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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3373B

Issued JAN 1981
Revised OCT 1995
Reaffirmed JAN 2001

Superseding AMS 3373A

Compound, Silicone Rubber, Insulating and Sealing 35 to 55

1. SCOPE:

1.1 Form:

This specification covers elastomeric silicone insulating and sealing compounds supplied as two-component systems which cure at room temperature.

1.2 Application:

These products have been used typically for protecting the electrical integrity of electrical and electronic components by excluding moisture and contamination and by providing resilient cushioning between -50 and +205 °C (-58 and +401 °F), but usage is not limited to such applications. Compound may be applied by potting or encapsulating.

1.3 Classification:

Compound covered by this specification is classified as follows:

Class 1 Low Viscosity
Class 2 Medium Viscosity

1.4 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.

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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.

2.1 SAE Publications:

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

AMS 2825	Material Safety Data Sheets
AMS 3020	Oil, Reference, for "L" Stock Rubber Testing
AMS 3021	Fluid, Reference, for Testing Di-Ester (Polyol) Resistant Materials
AMS 4049	Sheet and Plate, Alclad, 5.6Zn, 2.5Mg, 1.6Cu, 0.23Cr, Solution and Precipitation Heat Treated

2.2 ASTM Publications:

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

ASTM D 149	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D 150	A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D 257	D-C Resistance or Conductance of Insulating Materials
ASTM D 412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
ASTM D 471	Rubber Property - Effects of Liquids
ASTM D 495	High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation
ASTM D 573	Rubber - Deterioration in an Air Oven
ASTM D 792	Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1824	Apparent Viscosity of Plastisols and Organosols at Low Shear Rates by Brookfield Viscometer
ASTM D 2240	Rubber Property - Durometer Hardness

2.3 U.S. Government Publications:

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

MIL-L-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-H-83282	Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft
MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The compound shall be based on polysiloxane polymer and shall be supplied with the applicable curing agent. The base compound shall cure (polymerize) at room temperature when mixed with the curing agent.

3.1.1 Primer: Shall be used in all adhesion and repairability tests when specified by the manufacturer.

3.1.2 Color: The base compound shall be furnished in the color manufactured. The curing agent shall be of a contrasting color to facilitate proper mixing.

3.1.3 Storage Life: The polymer and curing agent shall meet the requirements of 3.2 at any time up to one year from date of shipment when stored below 38 °C (100 °F) in the original, unopened containers.

3.1.4 Application Life: Shall be 1 to 3 hours, unless shorter or longer life is ordered, determined in accordance with 4.5.2.

3.2 Properties:

Compound, mixed and cured as in 4.5.1 and tested at 23 °C ± 1 (73 °F ± 2) and 50% ± 5 relative humidity, shall conform to the requirements shown in Table 1.

TABLE 1 - Properties

Property	Requirement	Test Method
3.2.1 Uncured:		
3.2.1.1 Viscosity, as mixed		ASTM D 1824
3.2.1.1.1 Class 1	50 to 200 poises	
3.2.1.1.2 Class 2	200 to 800 poises	
3.2.2 As Cured:		
3.2.2.1 Hardness, Durometer A or equivalent	45 ± 10	AMS D 2240
3.2.2.2 Tensile Strength, min		ASTM D 412
3.2.2.2.1 Class 1	250 psi (1.72 MPa)	

TABLE 1 - (Continued)

Property		Requirement	Test Method
3.2.2.2.2	Class 2	325 psi (2.24 MPa)	
3.2.2.3	Elongation, min	100%	ASTM D 412
3.2.2.4	Linear Shrinkage, max	1.0%	4.5.3
3.2.2.5	Specific Gravity, max	1.55	ASTM D 792
3.2.2.6	Adhesion, min	4.0 pounds/inch of width (71.4 kg/m)	4.5.4
3.2.2.7	Repairability, min	4.0 pounds/inch of width (71.4 kg/m)	4.5.5
3.2.2.8	Dielectric Strength, min	400 volts per 0.001 inch (15,750 volts/mm)	ASTM D 149
3.2.2.9	Volume Resistivity, min	$1x10^{11}$ ohm·centimeters	ASTM D 257
3.2.2.10	Surface Resistivity, min	$1x10^{13}$ ohms	ASTM D 257
3.2.2.11	Dielectric Constant, max	4.5	ASTM D 149
3.2.2.12	Dissipation Factor		
	1 kilocycle, max 1 megacycle, max	0.020 0.010	ASTM D 150
3.2.2.13	Arc Resistance, min	100 seconds	ASTM D 495
3.2.2.14	Corrosivity	No worse than control	4.5.6
3.2.3	Water Resistance		ASTM D 471 Distilled Water
3.2.3.1	Weight Change	-2 to +2%	71 °C ± 2 (160 °F ± 5)
3.2.3.2	Volume Change	-3 to +3%	3 hours ± 0.25
3.2.3.3	Hardness Change, Durometer A or equivalent	0 to -10	

TABLE 1 - (Continued)

Property	Requirement	Test Method
3.2.4 Dry Heat Resistance		ASTM D 573 200 °C ± 3 (392 °F ± 5) 70 hours ± 2
3.2.4.1 Hardness Change, Durometer A or equivalent	-10 to +10	
3.2.4.2 Tensile Strength Change, max	-25%	
3.2.4.3 Elongation Change, max	-35%	
3.2.5 Oil Resistance:		4.5.7
3.2.5.1 Hardness Change, Durometer A or equivalent, max	-10	
3.2.5.2 Tensile Strength Change, max	-25%	
3.2.5.3 Elongation Change, max	-25%	
3.2.5.4 Volume Change	0 to +10%	
3.2.5.5 Weight Change	0 to +5%	
3.2.6 Reversion, Hydrolytic Stability, Durometer A or equivalent, min	30	4.5.8
3.2.7 Reversion, Closed Mold, Durometer A or equivalent, min	30	4.5.9

3.3 Quality:

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 manufacturer of the compound 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 compound conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to the requirements shown in Table 2 are acceptance tests and shall be performed on each lot.

TABLE 2 - Acceptance Tests

Requirement	Paragraph Reference
Viscosity, as received	3.2.1.1
Application Life	3.1.4
Hardness, mixed and cured	3.2.2.1

4.2.2 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of compound by the manufacturer, when a change in ingredients and/or processing requires approval 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. Except as specified in 4.5, 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.

4.3.1.1 A lot shall be all compound produced in a continuous production run from the same batches of raw materials under the same fixed conditions and presented for manufacturer's inspection at one time. A lot shall not exceed 2000 pounds (907 kg) of compound.

4.3.1.2 A statistical sampling plan acceptable to the purchaser, may be used in lieu of sampling as in 4.3.1.

4.3.2 For Preproduction Tests: Acceptable to purchaser.

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 Manufacturer shall use ingredients, manufacturing procedures and processes, and methods of inspection on production compound 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 compound. Production compound made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

Shall be as specified in 3.2 and as follows:

4.5.1 Specimen Preparation:

4.5.1.1 Mixing: The base compound and the curing agent, both in their original unopened containers, together with the required spatulas, beakers, and other mixing equipment shall be held at 23 °C ± 1 (73 °F ± 2) for not less than six hours. The individual components shall be thoroughly mixed, at 23 °C ± 1 (73 °F ± 2) and 50% ± 5 relative humidity, in their respective containers prior to combining in the proportions recommended by the manufacturer. Proper care shall be exercised to avoid incorporation of air by too rapid stirring or folding action. Deaeration by vacuum or centrifuge shall be employed.

4.5.1.2 Curing: Test specimens shall be cured for 72 hours ± 2 at 23 °C ± 1 (73 °F ± 2). All molded specimens shall be removed from the molds in 24 hours ± 2; total cure time shall include the time the specimen is in the mold. Cured specimens shall be tested within two hours from the end of the cure period.

4.5.2 Application Life: Approximately 50 grams of catalyzed compound shall be placed in a suitable container so that a layer of compound approximately 1/2 inch (13 mm) thick is obtained. A microspatula having a flat tip approximately 1/4 inch (6 mm) wide is to be utilized in this test. The spatula shall periodically be dipped well below the compound surface, slowly withdrawn, and the stringy compound observed. The length of time required for the strings to first break without stretching more than approximately 1 inch (25 mm) shall be considered the application life.

4.5.3 Linear Shrinkage: Shall be determined as follows:

4.5.3.1 Evacuate the catalyzed compound to eliminate presence of air due to mixing.

4.5.3.2 Slightly overfill a 6 x 6 x 0.075 inch (152 x 152 x 2 mm) cavity with a sufficient amount of compound. Place a flat cover plate on the mold and press out the excess compound. Remove from mold in accordance with 4.5.1.2.

4.5.3.3 Cure for 21 days, minimum.

4.5.3.4 Measure the linear shrinkage using a rule having 0.01 inch (0.2 mm) divisions.

4.5.3.5 Calculate the shrinkage of the compound using Equation 1.

$$\% \text{ Shrinkage} = \frac{(\text{Cavity measurement} - \text{Molded slab measurement}) \times 100}{\text{Cavity measurement}} \quad \text{(Eq. 1)}$$

4.5.4 Adhesion:

4.5.4.1 Specimen Preparation: A coating of compound approximately 1/8 inch (3.2 mm) thick shall be applied to the primed side (primed as specified by the manufacturer) of an AMS 4049 aluminum alloy panel nominally 3 x 6 x 1/16 inch (76 x 152 x 1.6 mm) thick (See Figure 1). Two strips, nominally 1 x 12 x 0.006 inch (25 x 305 x 0.15 mm) of a thin flexible material, such as 30-mesh (600 mm) aluminum screen (primed as specified by the manufacturer), shall be placed, primed side down, on the surface of the freshly applied compound. The strips shall be placed so that they are approximately 0.25 inch (6.4 mm) from each edge and 0.5 inch (13 mm) apart, leaving a tail approximately 6 inches (152 mm) long. Two panels, prepared as above, shall be cured for 72 hours ± 2.

4.5.4.2 Procedure: The panels shall be scored to bare metal along both edges of each strip and individually tested on an autographic testing machine having a capacity such that the load at failure is 15 to 85% of the full scale load. If the machine is of the pendulum type, the weight shall swing as a free pendulum without engagement of the pawls. The rate of separation of the jaws shall be nominally 2 inches (51 mm) per minute. Specimens shall be mounted in the machine so that the loose end of the aluminum mesh strip will be folded 180 degrees as it is pulled from the panel. Each strip shall be pulled as follows: A cut through the compound to the panel at the junction of separation shall be made at an angle of 45 degrees in the direction of separation. If the compound separates from the aluminum mesh, similar 45-degree cuts shall be made to promote separation of the sealant from the panel. A maximum of five cuts shall be made. The adhesion shall be automatically recorded on a chart as a continuous curve. The adhesion value shall be calculated by averaging the maximum forces required to separate the compound from the panel divided by the measured width of the strip between the scores.

4.5.5 Repairability: A coating of compound, approximately 1/8 inch (3.2 mm) thick, shall be applied to the primed side (as specified by the manufacturer) of two AMS 4049 aluminum alloy panels nominally 3 x 6 x 1/16 inch (76 x 152 x 1.6 mm) thick (See Figure 1). One panel shall be cured for 72 hours ± 2, and oven aged for 72 hours ± 2 at 205 °C ± 3 (401 °F ± 5). The panels shall then be recoated with newly mixed compound approximately 1/8 inch (3.2 mm) thick. Two strips, approximately 1 x 12 inches (25 x 305 mm) of a thin flexible material such as 30-mesh (600 mm) aluminum screen (primed as specified by the manufacturer), shall be placed, primed side down, on the surface of the freshly-applied compound. The strips shall be placed so that they are approximately 0.25 inch (6.4 mm) from each edge and 0.5 inch (13 mm) apart, leaving a tail approximately 6 inches (152 mm) long. The panels shall be cured for 72 hours ± 2 and tested in accordance with 4.5.4.2.

4.5.6 Corrosivity: Prepare two lengths of copper wire (AWG size No. 10), approximately 1.5 inches (38 mm) long, by removing all insulation, cleaning with a degreasing agent, and buffing to a bright copper finish. A previously cured section of the same silicone compound undergoing test shall be placed in the mold as a support for the wires. The wires used for this test shall not be treated with a primer. Encapsulate these two wire specimens centrally into a suitable mold approximately 1 x 2 x 0.5 inch (25 x 51 x 13 mm) (See Figure 2). The compound, prepared in accordance with the manufacturer's mixing instructions, shall be cured for 72 hours ± 2. The curing agent used for this test shall be the same used in sample preparation for all other physical and electrical tests. Place the specimen along side an unpotted 1.5-inch (38-mm) length of the above specified wire (control) into an environment of 95 to 98% relative humidity and 50 °C ± 1 (122 °F ± 2) for 28 days. At the end of this period, the mold shall be slit open and the encapsulated wire compared visually with the control as to corrosive effects.

4.5.7 Oil Resistance: Separate specimens, cured for 72 hours ± 2, shall be immersed at 60 °C ± 1 (140 °F ± 2) in accordance with ASTM D 471 in each of the following oils: AMS 3020 oil, AMS 3021 fluid, MIL-H-83282 hydraulic oil, and MIL-L-23699 lubricating oil. The specimens shall be tested to determine conformance to the requirements.

4.5.8 Reversion, Hydrolytic Stability:

4.5.8.1 Specimen Preparation: Sufficient base compound and curing agent shall be mixed to prepare three molded test specimens, approximately 2-1/2 inches (63.5 mm) in diameter by 1/2 inch (13 mm) thick. Hardness shall be determined in accordance with ASTM D 2240 using a Type A Durometer after three seconds application time. Hardness shall be determined in the same area before and after exposure.

4.5.8.2 Procedure: After determining hardness before exposure, the specimens shall be placed vertically in a suitable holder, on a tray in a suitable glass desiccator. The desiccator shall contain a 22% by weight solution of glycerin in water in the bottom which will produce a relative humidity of 95% at the test temperature. The desiccator, containing the specimens, shall then be closed and inserted into a circulating-air oven maintained at 71 °C ± 1 (160 °F ± 2) for 120 days. At the end of the exposure period, the desiccator shall be removed from the oven and cooled to the testing conditions of 3.2 for 16 to 24 hours. Hardness shall again be determined.

4.5.9 Reversion, Closed Mold:

4.5.9.1 Specimen Preparation: The container for the confinement of the compound shall be a metal tube 4.250 inches ± 0.005 (107.95 mm ± 0.13) long, threaded at both ends, having an inner diameter of approximately 2.5 inches (63.5 mm) and a wall thickness suitable for threading. Metal screw caps and aluminum foil gaskets which provide an air-tight seal shall be used for end closures and designed so that the total inside height of the capped tube does not exceed 4.25 inches ± 0.005 (107.95 mm ± 0.13). Seal one end of the tube and pour the mixed and deaerated catalyzed sealing compound to a depth of 4.125 inches ± 0.032 (104.78 mm ± 0.81). Where possible, the compound shall be vacuum deaerated for five minutes at less than 5 mm mercury (Hg) pressure at 23 °C ± 1 (73 °F ± 2). Allow the compound to cure for 72 hours ± 2 at 23 °C ± 1 (73 °F ± 2) and 50% ± 5 relative humidity with the container top uncapped.

4.5.9.2 Procedure: Remove the bottom cap and obtain the hardness at two locations in the center area of the bottom surface, using Type A durometer. Seal both ends of the tube and condition the test fixture at 200 °C ± 1 (392 °F ± 2) for 28 days ± 1. At the expiration of the heat aging period, allow the test fixture to cool for 24 hours ± 1. Obtain two hardness readings in the same location.

4.6 Reports:

The supplier of the compound shall furnish with each shipment a report from the manufacturer showing the results of tests to determine conformance to the acceptance test requirements and stating that the compound conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3373B, class, manufacturer's identification, date of manufacture, 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 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. Results of all tests shall be reported .

5. PREPARATION OF DELIVERY:

5.1 Packaging and Identification:

5.1.1 A lot of compound may be packaged in small quantities and delivered under the basic lot approval provided lot identification is maintained.

5.1.2 The base compound and the correct amount of curing agent shall be packaged in individual containers of a type and size acceptable to purchaser.

5.1.3 Each unit package and each intermediate and exterior shipping container shall be legibly marked with not less than purchase order, AMS 3373B, lot number, class, manufacturer's identification, quantity, date of manufacture and any directions for mixing and use, and precautions for handling and storage of toxic and hazardous materials. In addition, the label shall indicate that the compound should be stored at a temperature not exceeding 38 °C (100 °F).

5.1.4 Each exterior shipping container in the shipment shall contain the same class, number, and size of unit packages (or two-unit packages) supplied to the same purchase order number.

5.1.5 Containers of compound shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging and transportation of the compound to ensure carrier acceptance and safe delivery.

5.1.6 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-2073-1, Level C, unless Level A is specified in the request for procurement.

6. ACKNOWLEDGMENT:

A supplier shall mention this specification number, its revision letter and class in all quotations and when acknowledging purchase orders.

7. REJECTIONS:

Compound not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 A change bar (**|**) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. An (R) symbol to the left of the document title indicates a complete revision of the specification, including technical revisions. Change bars and (R) are not used in original publications, nor in specifications that contain editorial changes only.

8.2 This material has limited tear resistance.

8.3 Addition-cure compounds may require a barrier material on certain surfaces such as chloroprene rubber, amine compounds, certain other room-temperature-vulcanizing silicones, etc. to prevent cure inhibition.

8.4 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, class, and date of this specification
Type and size of containers desired
Quantity of compound desired
Level A packaging, if required (See 5.1.6).

8.5 Compound meeting the requirements of this specification and any applicable detail specification has been classified under Federal Supply Classification (FSC) 8030.

8.6 Revision B of AMS 3373 eliminated detail specifications AMS 3373/1A and AMS 3373/2A. The requirements for AMS 3373/1A have been incorporated as AMS 3373 Class 1. The requirements for AMS 3373/2A have been incorporated as AMS 3373 Class 2.

8.7 Key Words:

Silicone rubber compound, 35 to 55 Durometer, room temperature cure, oil resistant, reversion resistant

8.8 Revision B of AMS 3373 eliminated AMS 3373/1A and AMS 3373/2A, incorporating them into the basic AMS 3373B specification as Class 1 and Class 2, respectively.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE “CE”