



Polyurethane Foam for Trim Pads, Headliners, Sealing and Insulators

1 Scope

1.1 Material Description. Polyurethane (PUR) slab foam based on Methylene diphenyl Diisocyanate (MDI), Toluene Diisocyanate (TDI), or Methylene diphenyl Diisocyanate/Toluene Diisocyanate blends (MDI/TDI) for soft-trim lamination or mechanical foam applications. These foams may be polyether polyols or polyester polyols. For semi-rigid polyurethane headliner substrate biscuit foam, refer to GMW14838.

1.2 Symbols. Not applicable.

1.3 Applicability. The polyurethane material specified in this standard is recommended for use in automotive laminated seat upholstery fabrics, scrim backing, trim pads, insulators, headliners, sunshade, etc. Manufacturing processes may include: thermoforming; thermocrushing; thermosetting; flame-bonded lamination; adhesive lamination; mechanical cutting; etc. This specification segments polyurethane material into twenty types. The twenty types are based on material performance and product application, and they do not address the actual part design. These standards are to be considered minimum compliance. Optimum product conditions for maximum performance may require values different than those shown in the specification, but this will be program specific and part specific.

1.4 Recycled or Alternate Materials. Recycled polyurethane materials or bio-based materials may be used for parts under this specification. Prior to incorporating recycled or bio-based materials into a finished product, the supplier shall provide data to GM Materials Engineering showing that no decrease in performance or durability will occur due to the use of the recycled polyurethane materials or bio-based materials.

2 References

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

2.1 External Standards/Specifications.

ASTM D925	ISO 105-G02	ISO 1798
ISO 845	ISO 1856	ISO 9327
ISO 8067	ISO 1923	ISO 3386-1

2.2 GM Standards/Specifications.

GMW3059	GMW3235	GMW14357	GMW15634
GMW3205	GMW3259	GMW14358	GMW15635
GMW3221	GMW6992	GMW14444	GMW16853
GMW3232	GMW14270	GMW14838	

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

3.1.1 Test Piece and Number. Specimens shall be taken from the shaped or fabricated part. If it is not possible to take test pieces from the shaped or fabricated part, suitable plaques or parts shall be manufactured for testing (taken from the same manufacturing process, foam formulation, density and compression force deflection). The test piece shall be taken in the same foam structure orientation as in the production part.

3.1.2 Conditioning. Immediately prior to test, all test pieces shall be conditioned to GMW3221 Code A. Immediately prior to conditioning, all test pieces shall be predried at 70 °C ± 3 °C. The predrying period shall be ≥ 16 h for tests conducted after humidity aging and shall be ≥ 3 h for other tests.

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 General. This material is a polyurethane whose composition and properties suit the application stated in 1.3. This particularly applies to its fatigue resistance, permanent set, humidity aging, and loss of elasticity. The foam shall be uniform in foam structure, cell size, and mechanical properties. Unfoamed areas and densifications (streaks) are not permissible. The foam shall not cause skin irritations or have an offensive odor. Once a foam type has been approved and released, a substantial change of the formulation which could adversely affect the subsequent processing or serviceability is not permitted unless this change has been previously tested and approved for release by Global Material Engineering. The thickness of the foam types shall be specified by the design department depending on the quality/type of the upholstery fabric to be used.

3.3.1 New GM Materials Approved Source List approval may be required, if after review by GM Materials Engineering:

- Additional ingredients are added to the formula which have not been included in the original GM Materials Approved Source List approved recipe, or;
- There are changes to the major ingredients (Polyols or Isocyanates) of the foam recipe.

3.3.2 Annual certification densities shall meet Engineering Drawing requirements with tolerances. To be applicable, GM Materials Approved Source List approved materials must meet Engineering Drawing requirements with tolerances.

3.4 Type Descriptions. The material shall be categorized by type, according to application, firmness, thickness, backing type, and/or density.

3.4.1 Type A1 to Type A5. These types are general purpose materials used in applications where higher density is not required, such as trim pads, and insulators.

3.4.1.1 Type A1. PUR foam with medium density.

3.4.1.2 Type A3. PUR foam based on polyether with low density and medium compression force deflection.

3.4.1.3 Type A4. PUR foam based on polyether with medium density.

3.4.1.4 Type A5. PUR foam based on polyether with high density.

3.4.2 Type B1 to Type B3. These types are used primarily in trim cover applications where a higher density product is desired for seating areas where the foam is to be bonded to a scrim backing to provide additional backing support.

3.4.2.1 Type B1. PUR foam based on polyether with high density.

3.4.2.2 Type B2. PUR foam based on polyether with medium density.

3.4.2.3 Type B3. PUR foam based on polyether with medium density.

3.4.3 Type C1 to Type C2. These types are used primarily for trim cover applications where the foam is to be bonded to a lightweight scrim backing to provide a minimum of minimal backing support to the trim cover.

3.4.3.1 Type C1. PUR foam with low density, and thickness ≤ 25 mm.

3.4.3.2 Type C2. PUR foam with low density, and thickness ≥ 25 mm.

3.4.4 Type E1 to Type E5. These types are used as foam for textile laminates in low thicknesses, for trim cover applications areas such as: seating; headliner; door panel, and; sealing.

3.4.4.1 Type E1. PUR foam based on polyether with high density.

3.4.4.2 Type E2. PUR foam based on polyether with low density.

3.4.4.3 Type E3. PUR foam based on polyether with medium density.

3.4.4.4 Type E4. PUR foam based on polyester with low density. This type is used as foam for flame-bonded textile laminates in low thicknesses for non-sitting areas of a seat trim cover.

3.4.4.5 Type E5. PUR foam based on polyester with medium or high density, this type is used as foam for flame-bonded textile laminates in low thicknesses for trim cover seating area.

3.4.5 Type F1 to Type F4. These types are used for one (1) piece headliner applications where compression set is not a concern.

3.4.5.1 Type F1. Flexible open cell, polyether PUR foam used for a one (1) piece headliner where the criteria of meeting the flammability requirements are measured on the finished assembly. The foam must not contain flame retardant additive.

3.4.5.2 Type F2. Flexible open cell, polyether PUR foam used for a one (1) piece headliner laminate with deep draw design, where the criteria of meeting the flammability requirements are measured on the finished assembly. The foam does not contain flame retardant additive. This type of foam has lower permeability and is used to reduce mottling/orange peel/foam collapse compared to normal foam and to improve ability to withstand headliner high temperature molding conditions at thinner thickness than Type F1.

3.4.5.3 Type F3. Flexible open cell polyether PUR foam used for sunshade and headliner laminate applications, where, each component of the construction must meet flammability requirements. This foam must not have adverse clickable characteristics (e.g., part edges must not seal or weld on die cutting).

3.4.5.4 Type F4. Flexible open cell, PUR foam used for a headliner lamination foam where, each component of the construction must meet flammability requirements. This foam must not have adverse clickable characteristics (e.g., part edges must not seal or weld on die cutting). This foam shall be resistant to discoloration due to oxidation. Steam Autoclave testing shall be per GMW14357 Code E.

3.4.6 Type Z. PUR foam which does not fit in the other Types. Specific values to be documented on the Certification Data Form. (Appendix A, Data Sheet A1).

3.5 Data for Foam Certification Form. Complete the Appendix A, Data Sheet A1.

3.5.1 All requirements listed in Tables 1 through 6 shall be fulfilled by the delivered foam and shall be documented by the supplier in the Foam Certification Data Form (Appendix A, Data Sheet A1). Values designated as Per Engineering Drawing with Tolerance, shall be documented and noted on the drawing/in the math data for production quality check purposes. Values indicated with Not Applicable (N/A) are not required. Documentation of additional properties may be required by the approving region.

3.5.2 Test shall be performed at an ISO/IEC 17025 accredited laboratory, or a facility approved by GM Materials Engineering.

3.5.3 The Foam Certification Form must be signed by GM Materials Engineering to be valid for GM Materials Approved Source List, Production Part Approval Process (PPAP), and/or annual submissions.

3.5.4 GM Design Release Engineering, in cooperation with the material supplier, and GM Materials Engineering, may create a part/composite with polyester foam as a deviation to any GMW15058 Type, as long as it meets all specified property and performance requirements.

3.6 Annual Certification. Annual certification to this standard shall require continued conformance testing to all original physical property requirements within this standard or associated engineering drawing. Materials which have secured MATPSC approval shall only be required to submit compliance testing per GMW15058 for Annual Certification for Flammability, Density, As-Received Compression Force Deflection, and specific mechanical testing called out in Engineering Drawings. The primary Original Equipment Manufacturer (OEM) supplier shall hold annual material certifications on file.

Table 1: Required Performance Values for Documentation

Performance	Test Method	Specified Value
Fogging	GMW3235 Method B-Y1-T1	≤ 2 mg No droplets or crystals are acceptable upon visual inspection
Flammability Note 1	GMW3232	≤ 100 mm/minute
Interior Emissions	GMW15634 Volatile Organic Compound (VOC)	See GMW16853 for requirements
	GMW15634: Semi-Volatile Organic Compound (SVOC)	See GMW16853 for requirements
	GMW15635: Carbonyls	See GMW16853 for requirements
Resistance to Odor	GMW3205, Wet Condition (Code A) Note 2	≥ 6
	GMW3205, Dry Condition (Code B) Note 2	≥ 6
Steam Autoclave	PUR-Foam-Polyether: 5 h, 120 °C $\pm$ 3 °C GMW14357 Code E	No visible degradation
	PUR-Foam-Polyester: 3 h, 105 °C $\pm$ 3 °C GMW14357 Code D	No visible degradation
Mildew Note 3	GMW3259	No mildew.
Compatibility Note 4	ASTM D925 Method A, or as specified by GM Materials Engineering	Visual evaluation using GMW6992: - No color change; slight darkening permissible. - No adverse changes in shape, surface condition or in physical or chemical properties.

Note 1: F1 and F2 headliner foam meet the flammability requirement only as a composite. Report on Appendix A, Data Sheet A1, and per GMW14838 Appendix A, Substrate Construction Certification Data Form.

Note 2: For Parts, refer to "Formulas for Weighable Parts" in GMW3205 Coding A and Coding B. For Initial Testing, GMW3205, Coding A3 and B3.

Note 3: Required only if natural fibers are present in the construction.

Note 4: Foam shall meet compatibility in the production intended composite. The test pieces shall be sewn or welded (dependent on use), using production techniques, to all possible combinations of composite materials taken at the same time from production to form a test pack. Note: For any changes in the quality of any of the composite materials, compatibility tests shall be repeated. At the discretion of the approving GM Engineer, foam material may be tested to standard composite materials for initial foam approval, e.g., a standard vinyl. Final foam approval shall be achieved in the production intent composite.