SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3681C

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Superseding AMS 3681B

Adhesive, Electrically Conductive Silver-Filled Epoxy Resin

1. SCOPE:

1.1 Form:

This specification covers an electrically-conductive adhesive supplied as two components, a silver-filled, epoxy-base adhesive and a separate curing agent which may be paste or liquid.

1.2 Application:

This adhesive has been used typically for providing an electrically-conductive bond between surfaces and as an electrically-conductive sealing compound, but usage is not limited to such applications.

1.2.1 Caution is required in using this adhesive in applications where high humidity prevails or in the presence of moisture; under these conditions, the silver particles in this adhesive can produce corrosion cells in contact with other metals which are lower in the electromotive series. Silver migration or whisker growth may also occur between points of unequal electrical potential.

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 publications shall be the issue in effect on the date of the purchase order.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

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2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2825 Material Safety Data Sheets

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 257 D-C Resistance or Conductance of Insulating Materials
ASTM D 1002 Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)
ASTM G 21 Determining Resistance of Synthetic Polymeric Materials to Fungi

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall consist of epoxy resin filled with pure silver powder, flakes, or balls. The filler shall not contain silver-coated particles or extenders. The filler metal shall remain dispersed and suspended in the adhesive. The curing agent shall be an amine type material.

3.1.1 Shelf Life: The unmixed adhesive shall meet the requirements of 3.2 at any time up to nine months from date of manufacture when the adhesive and curing agent are stored in separate, unopened containers at a temperature not higher than 30 °C (86 °F).

3.1.2 Mixing: Mix in accordance with manufacturer's instructions.

3.1.3 Curing: The product shall meet the requirements of 3.2.2 when cured at 25 °C ± 1 (77 °F ± 2) for 24 hours ± 1 or at 65 °C ± 1 (149 °F ± 2) for 2 hours ± 5 minutes. Alternate cure schedules acceptable to purchaser may be used.

3.2 Properties:

The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable:

3.2.1 As Mixed Adhesive:

3.2.1.1 Pot Life: Shall be not less than 30 minutes at 25 °C ± 1 (77 °F ± 2), determined using a sample weight of 3 ounces (85 grams) of mixed adhesive placed in a 4 fluid-ounce (118 cc) container.

3.2.1.2 Consistency: Shall be suitable for application by spatula or pressure gun at a pressure of 20 pounds per square inch (138 kPa) to a thickness of 0.003 inch (0.076 mm).

3.2.2 Cured Properties: Shall be as shown in Table 1 and 3.2.2.1.

TABLE 1 - Cured Properties

Properties	Requirement	Test Method
Lap Shear Strength, min (Abraded Aluminum Specimens)	1000 psi (6.89 MPa)	ASTM D 1002
Volume Resistivity, max	0.004 ohm-cm	ASTM D 257
Volume Resistivity, max After aging at 150 °C ± 10 (302 °F ± 18) for 48 hours ± 2	0.010 ohm-cm	ASTM D 257
Fungus Resistance	1 rating	ASTM G 21

3.2.2.1 Corrosion: The adhesive shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure acceptable to purchaser. Discoloration of metal shall not be considered objectionable.

3.3 Quality:

The adhesive, as received by purchaser, shall be uniform in quality and condition and free from foreign materials and other contaminants detrimental to usage of the adhesive.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the adhesive shall supply all samples and shall be responsible for all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the adhesive conforms to specified requirements.

4.2 Classification of Tests:

All technical requirements are acceptance tests; however, preproduction tests shall also include such additional tests required by purchaser and shall be performed prior to or on the initial shipment of adhesive by the manufacturer, on each lot, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 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:

Sufficient adhesive 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.

4.3.1 A lot shall be all adhesive produced in a single production run from the same batch of raw materials under the same fixed conditions, or all adhesive subjected to the same unit chemical or physical process intended to make the final product homogeneous, and submitted for manufacturer's inspection at one time. An inspection lot shall not exceed 500 pounds (227 kg).

4.4 Approval:

4.4.1 Sample adhesive shall be approved by purchaser before adhesive for production use is supplied, unless such approval be waived by purchaser.

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