



Light Deflection Poly(Methyl Methacrylate)

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 a Poly(Methyl Methacrylate) (PMMA) material which appears crystal clear and completely transparent when unlit and uniformly illuminated with Light Emitting Diode (LED) light sources aimed through the edge of the geometry. Light deflection particles are added to traditional grades of PMMA to achieve this appearance.

1.1.1 Paintability. Approved paint systems that can be used on this material are listed in the General Motors Approved Paint on Parts Systems (GM APOPS) database.

1.1.2 Types. The classification into groups, as referenced in Table 1, is according to the distance of uniform illumination through the sample light path length using a single LED light source.

1.2 Symbols. The material abbreviation according to ISO 11469 is >PMMA<.

1.3 Applicability. Typical applications include exterior lighting light pipe, light guide, light curtain applications, as well as interior ambient lighting, emblems, and other specialty applications.

1.4 Remarks. Not applicable.

2 References

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

2.1 External Standards/Specifications.

ASTM D955	ISO 294-3	ISO 11359-2	UN R 7
ASTM D1003	ISO 294-4	ISO 11469	UN R 19
ASTM E831	ISO 306	SAE J2527	UN R 23
CMVSS 108	ISO 527-1	SAE J576	UN R 31
FMVSS 108	ISO 1133-1	UN R 1	UN R 38
ISO 75-1	ISO 1183-2	UN R 3	UN R 48
ISO 75-2	ISO 4892-1	UN R 4	UN R 77
ISO 179-1/1eU	ISO 4892-2	UN R 5	UN R 87
ISO 294-1	ISO 8752-2	UN R 6	UN R 91

2.2 GM Standards/Specifications.

GMW3013	GMW3235	GMW14650	GMW16172
GMW3059	GMW14124	GMW14797	GMW16853
GMW3205	GMW14270	GMW15634	GMW17296
GMW3221	GMW14444	GMW15635	

2.3 Additional References. Not applicable.

3 Requirements

3.1 Requirements on Test Specimens. Materials approved to this specification shall meet the requirements of GMW3013.

Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294-1 with the conditions for injection molding from ISO 8752-2. Test methods and specimen dimensions are also to be in accordance with ISO 8752-2.

All tests shall be performed on specimens for 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. In addition, tests specified at temperatures below or above $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 h minimum.

The values specified in Table 1 and Table 2 shall be met by test specimens in natural or in a standard sampled color if natural is not available.

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.

3.3 Compound Properties (Natural). See Table 1 and Table 2. The following are also required for full approval. The minimum number of lots per test required is one unless otherwise specified. See the Polyamide tab on the Plastics Submission Template and GMW3013 for test details and parameters.

- Poisson's Ratio
- Stress/strain data points and curves at the following temperatures:
-30 °C, +23 °C, +85 °C, +110 °C

Note: See GM Material Property Database (GMMPD) tab on Plastics Submission Template for test details (contact specification owning group named in Section 6 for access).

- Coefficient of Thermal Expansion (CTE) data.

Note: See GMMPD tab on Plastics Submission Template for test details (contact specification owning group named in Section 6 for access).

- Differential Scanning Calorimetry (DSC) curve.
- Fourier Transform Infrared (FTIR) spectroscopy curve.
- Mold shrinkage.

3.4 Initial Source Approval. No shipments shall be made by any supplier until representative initial production samples have been approved by the appropriate Materials Engineering department(s) as meeting the requirements of this specification.

3.5 Performance Requirements. Performance requirements, e.g., flammability and any other applicable component performance requirements shall be specified on part drawings or in component specifications. All parts manufactured from these materials shall be resistant to the media contacted at their place of use, such as aliphatic and aromatic hydrocarbons, fuels, lubricants, oils, greases and alcohols.

All finished parts for Interior applications shall meet the requirements according to GMW14444.

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

All finished lenses/parts for Exterior Lighting must meet the legal requirements of Canadian and Federal Motor Vehicle Safety Standards (CMVSS 108 and FMVSS 108) and the Economic Commission for Europe (UN) Regulatory Requirements - Lighting and Light Signaling Devices -- UN R 1, UN R 3, UN R 4, UN R 5, UN R 6, UN R 7, UN R 19, UN R 23, UN R 31, UN R 38, UN R 48, UN R 77, UN R 87, UN R 91.

3.6 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.

3.7 Paintability. Plastics used for painted applications are required to meet Paint Performance Requirements for New Plastic Materials per GMW16172. Additionally, painted plastic parts are required to meet Painted Plastic Parts Performance Requirements per GMW14797.