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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 3087F

Issued 5-1-44
Revised 1-1-86

Superseding AMS 3087E

COMPOUND, INSULATING AND SEALING
Silicone

1. SCOPE:

1.1 Form: This specification covers a highly viscous, non-melting, heat-stable silicone sealing compound.

1.2 Application: Primarily for sealing joints in high tension electrical connections, aircraft engine ignition systems, and electronic equipment and as a lubricant for components fabricated from elastomers. Compound is not recommended for use on silicone rubber parts subject to temperatures in excess of 150°C (300°F) and is to be avoided on or near any surfaces which subsequently are to be painted or adhesive bonded.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications 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 - Standards and Test Methods
AMS 3122 - Enamel, Phenolic, Black Baking

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

ASTM D70 - Specific Gravity of Semi-Solid Bituminous Materials
ASTM D149 - Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
ASTM D150 - A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D217 - Cone Penetration of Lubricating Grease
ASTM D257 - D-C Resistance or Conductance of Insulating Materials
ASTM D495 - High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation
ASTM D1478 - Low-Temperature Torque of Ball Bearing Greases
ASTM D2000 - Classification System for Rubber Products in Automotive Applications

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

2.3.1 Military Specifications:

MIL-M-14 - Molding Plastics and Molded Plastic Parts, Thermosetting
MIL-I-631 - Insulation, Electrical, Synthetic-Resin Composition, Nonrigid
MIL-C-3702 - Cable, Power, Electrical, Ignition, High Tension
MIL-I-24092 - Insulating Varnish, Electrical, Impregnating, Solvent Containing

2.3.2 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a smooth, homogeneous mixture of silicone fluid and suitable additives, having the consistency of a medium-heavy grease.

3.2 Properties: The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with the methods listed. All tests shall be conducted at room temperature unless otherwise specified. All electrical tests shall be conducted on samples conditioned for 24 hr ± 0.5 at 23°C ± 2 (73°F ± 4) and 50% ± 5 relative humidity prior to testing.

3.2.1 General Characteristics:

3.2.1.1 Compound shall be translucent and light gray in color.

3.2.1.2 Compound shall wet and adhere to both metallic and nonmetallic surfaces.

3.2.1.3 Compound shall be relatively insoluble in, and highly resistant to the action of, water, alcohols, glycols, and glycerine.

3.2.1.4 Compound shall be neutral in pH as indicated by lack of reaction on litmus paper.

3.2.1.5 Ø Compound shall have no adverse effect on the health of personnel when used for the intended purpose.

3.2.2	Consistency:		ASTM D217
	Unworked	200 - 240	
	Worked, max	280	
	Worked, after 24 hr ± 0.5 at 205°C ± 5 (400°F ± 10), max	310	
3.2.3	Specific Gravity at 25°/25°C (77°/77°F)	0.98 - 1.05	4.5.1
3.2.4	Dielectric Constant at 1000 Hz, max	3.2	ASTM D150
3.2.5	Dissipation Factor at 1000 Hz, max	0.0035	ASTM D150
3.2.6	Dielectric Strength, min		
	0.010 in. (0.25 mm) thick specimens	500 V per mil (19,700 V/mm)	4.5.2
	0.050 in. (1.27 mm) thick specimens	300 V per mil (11,800 V/mm)	
3.2.7	Volume Resistivity, min		4.5.3
	At 23°C ± 2 (73°F ± 4)	1.0×10^{13} ohm-cm	
	At 175°C ± 3 (347°F ± 5)	1.0×10^{12} ohm-cm	
3.2.8	Arc Resistance, min	80 sec	4.5.4
3.2.9	Low-Temperature Stability	Shall not crack	4.5.5
3.2.10	Low-Temperature Torque, max		4.5.6
	Starting Torque	5000 g-cm	
	Running Torque	1000 g-cm	
3.2.11	High-Temperature Stability	Shall not melt or become brittle	4.5.7
3.2.11.1	Loss by Evaporation, max	2%	
3.2.11.2	Flow, max	10%	
3.2.12	Solubility in Water, Change in Weight	0 to 0.10%	4.5.8
3.2.13	Effect on Metals	No corrosion	4.5.9

3.2.14	Effect on Nonmetals	No damage	4.5.10
3.2.15 Ø	Flammability	Self-extinguishing	4.5.11

3.3 Quality: The compound, as received by purchaser, shall be uniform in consistency and appearance and free from lumps, cakes, abrasives, and foreign materials.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: Ø The vendor of the compound shall supply all samples for vendor's tests and shall be reponsible 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 to determine conformance to the following requirements are classified as acceptance tests and shall be performed on each lot.

Requirement	Paragraph Reference
Consistency	3.2.2
Dielectric Strength, 0.050 in, (1.27 mm) thick only	3.2.6
Arc Resistance	3.2.8
Low-Temperature Torque	3.2.10
High-Temperature Stability	3.2.11
Flammability	3.2.15

4.2.2 Periodic Tests: Tests to determine conformance to the following requirements are classified as periodic tests and shall be performed on one lot in every 10 lots.

Requirement	Paragraph Reference
Dielectric Constant	3.2.4
Dissipation Factor	3.2.5
Effect on Metals	3.2.13
Effect on Nonmetals	3.2.14

4.2.3 Preproduction Tests: Ø Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the inital shipment of compound to a purchaser, when a change in material, processing, or both requires reapproval as in 4.2, and when purchaser deems confirmatory testing to be required.

4.2.3.1 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, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient compound shall be taken at random from Ø 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.

4.3.1.1 A lot shall be all compound produced in a single production run from the Ø same batches of raw materials under the same fixed conditions and presented for vendor's inspection at one time. An inspection lot shall not exceed 500 lb (225 kg).

4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have Ø 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 Periodic Tests and Preproduction Tests: As agreed upon by purchaser Ø 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 material, processing, or both 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 Specific Gravity: Shall be determined in accordance with ASTM D70, except that pycnometer and compound shall be heated to 110°C ± 3 (230°F ± 5) in a vacuum oven, and the oven evacuated several times to remove entrained air before filling pycnometer with water. After filling with water, pycnometer and contents shall be immersed in boiling water for 1 hr ± 0.1 to remove air bubbles adhering to surface of compound.

4.5.2 Dielectric Strength: Shall be determined in air at 23°C ± 2 (73°F ± 4) and 50% ± 5 relative humidity in accordance with ASTM D149, short time method except that 1/2-in. (12.5-mm) hemispherical electrodes shall be pressed into the compound in order to form the specified electrode gap.

4.5.3 Volume Resistivity: Shall be determined in accordance with ASTM D257 between flat, parallel plates on compound carefully spread and smoothed to provide an air-free layer of uniform thickness. Sample shall have reached thermal equilibrium at the test temperature, which can be assumed to have occurred after 24 hr ± 0.5 at 23°C ± 2 (75°F ± 4) and after 4 hr ± 0.25 at 175°C ± 3 (347°F ± 5).

4.5.4 Arc Resistance: Shall be determined in accordance with ASTM D495 except that sample shall consist of a 1/8-in. (3-mm) thickness of compound spread on a glass plate and the electrodes just touching the surface of the compound.

4.5.5 Low-Temperature Stability: A sample, placed in a clean open container, cooled to -55°C ± 1 (-67°F ± 2), and maintained at that temperature for not less than 24 hr, shall retain its appearance and shall not crack or harden noticeably, a slight increase in stiffness being permitted.

4.5.6 Low-Temperature Torque: Shall be determined in accordance with ASTM D1478 at -55°C ± 1 (-67°F ± 2) with a 60-min. ± 1 running time.

4.5.7 High-Temperature Stability:

4.5.7.1 Loss by Evaporation: Approximately 10 g of compound shall be weighed into a 60-mesh (250 μm) screen cone approximately 2-3/32 in. (53 mm) in diameter at the open end by 1-3/16 in. (30 mm) high, soldered along the seam, and having a 0.040-in. (1.00-mm) diameter hole drilled through the tip. The cone shall be suspended in a clean, weighted 100-mL beaker; the assembly shall be weighed, placed in an air oven, and maintained at 200°C + 5 (392°F + 10) for 24 hr + 0.5. The assembly shall be removed, cooled in a desiccator, and reweighed. The weight loss, as a percentage of the weight of compound originally placed in the cone, is the percentage loss by evaporation.

4.5.7.2 Flow: The cone and contents shall then be removed from the beaker and the beaker weighed to determine the weight of compound which flowed through the cone. The weight of compound in the beaker, as a percentage of the initial weight of compound placed in the cone, is the percentage flow.

4.5.7.3 Visual Examination: After the weights have been determined, the residual compound in the cone shall be examined for surface hardening and cracking. The compound shall have retained its appearance and shall not have cracked or hardened on the surface. A slight increase in stiffness of the compound retained in the cone will be permitted.

4.5.8 Solubility in Water: A weighed 25-mL beaker shall be filled with compound and the surface of the compound scraped off level with the top of the beaker. The beaker and contents shall be weighed, immersed in distilled water at 25°C ± 1 (77°F ± 2) for 24 hr ± 0.2, dried in a desiccator for 1 hr ± 0.1, and reweighed.

4.5.9 Effect on Metals: Panels of aluminum, magnesium, copper alloys, steel, and cadmium plated steel, or couples thereof, freshly polished and coated with compound, shall show no evidence of corrosion, as indicated by rusting or pitting, after being suspended vertically in a convention-current air oven at 100°C ± (212°F ± 2) for 70 hr ± 0.5. Slight darkening on comparison with freshly polished panels of the same material will be permitted.

4.5.10 Effect on Nonmetals: Samples of nonmetallic materials listed below shall be coated with the compound and, together with similar, uncoated samples, suspended vertically in a convention-current air oven at 100°C ± 1 (212°F ± 2) for 70 hr ± 0.5. Coated samples shall show no greater change in physical condition than uncoated samples.

4.5.10.1 Sample materials may include any of the following:

Ignition cable conforming to MIL-C-3702, Grade B or C.
Elastomer samples conforming to ASTM D2000, Classes AA, BC, or FC
Panels coated with phenol-formaldehyde resin varnish conforming to MIL-I-24092.
Panels coated with phenolic resin enamel conforming to AMS 3122.
Polyvinyl insulation conforming to MIL-I-631, Type F, Grade b.
Molded samples conforming to MIL-M-14, Types CFG, MAG, or SDG.

4.5.11 Flammability: A 10 g sample of compound shall be placed on a 10- to 20-mesh (2 mm to 850 µm) corrosion-resistant steel screen so that it covers an area approximtely 1 in. (25 mm) in diameter. The underside of the screen shall be cautiously heated with a Bunsen burner so the flame does not project through or above the screen. As soon as the compound begins to decompose or volatilize, a second burner shall be used to ignite the vapors evolved. The compound will be considered self-extinguishing if the burning ceases as both burners are withdrawn from the screen.

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, when performed, to the periodic 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 3087F, vendor's compound number, lot number, and quantity.