



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 3571

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Revised

POLYURETHANE CASTING RESIN, FLEXIBLE, SOLID Polyether-Type

1. SCOPE:

- 1.1 Form: This specification and its supplementary detail specifications cover polyether-type urethane resins and hardeners which, when mixed and cured, produce elastomeric polyurethane products.
- 1.2 Application: Primarily for applications such as electronic encapsulation or for casting parts and shapes.
- 1.3 Classification: The resin system shall be classified by hardness of the cured product as shown in the detail specifications, wherein each material is classified by hardness of 45 to 85 Durometer "A" and 45 to 75 Durometer "D".

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

- 2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

- 2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D257 - D-C Resistance or Conductance of Insulating Materials
ASTM D395 - Compression Set of Vulcanized Rubber
ASTM D412 - Tension Testing of Vulcanized Rubber
ASTM D624 - Tear Resistance of Vulcanized Rubber
ASTM D792 - Specific Gravity and Density of Plastics by Displacement
ASTM D903 - Peel or Stripping Strength of Adhesive Bonds
ASTM D1002 - Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)
ASTM D1053 - Measuring Low-Temperature Stiffening of Rubber and Rubber-Like Materials by Means of a Torsional Wire Apparatus
ASTM D2240 - Indentation Hardness of Rubber and Plastics by Means of a Durometer
ASTM F74 - Determining Hydrolytic Stability of Plastic Encapsulants for Electronic Devices

- 2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-M-24041 - Molding and Potting Compound, Chemically Cured, Polyurethane (Polyether Based)

SAE Technical Board rules provide that: "All technical reports, including standards approved by the Board, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or to be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

- 3.1 Detail Specifications: The requirements for a specific material shall consist of all the requirements specified herein in addition to the requirements specified in the applicable detail specification. In the case of conflict between the requirements of this basic specification and an applicable detail specification, the requirements of the detail specification shall govern.
- 3.2 Material: The compounds shall be two-component, polyether-type polyurethane systems, each consisting of a prepolymer and a separate curing agent. The prepolymer shall cure by the addition of the curing agent and shall not depend on solvent or moisture evaporation for curing. The prepolymer and curing agent shall be of high quality, selected for the purpose.
- 3.3 Properties of Uncured Material:
- 3.3.1 Appearance: The liquid, mixed compound shall have a uniform, homogeneous texture and shall be free of lumps, coarse particles, and air bubbles before molding or potting. There shall be no separation of pigment which cannot be dispersed readily. Solidification of the material is permissible provided it can be reliquified readily by heating.
- 3.3.2 Nonvolatile Content: Shall be not less than 99%, determined in accordance with MIL-M-24041.
- 3.3.3 Storage Life: The resin and hardener shall meet the requirements of this specification at any time up to 6 months from date of receipt by purchaser when stored in the original, unopened containers at temperatures below 29°C (84°F).
- 3.4 Properties of the Cured Product: The material, when mixed and cured in accordance with the manufacturer's instructions, shall have properties as shown in the applicable detail specification and as follows, determined in accordance with the methods specified in 4.5.
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| 3.4.1 Specific Gravity | 1.05 to 1.20 |
| 3.4.2 Modulus of Rigidity at -54°C (-65.2°F), max | 100,000 psi
(690 MPa) |
| 3.4.3 Electrical Insulation Resistance, min | |
| at 25°C (77°F) | 100,000 Megohms |
| at 121°C (249.8°F) | 750 Megohms |
| 3.4.4 Hydrolytic Stability at 85°C (185°F) and 95% RH | Maximum decrease, in
60 days, of 20% of
Durometer hardness |

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

- 4.2.1 Acceptance Tests: Tests to determine conformance of the mixed, uncured compound to appearance (3.3.1 of this basic specification) and of the cured product to hardness (3.3.1 of the applicable detail specification) requirements are classified as acceptance tests.
- 4.2.2 Qualification Tests: Tests to determine conformance to all technical requirements of this specification are classified as qualification or periodic tests and may be the basis for approval of the compound (See 4.4.1).
- 4.2.3 For direct U.S. Military procurement, substantiating test data and, when requested, qualification test material shall be submitted to the cognizant qualification agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Sufficient material shall be selected from containers from each lot to form two separate specimens.

4.3.1 Lot: A lot shall be all material produced in a single production run from the same batches of raw materials under the same fixed conditions and submitted for vendor's inspection at one time.

4.4 Approval:

4.4.1 Sample material shall be approved by purchaser before material for production use is supplied, unless such approval be waived. Results of tests on production material shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production material which are essentially the same as those used on the approved sample material. If any change is necessary in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material and processing and, when requested, sample material. Production material made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be in accordance with the following:

Requirement	Test Method
Hardness	ASTM D2240
Tensile Strength	ASTM D412
Elongation	ASTM D412
Tensile Stress	ASTM D412
Tear Strength	ASTM D624, Die C
Compression Set	ASTM D395
Specific Gravity	ASTM D792
Modulus of Rigidity	ASTM D1053
Hydrolytic Stability	ASTM F74
Electrical Insulation Resistance	ASTM D257
Bond Strength to Metal	4.5.1

4.5.1 Bond Strength to Metal: Shall be determined in accordance with ASTM D903 or ASTM D1002. No primer shall be used for this test. Tests shall be run on grit blasted aluminum specimens with a nominal 1/2 in. (12.7 mm) overlap. Grit size shall be 100 - 200 mesh (150 - 75µm).

4.6 Reports:

- 4.6.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests made on the product to determine conformance to the acceptance test requirements and identification of the resin system cure cycle used and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, material specification number and applicable detail specification number, vendor's material designation, lot number, and quantity.
- 4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number including the applicable detail specification number, contractor or other direct supplier of material, supplier's material designation, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and the applicable detail specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.
- 4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

- 5.1 Unit Packaging: The base compound and the correct amount of curing agent shall be packaged in individual containers. Each base compound container shall be packaged with one curing agent container with a fiberboard separator between the two containers in a manner which will prevent accidental separation but which will permit easy separation for mixing purposes. Two-compartment unit packs are acceptable providing positive separation of compound and curing agent is achieved.
- 5.2 Identification: Each unit package and each intermediate and exterior shipping container shall be legibly marked with the material specification and applicable detail specification numbers, manufacturer's identification, lot number, quantity, date of manufacture, and any applicable cautions or handling instructions for toxic or hazardous materials.
- 5.3 Packing:
- 5.3.1 Each exterior shipping container in the shipment shall contain the same type, number, and size of unit packages (or two-unit packages).
- 5.3.2 Containers shall be prepared for shipment in accordance with commercial practice to ensure carrier acceptance and safe transportation to the point of delivery and in compliance with applicable regulations pertaining to the handling of this material. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
- 5.3.3 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.3.2 will be acceptable if it meets the requirements of Level C.
6. ACKNOWLEDGMENT: A vendor shall mention this specification number and applicable detail specification number in all quotations and when acknowledging purchase orders.
7. REJECTIONS: Material not conforming to this specification and the applicable detail specification or to authorized modifications will be subject to rejection.