

Issued 1957-07
Reaffirmed 2001-04
Revised 2009-05

Superseding AMS3332D

Silicone Rubber
Extreme Low-Temperature Resistant
15 - 30

RATIONALE

AMS3332E results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an extreme low-temperature-resistant silicone rubber in the form of sheet, strip, and molded shapes.

1.2 Application

- Primarily for rubber-like parts required to operate or seal from -112 to +446 °F (-80 to +230 °C), compounded especially for operation at extreme low temperatures. Silicone rubber is resistant to deterioration by weathering and by high-aniline-point petroleum-base oils and remains flexible over the temperature range noted. 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 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 purchase order date shall stipulate the published document that shall be in effect. The supplier may work to a subsequent revision unless a particular revision is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published revision 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 724-776-4970 (outside USA), www.sae.org.

AMS2817 Packaging and Identification, Preformed Packings
AMS2279 Tolerances, Rubber Products

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2009 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

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

**SAE values your input. To provide feedback
on this Technical Report, please visit
<http://www.sae.org/technical/standards/AMS3332E>**

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 D 297	Rubber Products Chemical Analysis
ASTM D 395	Rubber Property Compression Set
ASTM D 412	Rubber Properties in Tension
ASTM D 471	Rubber Property Effect of Liquids
ASTM D 573	Rubber Deterioration in an Air Oven
ASTM D 624	Rubber Property Tear Resistance
ASTM D 1149	Rubber Deterioration Surface Ozone Cracking in a Chamber (Flat Specimens)
ASTM D 2137	Rubber Property Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D 2240	Rubber Property Durometer Hardness

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be a compound, based on a silicone rubber, suitably cured to produce a product meeting the requirements of 3.2.

3.2 Properties

The product shall conform to the following requirements shown in Table 1; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable:

TABLE 1 – PHYSICAL PROPERTIES

Paragraph	Test	Requirement	Test Method
3.2.1	Original Properties		
3.2.1.1	Hardness, Durometer "A" or equivalent	15 - 30	ASTM D 2240
3.2.1.2	Tensile Strength, minimum	400 psi (2.76 MPa)	ASTM D 412, Die B or C
3.2.1.3	Elongation, minimum	350%	ASTM D 412, Die B or C
3.2.1.4	Tear Resistance, minimum	30 pounds force per inch (5.25 kN/m)	ASTM D 624, Die B
3.2.1.5	Specific Gravity	Preproduction Value ± 0.03	ASTM D 297
3.2.2	Petroleum Lubricating Oil Resistance: (Immediate Deteriorated Properties)		ASTM D 471 Medium: ASTM Oil No. 1 Temperature: 347 °F ± 5 (175 °C ± 3) Time: 70 hours ± 0.5
3.2.2.1	Hardness Change, Durometer "A" or equivalent	-10 to +5	
3.2.2.2	Tensile Strength Change, maximum	-50%	
3.2.2.3	Elongation Change, maximum	-20%	
3.2.2.4	Volume Change	0 to +25%	
3.2.2.5	Decomposition	None	
3.2.2.6	Surface Tackiness	None	
3.2.3	Dry Heat Resistance		ASTM D 573 Temperature: 437 °F ± 5 (225 °C ± 3) Time: 22 hours ± 0.5
3.2.3.1	Hardness Change, Durometer "A" or equivalent	-5 to +10	
3.2.3.2	Tensile Strength Change, maximum	-15%	
3.2.3.3	Elongation Change, maximum	-20%	

TABLE 1 – PHYSICAL PROPERTIES (CONTINUED)

Paragraph	Test	Requirement	Test Method
3.2.3.4	Bend (flat)	No cracking or checking	
3.2.4	Compression Set		ASTM D 395, Method B Temperature: 347 °F ± 5 (175 °C ± 3)
3.2.4.1	Percent of Original Deflection, maximum	60	Time: 22 hours ± 0.5
3.2.5	Low-Temperature Resistance		ASTM D 2137, Method A Temperature: -112 °F ± 5 (-80 °C ± 3)
3.2.5.1	Brittleness	Pass	

3.2.6 Weathering

The product shall show no evidence of cracking when tested in accordance with ASTM D 1149, Method B, Procedure B2 for 7 days at 105 °F ± 2 (40 °C ± 1). The ozone pressure shall be 50±5 mPa.

3.3 Dimensions and Tolerances

Dimensions and tolerances shall be as specified in the parts standard, drawing, or purchase document, and shall conform to all applicable requirements of AMS2279.

3.4 Toxicological Formulations

The material shall have no adverse effects on the health of personnel when used for its intended purpose in accordance with manufacturer's instructions and with appropriate handling procedures.

3.5 Quality

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

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the product shall be responsible of performance of all required tests. Purchaser reserves the right to sample and perform any testing deemed necessary to ensure that the product conforms to the AMS requirements. .

4.2 Classification of Tests

4.2.1 Acceptance Tests

Tests for the following requirements shown in Table 2 are acceptance tests and shall be performed on each lot.

TABLE 2 – INITIAL ACCEPTANCE TESTS

Requirement	Paragraph Reference
Hardness	3.2.1.1
Tensile Strength	3.2.1.2
Elongation	3.2.1.3
Specific Gravity	3.2.1.5
Volume Change	3.2.2.4
Compression Set	3.2.4
Brittleness	3.2.5.1

4.2.1.1 Lot

Quantity of one size of product processed and as one production entity from a batch.

4.2.1.2 Batch

Quantity of compound run through a mill or mixer at one time.

4.2.1.3. Random Sampling

The method shall be as specified in the part 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 iterations for each requirement shall be specified in the applicable test procedure.

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 the product 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.

4.4. Sampling and Testing

4.4.1. For Acceptance Tests

Sufficient product 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.

4.4.1.1. If test specimens cannot be prepared from the product, ASTM test specimens prepared from the same batch and state of cure shall be used. When the product is a molded shape from which test specimens cannot be cut, a slab of 6 x 6 inch (152 x 152 mm) by 0.075 inch \pm 0.008 (1.90 mm \pm 0.20) molded from the same batch of compound shall be supplied upon request.

4.4.1.2. A lot shall be all product from the same batch of compound processed in one continuous run and presented for vendor's inspection at one time.

4.4.1.3. A batch shall be the quantity of compound run through a mill or mixer at one time.

4.4.1.4. 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 4.6.1 shall state that such plan was used.

4.5. Approval

4.5.1 Sample product shall be approved by purchaser before product for production use is supplied, unless such approval be waived by purchaser. Results of tests on production product shall be essentially equivalent to those on the approved sample.

4.5.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved sample product. 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 product. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.