

SEALING COMPOUND, POLYTHIOETHER ELASTOMERIC
Two Part
Electrically Conductive

1. SCOPE:

- 1.1 Form: This specification covers a room-temperature curing, electrically conductive, elastomeric polythioether sealant.
- 1.2 Application: Primarily to provide an electrically conductive sealant or metal joint interface for shielding purpose.
- 1.3 Safety - Hazardous Materials: While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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

- 2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

- AMS 2350 - Standard and Test Methods
- AMS 2473 - Chemical Treatment of Aluminum Alloys, General Purpose Coating
- AMS 2825 - Material Safety Data Sheets
- AMS 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.6Mn,
(2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated

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2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM B 117 - Salt Spray (Fog) Testing

ASTM D 412 - Rubber Properties in Tension

ASTM D 792 - Specific Gravity (Relative Density) and Density of Plastics by Displacement

ASTM D 1002 - Strength Properties of Adhesives in Shear by Tension Loading, (Metal-to-Metal)

ASTM D 2137 - Rubber Property - Brittleness Point of Flexible Polymers and Coating Fabrics

ASTM D 2240 - Rubber Property - Durometer Hardness

2.3 National Aerospace Standard: Available from Aerospace Industries Association of America, Inc., 1725 DeSales Street, N.W., Washington, DC 20036.

NAS 705 - Terminal, Stud-Turret, Single End

2.4 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.4.1 Federal Specifications:

L-P-378 - Plastic Sheet and Strip, Thin Gauge, Polyolefin

QQ-A-200/9 - Aluminum Alloy Bar, Rod, Shapes, Tube, and Wire, Extruded 6063

CCC-C-419 - Cloth, Duck, Cotton, Unbleached, Plied-Yarns, Army and Numbered

2.4.2 Military Specifications:

MIL-S-8802 - Sealing Compound, Temperature-Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion

MIL-C-38736 - Compound, Solvent, For Use in Integral Fuel Tanks

2.4.3 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall consist of two parts, a base compound and a separate curing agent which, when mixed in proper proportions, will cure at room temperature to a rubbery solid.

3.1.1 Base Compound: Shall be an uncatalyzed polythioether polymer with nickel filler.

3.1.2 Curing Agent: The curing agent shall be a manganese dioxide base compound of sufficiently different color from the base compound to easily identify an incompletely mixed system.

3.1.3 Adhesion Promoter: The adhesion promoter shall be an air drying clear liquid and shall be included as part of the package with the base compound.

3.2 Properties: Compound shall conform to the following requirements:

3.2.1 Unmixed Compound:

3.2.1.1 Storage Life: The base compound and the curing agent, stored in a closed container at not higher than 25°C(77°F), shall meet the requirements of 3.2.2 and 3.2.3 when mixed in proper proportions at any time up to six months from the date of receipt.

3.2.1.2 Tack Free Time, maximum 10 hours 4.5.3

3.2.2 Mixed, Uncured Compound:

3.2.2.1 Application Time: One hour after mixing, the extrusion rate shall be not less than 15 grams/minute, determined in accordance with 4.5.2.

3.2.3 Mixed - Cured Compound: The product shall conform to the following requirements; tests shall be performed on specimens cut from air-free slabs prepared as in 4.5.1 and tested in accordance with specified test methods at 25°C ± 1 (77°F ± 2) and 45 ± 55% relative humidity.

3.2.3.1 Hardness, Durometer "A"
After 72 hours curing, minimum 40 ASTM D 2240

3.2.3.2 Tensile Strength, minimum 50 psi (345 kPa) ASTM D 412
Method A, Die C

3.2.3.3 Elongation, minimum 40% ASTM D 412,
Method A, Die C

3.2.3.4 Specific Gravity 1.9 - 2.25 ASTM D 792,
Method A

3.2.3.5 Electrical Contact Resistance 4.5.4

3.2.3.5.1 Initial, maximum 0.05 ohm

3.2.3.5.2 After 1000 hours Salt Spray, maximum 1.0 ohm ASTM B 117, 4.5.4

3.2.3.6 Low-Temperature Brittleness Pass ASTM D 2137,
Method A
Temp: -55°C ± 2,
(-65°F ± 2)

3.2.3.7 Thermal Stability No sign of blistering or cracking. Hardness shall change not more than 15 points from preproduction value 4.5.5

3.2.3.8 Corrosion	No visible evidence of pitting corrosion at metal/conductive sealant interface	4.5.6
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3.2.3.9 Tensile Shear, minimum	40 psi (276 kPa)	4.5.7
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3.3 QUALITY: The sealing compound, as received by purchaser, shall be uniform in quality and condition, and free from foreign materials and from imperfections detrimental to usage of the compound.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the compound shall supply all samples for vendor's tests 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 sample and to perform any confirmatory testing deemed necessary to ensure that the compound conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for the following requirements are acceptance tests and shall be performed on each lot:

Requirement	Paragraph
Tack-Free Time	3.2.1.2
Application Time	3.2.2.1
Hardness	3.2.3.1
Electrical Contact Resistance, initial	3.2.3.5.1

4.2. Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of compound to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient compound shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three, with the exception that tack-free time of mixed compound shall require only one determination.

- 4.3.1.1 A lot shall be all compound from the same batch of raw materials processed in one continuous run and presented for vendor's inspection at one time. A lot may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.
- 4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.
- 4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.
- 4.4 Approval:
- 4.4.1 Sample compound shall be approved by purchaser before compound for production use is supplied, unless such approval be waived by purchaser. Results of tests on production compound 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 compound which are essentially the same as those used on the approved sample compound. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample compound. Production compound made by the revised procedure shall not be shipped prior to receipt of reapproval.
- 4.5 Test Methods:
- 4.5.1 Preparation of Cured Test Specimens: Test specimens of the mixed, cured compound shall be cut from slabs, nominally 6 x 6 inches (152 x 152 mm) and 0.075 inch $\pm$ 0.008 (1.90 mm $\pm$ 0.20) thick, prepared from a mixture of 100 parts by weight of base compound and 10 parts by weight of curing agent, and cured for not less than 72 hours at 25°C $\pm$ 1 (77°F $\pm$ 2) and 45 - 55% relative humidity.
- 4.5.2 Application Time:
- 4.5.2.1 Preparation of Test Sample: The base compound and curing agent, both in their original unopened containers, together with the required mixing equipment shall be held at 25°C $\pm$ 1 (77°F $\pm$ 2) for 24 hours $\pm$ 1. The base compound and curing agent shall be proportioned, mixed in accordance with manufacturer's recommendations, taking care to avoid incorporation of air. Immediately after mixing, sealant shall be placed into cartridges, for extrusion, with an orifice of 0.125 inch $\pm$ 0.005 (3.18 mm $\pm$ 0.13).
- 4.5.2.2 Two to three inches (51 to 76 mm) of sealing compound shall be extruded initially to clear trapped air. One hour after mixing, the sealing compound shall be extruded onto a suitable receptacle for one minute at a pressure of 90 psi (621 kPa) and the weight in grams measured.

4.5.3 Tack-Free Time: An AMS 4037 aluminum alloy test panel, nominally 0.040 x 2.75 x 6 inches (1.02 x 69.85 x 152 mm), shall be cleaned and covered with freshly mixed sealing compound to a depth of 0.125 inch $\pm$ 0.010 (3.18 mm $\pm$ 0.25). The sealing compound shall be allowed to cure at 25°C $\pm$ 1 (77°F $\pm$ 2) and 45% $\pm$ 5 relative humidity. After 10 hours of curing, two 1 by 6 inch (25 by 152 mm) pieces of clean L-P-378 plastic sheet, 0.004 inch (0.010 mm) nominal thickness, shall be applied to the sealing compound and held in place at a pressure of 1/2-ounce force per square inch (0.0002 N/mm²) for two minutes. The strips shall be slowly and evenly withdrawn at right angles to the sealing compound surface. The plastic shall come away clean and free of sealing compound.

4.5.4 Electrical Contact Resistance:

4.5.4.1 Test Specimen Preparation: At least ten test specimens shall be prepared as shown in Figure 1. Drill two holes using a No. 43 drill on one side on each of the chromate conversion coating treated aluminum angles, approximately 1/2 inch (12.7 mm) apart. Press fit silver plated terminals, conforming to NAS 705, into the drill holes. Swage the terminals to make certain the terminals are held tightly into the aluminum angle. Solvent clean the faying surfaces of the angles with MIL-C-38736 solvent. Mix MIL-S-8802, Class B-2, polysulfide sealant according to manufacturer's instruction. Apply mixed sealant to both faying surfaces. Place a CCC-C-419, Type III, cotton duck cloth, 1.0 x 1.5 inches (25 x 38 mm), over the coated surface and impregnate with sealant. Mate the two angles together and clamp; allow to cure for 24 hours at ambient temperature. Also, seal the terminal/angle joints with the same material. Remove the conversion coating from surface "A", as shown in Figure 1, with a nylon scouring pad and clean with MIL-C-38736 solvent. Apply electrically conductive sealant to surface "A". Assembly shall be left undisturbed for 72 hours while sealant is curing.

4.5.4.2 Resistance Measurements: A Kelvin connection shall be used to measure contact resistance. A 100-milliamperere current shall be applied across the test assembly. The voltage drop shall be measured and resistance can be calculated using the following formula:

$$\text{Electrical Contact Resistance (W)} = \frac{\text{Voltage drop}}{0.1}$$

4.5.4.3 Salt Fog Aging: Not less than five test specimens shall be prepared in accordance with 4.5.4.1 and subjected to a salt fog test for 1000 hours in accordance with ASTM B 117. Thereafter, contact resistance shall be measured and shall meet the requirement of 3.2.3.5.

4.5.5 Thermal Stability: Specimens, prepared and cured as in 4.5.1, shall be tested for hardness in accordance with ASTM D 2240, circulating air oven and heat age for 48 hours $\pm$ 1 at 121°C $\pm$ 1 (250°F $\pm$ 2). The specimens shall be removed from the oven, cooled to 25°C $\pm$ 1 (77°F $\pm$ 2), and hardness remeasured.

- 4.5.6 Corrosion: The test specimens used for the salt fog test (4.5.4.3) shall be disassembled by removing the conductive sealant exposing the surface of the substrate. The faying surface, under the conductive sealant, shall be examined visually for corrosion and at 10X magnification.
- 4.5.7 Tensile Shear: Shall be determined in accordance with ASTM D 1002 with the following modifications. Individual test pieces shall be made of AMS 4037 aluminum, or equivalent, nominally 1/8 x 1 x 5 inches (3.2 x 25 x 127 mm). Tensile holding fixture shall allow sufficient offset to account for the metal thickness, and through-pin holding arrangement shall be allowable when 1/8 inch (3.2 mm) thick test pieces are used. The test piece width shall be 1 inch $\pm$ 0.1 (25 mm $\pm$ 0.2) and the overlap area one square inch (645 mm²). Bonding fixtures used shall include shims to control the bondline thickness between 0.005 and 0.010 inch (0.13 mm and 0.25 mm) from batch to batch. Bonding surface shall be freshly abraded to obtain a uniformly roughened surface and shall be thoroughly washed with a suitable solvent. Apply adhesion promoter in accordance with manufacturer's instructions.
- 4.6 Reports: The vendor of the compound shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the compound conforms to the other technical requirements of this specification. This report shall include the purchase order number, AMS 3266, compound number, lot number, and quantity.
- 4.6.1 A material safety data sheet conforming to AMS 2825, or equivalent, shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of compound for production use. Each request for modification of compound or catalyst formulation shall be accompanied by a revised data sheet for the proposed formulation.
- 4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the compound 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 compound represented and no additional testing shall be permitted. Results of all tests shall be reported.
5. PREPARATION FOR DELIVERY:
- 5.1 Identification: Each tube or container of compound shall be identified with not less than AMS 3266, vendor's name and compound number, lot number, date of expiration, method of storage, and net quantity.
- 5.2 Packaging:
- 5.2.1 Base compound shall be supplied in 1-pound (454-g), 10-pound (4.5-kg), 50-pound (23-kg), or 450-pound (204-kg) containers, or as ordered.
- 5.2.2 Curing agent shall be supplied in 2-ounce (57-g) tubes or 10-pound (454-g), 10-pound (4.5-kg), or 45-pound (20-kg) containers, or as ordered.