



Polycarbonate - Optical Lens

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 materials types of unfilled Polycarbonate (PC) for optical lens applications. Type code numbers that apply to this specification are listed in Table 1. This specification is based on GMW3013 per ISO 21305-1/2 recommendations.

1.1.1 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.

1.1.2 Types. The type classifications are in groups according to the different properties as described in Table 1.

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

1.3 Applicability. Typical applications include exterior optical lenses.

2 References

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

2.1 External Standards/Specifications.

ASTM D1003	ISO 294-1	ISO 527-1	ISO 21305-2
ASTM D3763	ISO 294-3	ISO 527-2	ISO 21305-1/2
ISO 75-1	ISO 294-4	ISO 1133	SAE J576
ISO 75-2	ISO 306	ISO 1183	
ISO 179-1/1eA	ISO 527	ISO 11469	

2.2 GM Standards/Specifications.

GMW3013	GMW14270	GMW14650	GMW16172
GMW3059	GMW14444	GMW14797	GMW16853
GMW3221			

2.3 Additional References.

Plastic Submission Template

3 Requirements

3.1 Requirements on Test Specimens. Unless otherwise specified, injection molding of test specimens shall be accomplished per ISO 294-1, with the conditions for injection molding from ISO 21305-2. Test methods and specimen dimensions are also to be in accordance with ISO 21305-2.

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. All tests shall be performed on unannealed specimens, unless otherwise noted.

The values specified in Table 1 shall be met by test specimens in natural/crystal. For crystal lens grades used in exterior lighting, color review and approval by GM Materials Engineering is required. Integrally colored transparent grades used in exterior lighting shall meet 3 year weathering resistance as specified in Table 1.

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

3.4 Requirements on Delivery. Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1.

Note: For each product, the requirements shall be documented using the latest certification template and certification statement according to GMW3013. The color shall be specified on drawings, in material specifications and otherwise.

3.5 Chemical Requirements. All parts manufactured from molding compounds shall be resistant to the media contacted at the place of use.

3.6 Compound Properties. For compound property requirements, see Table 1. Table 1 defines the properties by code numbers which will be used within the specification. Full specification approval also requires general material properties listed in 3.6.1. The values listed in the compound property tables shall represent the minimum three sigma calculated values unless otherwise noted.

3.6.1 Other Data. The minimum number of lots per test required for the following properties is one in natural/crystal:

- Poisson's Ratio.
- Stress Strain Curve at multiple temperatures: -30 °C, +23 °C, +85 °C and 120 °C. See the GMMPD tab on Plastic Submission Template for test parameters (contact specification owning group named in Section 6 for access).
- Coefficient of Thermal Expansion (CTE) data, See GMMPD tab on Plastic Submission Template for test parameters (contact specification owning group named in Section 6 for access).
- Differential Scanning Calorimetry (DSC) curve.
- Dynamic Mechanical Analysis (DMA) curve.
- Fourier Transform Infrared (FTIR) spectroscopy transmission and absorbance curves.

See the Polycarbonate tab on the Plastic Submission Template for the test procedures (contact specification owning group named in Section 6 for access).

Reference GMW3013 for all test procedures and parameters.

3.7 Performance Requirements. All finished lens components for exterior lighting require the use of a hardcoat unless not used for optical devices and are not visible when in vehicle position.

Optical device requirements shall be met as a requirement for approval to this specification. All finished lenses/parts for exterior lighting shall meet all applicable regulatory requirements, e.g., in the United States of America, Federal Motor Vehicle Safety Standard (FMVSS) FMVSS 108 and in Canada, Canadian Motor Vehicle Safety Standard (CMVSS), CMVSS 108.

All finished parts for exterior applications shall meet the requirements according to GMW14650 and will require the use of an Ultraviolet (UV) protecting coating such as a clearcoat or a hardcoat.

Additional performance requirements, e.g., flammability, fogging or resistance to odor, shall be specified on part drawings or in component specifications.

3.8 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 Property Requirements - Type Code (Natural/Crystal)

Property (Information Only)	Standard ^{Note 1}	Unit	Type Code	
			T1	T2
Melt Flow Rate (MFR) 300 °C/1.2 kg ^{Note 2}	ISO 1133	g/10 minutes	Target Average 12	Target Average 18