plastic Submission Template for test parameters).
- Differential Scanning Calorimetry (DSC) Curve.
- Fourier Transform Infrared Spectroscopy (FTIR) Curve.
- Mold Shrinkage.
- See the polypropylene tab on the Plastic Submission Template for the test procedures.

3.5 Performance Requirements. Performance requirements shall be specified on part drawings or in component specifications.

All finished parts for Interior applications shall meet the requirements specified in GMW14444.

3.6 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.

Table 1: Compound Properties (Black or Natural)

Property	Standard	Units	Types and Requirements				
			T2	T4	T6		
					Class A	Class B	Class C Paintable (No UV and No Scratch Additives)
ISO Symbol	ISO 11469	N/A	>PP/PE-M15<	>PP/PE-M20<	>PP/PE-M15<		
Filler Content	ISO 3451-1, Method A (at +600 °C)	%	15 ± 2	20 ± 2	15 ± 2		
Density (Target Range)	ISO 1183-A	g/cm³	1.0 ± 0.02	1.05 ± 0.02	1.00 ± 0.02		
Tensile Stress at Yield	ISO 527-1 ISO 527-2	MPa	≥ 17	≥ 24	≥ 26		
Tensile Modulus	ISO 527-1 ISO 527-2 Specimen 1A, 1 mm/minute test speed	MPa	1400 to 2000	2000 to 3000	2100 to 2700		
Tensile Stress at Yield after Heat Aging Note 1	ISO 527-1 ISO 527-2	% Retention	≥ 90	≥ 90	≥ 100		
Notched Charpy Impact at +23 °C	ISO 179-1/1eA	kJ/m²	≥ 10	≥ 3	≥ 4		
Notched Charpy Impact at -30 °C	ISO 179-1/1eA	kJ/m²	≥ 2	≥ 1.5	≥ 2		
Heat Deflection Temperature (HDT) – Method B, 0.45 MPa, Flatwise	ISO 75-1 ISO 75-2	°C	≥ 90	≥ 110	≥ 105		
HDT – Method A, 1.8 MPa, Flatwise	ISO 75-1 ISO 75-2	°C	≥ 50	≥ 60	≥ 55		
Flammability	GMW3232 or ISO 3795 All reporting must be in accordance with GMW3232	mm/minute	Self-Extinguishing or ≤ 100				
Emission Testing of Interior Materials: For initial approval, test one (1) lot in black.	GMW16853						
- Odor	GMW3205-B3	Rating	≥ 6				
- Fogging	GMW3235-B-Y1-T2	mg	Requirements see GMW16853				
- Emissions	GMW15634 VOC Value SVOC Value	µg/g µg/g	Requirements see GMW16853 Requirements see GMW16853				
Melt Flow Rate (MFR)	ISO 1133 230 °C/2.16 kg	g/10 minimum	15 to 25	10 to 20	14 to 25		