AEROSPACE MATERIAL SPECIFICATION

AMS3332™	REV. G

Issued 1957-07
Reaffirmed 2001-04
Revised 2021-03

Superseding AMS3332F

(R) Elastomer: Methyl Phenyl Vinyl Silicone Rubber (PVMQ) Extreme Low-Temperature Resistant 15 - 30 Type A Hardness

RATIONALE

Five-Year Review and update to the latest AMS3XXX series template.

1. SCOPE

1.1 Form

This specification covers an extreme low-temperature-resistant Methyl Phenyl Vinyl Silicone(PVMQ) elastomer that can be used to manufacture product in the form of sheet, strip, extrusions, and molded shapes. For molded rings, compression seals, O-ring cord, and molded-in-place gaskets for aeronautical and aerospace applications, use the AMS7XXX specification.

1.2 Application

This material type has a resistance to high-aniline point petroleum-based oils as well as weathering. This material type has a typical service temperature range of -112 to +446 °F (-80 to +230 °C). The service temperature range of the material is a general temperature range, but the presence of particular fluids and specific design requirements may modify this range. Each application should be considered separately. It is the responsibility of the user to determine that this specification is appropriate for the environments (temperature range, fluids exposure, etc.) in which it is sought to be used. These products are not normally suitable for use in contact with low-aniline-point petroleum-base fluids, including fuels, due to excessive swelling.

1.3 Order of Precedence

This specification is in addition to and in no way limiting, superseding, or abrogating any contractual obligation as required by the applicable procurement document. In the event of conflict in requirements, the order of precedence shall be:

1. Procurement document or contractual agreement and all statutory and regulatory requirements (excluding this document).
2. Applicable purchaser's drawing and/or design data.
3. Specifications referenced on the drawing.
4. This document.
5. All specifications referenced in this document.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS3332G

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.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2279 Tolerances, Rubber Products

AMS2817 Packaging and Identification of Molded Elastomeric Seals and Sealing Components

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D297 Standard Test Methods for Rubber Products - Chemical Analysis

ASTM D395 Standard Test Methods for Rubber Property - Compression Set

ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

ASTM D471 Standard Test Method for Rubber Property - Effect of Liquids

ASTM D573 Standard Test Method for Rubber - Deterioration in an Air Oven

ASTM D624 Standard Test Method for Tear Strength of Conventional Rubber and Thermoplastic Elastomers

ASTM D1149 Standard Test Methods for Rubber Deterioration Surface Cracking in an Ozone Controlled Environment

ASTM D2137 Standard Test Methods for Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics

ASTM D2240 Standard Test Method for Rubber Property - Durometer Hardness

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be prepared from ingredients as shall be necessary to achieve the requirements detailed in this standard and shall be a compound, based on the polymer specified in 1.1, suitably cured to produce product meeting the requirements of 3.2. Reprocessed vulcanized material is not acceptable.

3.2 Properties

The product shall conform to the following requirements shown in Table 1.

Table 1 - Physical property requirements

The following testing shall be performed every 5 years and test reports shall be made available upon request.

Paragraph	Property	Test Sample	Requirements	Test Method
3.2.1	As Received			
3.2.1.1	Hardness, Durometer Type "A"	Button or plied platens	15 to 30	ASTM D2240
3.2.1.2	Tensile strength, minimum	ASTM platen	400 psi (2.76 MPa)	ASTM D412, Die B or C
3.2.1.3	Elongation, minimum	ASTM platen	350%	ASTM D412, Die B or C
3.2.1.4	Tear resistance, minimum	ASTM platen	30 ppi (5.25 kN/m)	ASTM D624, Die B
3.2.1.5	Specific gravity	ASTM platen	Preproduction value ±0.03	ASTM D297, Hydrostatic Method
3.2.1.6	Compression set, percent of original deflection, maximum	ASTM platen, plied discs	60%	ASTM D395, Method B Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 22 hours ± 0.5 hour
3.2.1.7	Low-temperature resistance - brittleness	ASTM platen	No cracks/no breaks	ASTM D2137, Method C Temperature: -112°F ± 5 °F (-80°C ± 3 °C)
3.2.2	Dry heat resistance ASTM D573			
3.2.2.1	Hardness change, Durometer Type "A"	Button or plied platens	-5 to +10	ASTM D573 Temperature: 437 °F ± 5 °F (225 °C ± 3 °C) Time: 22 hours ± 0.5 hour
3.2.2.2	Tensile strength change, maximum	ASTM platen	-15%	
3.2.2.3	Tensile elongation change, maximum	ASTM platen	-20%	
3.2.2.4	Bend (flat)	ASTM platen	No cracking or checking	
3.2.3	Fluid resistance ASTM D471 IRM901			
3.2.3.1	Hardness change, Durometer Type "A"	Button or plied platens	-10 to +5	ASTM D471 Medium: IRM901 Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 70 hours ± 0.5 hour
3.2.3.2	Tensile strength change, maximum	ASTM platen	-50%	
3.2.3.3	Elongation change, maximum	ASTM platen	-20%	
3.2.3.4	Volume change	ASTM platen	0 to +25%	
3.2.3.5	Decomposition	ASTM platen	None	
3.2.3.6	Surface tackiness	ASTM platen	None	

3.3 Quality

Product, as received by purchaser, shall conform to dimensional requirements, be uniform in quality and condition, as free from foreign materials as commercially practical, and free from internal imperfections (such as voids, etc.) that are detrimental to usage of the product.

3.4 Tolerances

Shall conform to all applicable requirements of AMS2279 unless otherwise specified in drawing, PO, design data, or contract.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the product shall be responsible to assure that all required testing and product inspection has been performed and that test data is available. Unless specified otherwise by contractual requirements, testing may be performed at either the product vendor's own internal test facility, at the mixer, or at a suitable independent test facility. Purchaser reserves the right to sample and perform any confirmatory testing deemed necessary to ensure that the product conforms to the specified requirements.

4.2 Classification of Tests

4.2.1 Preproduction Tests

Preproduction testing is defined as the necessary testing required to show that a compound complies with all of the technical requirements of this specification as listed in 3.2 and includes all such testing. This testing must be performed upon the initial development of the compound in order for any product to be certified to this specification. Once performed, a copy of this testing must be kept on file as objective evidence of compliance and must be made available upon request. Preproduction testing is valid for a period of 5 years and must be re-performed if any one of the following occurs:

- At the end of the current 5 year validity period.
- When a change in ingredients and/or process requires reapproval (see 4.5).
- If contractually required by the purchaser.

4.2.2 Acceptance Tests

Tests for the following requirements are acceptance tests and shall be performed on each lot. If test specimens cannot be prepared from the end item, the applicable ASTM method shall be applied using material from the same batch and same state of cure and tested within 90 days of the manufacture subject lot.

Table 2

Paragraph	Property	Test Sample	Requirements	Test Method
3.2.1	As Received			
3.2.1.1	Hardness, Durometer Type "A"	Button or plied platens	15 to 30	ASTM D2240
3.2.1.2	Tensile strength, minimum	ASTM platen	400 psi (2.76 MPa)	ASTM D412, Die B or C
3.2.1.3	Elongation, minimum	ASTM platen	350%	ASTM D412, Die B or C
3.2.1.5	Specific gravity	ASTM platen	Preproduction value ±0.03	ASTM D297
3.2.1.6	Compression set, percent of original deflection, maximum	ASTM platen, plied discs	60%	ASTM D395, Method B Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 22 hours ± 0.5 hour
3.2.1.7	Low-temperature resistance - brittleness	ASTM platen	No cracks/no breaks	ASTM D2137, Method C Temperature: -112 °F ± 5 °F (-80 °C ± 3 °C)
3.2.3	Fluid resistance ASTM D471 IRM901			
3.2.3.4	Volume change, maximum	ASTM platen	0 to +25	ASTM D471 Medium: IRM901 Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 70 hours ± 0.5 hour

4.2.2.1 Lot Acceptance Testing

Should the purchaser require additional or reduced product lot acceptance testing other than what is stated in Table 2, then the details of such testing shall be agreed upon between the purchaser and the manufacturer and shall be defined in the purchase agreement and/or specified in the design data.

4.2.3 Retesting

If any original test fails to meet the specified requirements, the re-sampling and retesting requirement of the relevant ASTM test method shall be observed (see note). If the relevant ASTM test method makes no mention of a re-sampling or retesting requirement then repeat the test using valid test specimens from the same lot under consideration for product acceptance. If the repeat test using valid test specimens from the same lot under consideration also fails, then it is an indication of a lot-specific process issue; the lot must be reviewed to determine probable cause, and the cause resolved (rework or re-sort of the product). After such a review, one additional test set is permitted. If a failure occurs using this one additional test set, then the lot shall be rejected. The same lot and batch of product as was used for the original test shall be used for retesting. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the products represented. If failure is due to a testing error, then the test is considered invalid and new specimens can be issued for testing.

NOTE: Example - As ASTM D412 for tensile tests: run three samples, if any fail, then two additional samples shall be tested with test results reporting the median of the five.

4.2.3.1 No batch may be retested more than two times.

4.3 Blending of Compounds

If the practice is observed for blending batches, the compounder/manufacturer shall have a material approval process, which shall include these minimum requirements.

4.3.1 The original batch numbers and weights utilized in the blended batch shall be documented and easily accessible.

4.3.2 The original batches used shall be the same formulation and the same mix location.

4.3.3 The original batches used in creating a blended batch shall meet all of the acceptance testing criteria prior to blending and shelf life requirements. The manufacturer shall run batch acceptance tests on stored compound if it has exceeded its initial shelf life per the applicable specification. If all the values are within the acceptance testing requirements per the applicable specification, then the material is still approved for use. This process shall not exceed a maximum of 1 year for all specifications; if beyond 1 year, the manufacturer shall have a process to run a batch/acceptance test prior to extending the shelf life for an additional shelf life cycle per the applicable specification.

4.3.4 The new, blended batch shall be tested for batch and lot acceptance testing prior to shipment.

4.3.5 The new, blended batch shelf life shall be determined based upon the shelf life of the oldest original batch date of manufacture and shall follow the requirements of 4.3.3 used in the blend.

4.3.6 Blended material cannot be blended a second time.

4.4 Random Sampling

The method shall be as specified in the parts standard, drawing, or purchase document. If not specified, product shall be taken at random from each lot to perform all the required acceptance tests. The number of test specimens for each requirement shall be specified in the applicable test procedure.