SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3643B

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Superseding AMS 3643A

Plastic Moldings, Silicone, Thermosetting Glass Roving Filled Heat Resistant

1. SCOPE:

1.1 Form:

This specification covers a glass-roving-filled silicone resin in the form of compression moldings or transfer moldings.

1.2 Application:

These products have been used typically for parts requiring good mechanical and electrical properties and thermal stability in continuous service up to 315 °C (599 °F) or intermittent service up to 370 °C (698 °F), but usage is not limited to such applications.

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**

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 150	A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D 256	Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D 257	D-C Resistance or Conductance of Insulating Materials
ASTM D 570	Water Absorption of Plastics
ASTM D 635	Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D 638	Tensile Properties of Plastics
ASTM D 638M	Tensile Properties of Plastics (Metric)
ASTM D 648	Deflection Temperature of Plastics Under Flexural Load
ASTM D 695	Compressive Properties of Rigid Plastics
ASTM D 695M	Compressive Properties of Rigid Plastics (Metric)
ASTM D 790	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 790M	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials (Metric)

2.2 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 and Fabrication:

Shall be a glass-roving-filled silicone resin fabricated by compression molding or transfer molding to meet the requirements of 3.2.

3.1.1 Color: Shall be brown-red opaque.

3.1.2 Glass Filler: The glass roving, prior to being chopped, shall be heat cleaned to a No. 112 finish followed by washing to a neutral pH or shall be subjected to an equivalent procedure which will promote good adhesion to the silicone resin. The length of the chopped glass shall be 1/2 to 5/8 inch (12.7 to 15.9 mm).

3.2 Properties:

Moldings shall conform to requirements shown in Table 1, 3.2.12, and 3.2.13; tests shall be performed on the moldings supplied and in accordance with specified test methods, insofar as practicable. Wet tests shall be performed, within one minute, after immersion in water at 23 °C ± 1 (73 °F ± 2) for not less than 24 hours.

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.2.1	Tensile Strength, minimum Tested at 25 °C (77 °F) after 72 hours at 370 °C (698 °F)	1800 psi (12.4 MPa)	ASTM D 638 or ASTM D 638M
3.2.2	Flexural Strength, minimum		ASTM D 790 or ASTM D 790M
3.2.2.1	Tested at 25 °C (77 °F) after 2 hours at 260 °C (500 °F)	15.0 ksi (103 MPa)	
3.2.2.2	Tested at 370 °C (698 °F) after 72 hours at 370 °C (698 °F)	8.0 ksi (55.2 MPa)	
3.2.3	Compressive Strength, minimum		ASTM D 695 or ASTM D 695M
3.2.3.1	Tested at 25 °C (77 °F) after 2 hours at 260 °C (500 °F)	12.0 ksi (82.7 MPa)	
3.2.3.2	Tested at 370 °C (698 °F) after 72 hours at 370 °C (198 °F)	4.0 ksi (27.6 MPa)	
3.2.4	Impact Resistance, minimum		ASTM D 256
3.2.4.1	Tested at 25 °C (77 °F) after 2 hours at 260 °C (500 °F)	10 foot-pounds per inch (534 J/m)	
3.2.4.2	Tested at 370 °C (698 °F) after 72 hours at 370 °C (698 °F)	4 foot-pounds per inch (214 J/m)	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.5	Heat Deflection Temperature at 264 psi (1820 kPa) Fiber Stress, minimum	370 °C (698 °F)	ASTM D 648 Heating Rate 2 °C (4 °F) per minute
3.2.6	Water Absorption (24 hour immersion), weight gain, maximum	0.30%	ASTM D 570
3.2.7	Dielectric Constant at 10^6 Hz, maximum		ASTM D 150
3.2.7.1	As molded		
3.2.7.1.1	Dry	4.7	
3.2.7.1.2	Wet	4.8	
3.2.8	Dissipation Factor at 10^6 Hz, maximum		ASTM D 150
3.2.8.1	As Molded		
3.2.8.1.1	Dry	0.005	
3.2.8.1.2	Wet	0.01	
3.2.8.2	After 72 hours at 370 °C (698 °F)		
3.2.8.2.1	Dry	0.005	
3.2.8.2.2	Wet	0.03	
3.2.9	Dielectric Strength, volts per mil, minimum		ASTM D 149 Short time test 0.125 inch (3.18 mm) thick specimen
3.2.9.1	As Molded	250	
3.2.9.2	After 72 hours at 370 °C (698 °F)	180	
3.2.10	Insulation Resistance, minimum		ASTM D 257
3.2.10.1	As Molded		
3.2.10.1.1	Dry	$1x10^{13}$ ohms	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.10.1.2	After exposure for 96 hours ± 1 at 23 °C ± 1 (73 °F ± 2) and not less than 96% relative humidity	$1x10^{13}$ ohms	
3.2.10.2	After 72 hours at 370 °C (698 °F)		
3.2.10.2.1	Dry	$1x10^{12}$ ohms	
3.2.10.2.2	After exposure for 96 hours ± 1 at 23 °C ± 1 (73 °F ± 2) and not less than 96% relative humidity	$1x10^{10}$ ohms	
3.2.11	Flammability (See 8.2)		ASTM D 635
3.2.11.1	Time of burning	5 seconds	
3.2.11.2	Burn length after flame removal, maximum	2 inches (51 mm)	

3.2.12 Weathering: When specified, the product shall have weather resistance acceptable to purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.2.13 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and vendor. Discoloration of metals shall not be considered objectionable.

3.3 Quality:

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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for compressive strength (3.2.3.1), impact resistance (3.2.4.1), water absorption (3.2.6), and flammability (3.2.11) are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of moldings 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 moldings 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.

4.3.1.1 If test specimens cannot be prepared from the moldings, a separate molded test specimen shall be prepared upon request of purchaser. This test sample shall be 0.125 inch ± 0.010 (3.18 mm ± 0.25) thick, having the same materials and processing as used for the moldings represented; the specific gravity of the test panel shall be within ±0.05 of that of the moldings.

4.3.1.2 A lot shall be all moldings of the same configuration made from the same batches of ingredients in one production run and presented for vendor's inspection at one time.

4.3.1.3 An inspection lot shall be not less than 400 moldings or 200 pounds (91 kg), whichever is the lesser weight.

4.3.1.4 When a statistical sampling plan has 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 4.5 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 moldings shall be approved by purchaser before moldings for production use are supplied, unless such approval be waived by purchaser. Results of tests on production moldings 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 moldings which are essentially the same as those used on the approved sample moldings. 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 moldings. Production moldings made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

The vendor of moldings shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the moldings conform to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3643B, vendor's compound number, form and size or part number, and quantity.

4.6 Resampling and Retesting:

If any specimen used in the above tests fails to meet the specified requirements, disposition of the moldings 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 moldings represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Product Identification:

Each molding of suitable size shall have the part number molded or permanently impressed therein. If size precludes integral marking, parts of each different part number shall be packed in separate, suitable containers marked with the part number.

5.2 Packaging and Package Identification:

5.2.1 Packaging shall be accomplished to ensure that moldings, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to moisture, weather, or any other normal hazard.

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