



Polyurethane Foam for Seal, Gasket, and Vibration Decoupler Applications

1 Scope

1.1 Material Description. All types of foams described in this specification are polyurethane open cell foam based on polyether or polyester chemistry. For molded, cast, and slab polyurethane foam for sound absorbing applications that will not see a continuous temperature environment over 121 °C, or short term temperature over 149 °C, refer to GMW14196: Polyurethane Foams for Acoustic Applications. For elastomer polyurethane foams for sealing and vibration handling applications with densities of 210 kg/m³ to 270 kg/m³ and minimum of 15% bio-renewable and a minimum of 25% post automotive shredder residue, refer to GMW16515: Flexible Expanded Material for Air, Dust, Water Sealing and Noise Vibration Handling Applications. For slab/sheet polyurethane foam for Engine Compartment Sound Absorber (ESCA), refer to GMW16869.

1.2 Symbols. Not applicable.

1.3 Applicability. The polyurethane material specified in this standard is recommended for use as follows.

- Automotive high-temperature acoustical applications or as a decoupler.
- Gasket for vibration damping and vibration and shock insulation.
- Air, dust, water seal and/or light seals.
- Squeak and rattle applications.
- Seal and gasket applications.
- Energy absorber and interior trim applications.

This specification segments these polyurethane materials into seven types. The seven 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 conditions for maximum product performance may require values different than those shown in the specification, but this will be program and part specific.

1.4 Remarks.

1.4.1 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 C522	ISO 1798	ISO 3386-1	SAE J1389
ASTM D737	ISO 1856	ISO 7231	
ISO 354	ISO 1923	ISO 8067	
ISO 845	ISO 2589	ISO/IEC 17025	

2.2 GM Standards/Specifications.

GMW3059	GMW3232	GMW14177	GMW15634
GMW3182	GMW3235	GMW14196	GMW16515
GMW3205	GMW3259	GMW14357	GMW16869
GMW3221	GMW4217	GMW14358	GMW17408

2.3 Additional References.

- CG4151, Foam Certification Data Form (available with GMW16750 from the engineering standards supplier).

3 Requirements

3.1 General. This material shall be a polyurethane foam with density, as specified on the part drawing, and which is suited to its application and purpose. Parts made from this foam shall be equal in foam structure, cell size and mechanical properties. The foam shall not cause any skin irritation, or have an unpleasant odor. The foam part shall have no unfoamed areas (e.g., shrinkage spots, voids, missing foam), no cracks, and no densification areas (e.g., streaks, mismix, knit lines) which could have adverse effects on appearance, performance or serviceability. The foam must be physiologically unobjectionable. It must be free from constituents which could cause health damages or skin irritations.

3.1.1 After part release, no change to the formulation can take place without the approval of GM Materials Engineering.

3.2 Mass and Thickness. Mass per unit area per GMW3182 and thickness per ISO 2589, of all materials for this specification shall be called out on the engineering drawing or the math files. Mass and thickness callouts are for the finished part. Mass and thickness does not apply to bulk materials.

3.3 Type Descriptions.

3.3.1 Type 1: Used for acoustical applications (Type A) or as a decoupler (Types B and C). Not to be used in applications where continuous temperature is over 121 °C or short term temperature is over 149 °C.

3.3.2 Type 2: Used for gasket for vibration and shock insulation. Intended for use below 122 °C and not intended for water sealing applications.

3.3.3 Type 3: Used for air, dust, and/or light seals and in squeak and rattle applications. Material can be used in a temperature range of -29 °C to 120 °C.

3.3.4 Type 4: Used for air, dust, light and/or water seal (water seal must be compressed at least 50%). Suitable temperature range is from -40 °C to 120 °C.

3.3.5 Type 5: Used for seal and gasket applications as well as energy absorber and interior trim applications material with broader temperature service and excellent chemical resistance.

3.3.6 Type 6: Used for seal and gasket applications as well as energy absorber and interior trim applications material with broader temperature service and excellent chemical resistance when more stiffness is required.

3.3.7 Type 7: Used for seal and gasket applications as well as energy absorber and interior trim applications material with broader temperature service and excellent chemical resistance when more stiffness and density are required.

3.3.8 Type Z: Polyurethane (PUR) foam which does not fit in the other types. Specific values to be documented on the Foam Certification Data Form CG4151 (see Appendix A, Figure A1 for sample).

3.4 Requirements for Test and Specimens.

3.4.1 After Conditioning. Immediately prior to tests, all test specimens shall be conditioned for a minimum of 24 h according to GMW3221 Code A.

3.4.2 After Aging (GMW3232). Test all specimens after aging according to GMW3232.

3.4.3 Fogging (GMW3235). Method A, Code Y1-T1. Report the average of the five reflectance values. A reflectance value of 90 minimum with either a dry uniform or non-uniform film is required. Specimens that form crystals, an oily film, or discernable droplets ≥ 0.05 mm in diameter at 40x magnification do not meet this requirement. For Method B-Y1-T1, the "condensable constituents" value must be ≤ 2 mg.

3.4.4 Acoustical Performance. When material is to be used for acoustical performance, products listed in this specification shall be determined by alpha cabin testing ISO 354.

3.4.5 Air, Dust, Light Seals Application Only for Type 3-I. Report air flow when tested to ASTM D737 (13 mm thick sample).

3.4.5.1 Test using paint pot test. Test apparatus shall consist of a 7.6 L paint pressure tank with a 0.6 mm pipe at least 15.2 cm long extending from the top of the pot. On the top of the 6.35 mm pipe shall be a standard 2.5 cm pipe flange (29 mm diameter opening). The tank shall be equipped with an air pressure gage having a 10 psi total scale graduated in 0.1 psi units.

Place a test piece of foam 15.2 cm x 15.2 cm x 2.5 cm thick of the 2.5 cm pipe flange; place a piece of 1.6 mm screening on top of the test piece; put another 2.5 cm pipe flange to the one attached to the pressure pot, with the test piece and screen in between, tighten the bolts until secure but avoid tightening one any more than the others.

Introduce a pressure of 35 kPa into the pressure pot and allow the pressure to build up slowly, turn off the air supply and observe the pressure drop over a 30 minute time period. At the end of 30 minutes, the residual pressure in the paint pot must be a minimum of 7 kPa.

3.4.6 Water Sealing Applications. Applications that require a water seal shall be tested to GMW17408 for Class II water seal requirements at 50% compression with 25 mm head of water. Report as received sealability and aged sealability.

3.4.7 Physical Properties. The requirements for physical properties are specified in Table 1 and Table 2.

3.5 Additional Requirements.

3.5.1 Any fire retardant additives contained in the foam must be formulated without the use of Phenyl Phosphate esters and/or Cresyl Phosphate esters including:

- Triphenyl Phosphate (TPP) (Chemical Abstracts Service (CAS) Number 115-86-6).
- Cresyl Diphenyl Phosphate (CDPP) (CAS Number 26444-49-5).
- Dicesyl Phenyl Phosphate (DCPP) (CAS Number 6446-73-1).
- Tricresyl Phosphate (TCP) (CAS Number 1330-78-5).

Alternative flame retardant chemistries in foam formulations must be used.

3.5.2 The foam material recipe shall be free of Chlorofluorocarbons (CFC) and Hydrofluorocarbons (HFC).

3.5 Data Reporting. All requirements listed in Table 1, Table 2, and Table 3 shall be fulfilled by the delivered foam and shall be documented by the supplier in the Foam Certification Data Form CG4151 (see Appendix A, Figure A1 for sample). Values designated as "Per Engineering Drawing", or "Report", shall be documented and noted on the drawing, or 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.

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

3.7 Annual Certification. Annual Production Part Approval Process (PPAP) 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 GMW16750 for Annual Certification for Flammability, Density, Compression Force Deflection (CFD) @ 25%, Air Flow (where applicable), and Water Impermeability (where applicable). The primary Original Equipment Manufacturer (OEM) supplier shall hold annual material certifications on file.