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| AEROSPACE MATERIAL SPECIFICATION | AMS7267™ | REV. H |
| | Issued 1960-01 Reaffirmed 2001-04 Revised 2021-05 | |
| Superseding AMS7267G | | |
| (R) Rubber: Vinyl-Methyl Silicone (VMQ) Hot Air Resistant Low Compression Set, 70 to 80 Type A Hardness for Seals in Hot Air Systems | | |

RATIONALE

This update performs the Five-Year Review and incorporates previous balloted items and is a complete revision. Also, the latest AMS7XXX template was used.

1. SCOPE

This specification covers a silicone (VMQ) rubber in the form of molded rings. These rings have been used typically as sealing rings for service from -65 to +260 °C (-85 to +500 °F) in contact with air, but usage is not limited to such applications. The cross-section of such rings is usually not over 0.275 inch (6.98 mm) in diameter or thickness.

1.1 Form

This specification covers a vinyl-methyl silicone (VMQ) rubber in the form of molded rings, compression seals, O-ring cord, and molded-in-place gaskets for aeronautical and aerospace applications. For sheet, strip, tubing, extrusions, and molded shapes, use the AMS3304 or AMS3305 specifications, which are intended for that use.

1.2 Application

This material has resistance to hot air but generally poor resistance to fuels and lubricants, but usage is not limited to such applications. This material has a typical service temperature range of -85 to 500 °F (-65 to 260 °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.

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

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1.3 Order of Precedence

Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained. 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 or AS9385 or AS9386 parts standards.
3. Specification referenced on the drawing.
4. This document.
5. All specifications referenced in this document.

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 document 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.

| | |
|---------|--|
| AMS2817 | Packaging and Identification of Molded Elastomeric Seals and Sealing Components |
| AIR851 | O-Ring Tension Testing Calculations |
| ARP3050 | Suitable Test Sizes for O-Ring Specifications |
| AS568 | Aerospace Size Standard for O-Rings |
| AS5316 | Storage of Elastomer Seals and Seal Assemblies Which Include an Elastomer Element Prior to Hardware Assembly |
| AS5752 | Aerospace - Visual Inspection Standard for Elastomeric Sealing Elements Other Than O-Rings |
| AS6414 | Manufacturing Processing Requirements for Molded Elastomer Components Used in Aerospace Applications |
| AS9385 | Packing, Preformed, AMS7267, O-Ring |
| AS9386 | O-Ring Molded from AMS7267 Material |

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 Method for Rubber Property - Compression Set Method B |
| ASTM D471 | Standard Test Method for Rubber Property - Effects of Liquids |
| ASTM D573 | Standard Test Method for Rubber - Deterioration in an Air Oven |
| ASTM D575 | Standard Test Methods for Rubber Properties in Compression |
| ASTM D1414 | Standard Test Methods for Rubber O-Rings |
| ASTM D1329 | Standard Test Method for Evaluating Rubber Property - Retraction at Lower Temperatures (TR) |
| ASTM D2240 | Standard Test Method for Rubber Property - Durometer Hardness |

2.3 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org>.

| | |
|------------|--|
| ISO 3601-1 | Fluid Power Systems - O-Rings - Part 1: Inside Diameter, Cross Sections, Tolerances and Size Identification Code |
| ISO 3601-3 | Fluid Power Systems - O-Rings - Part 3: Quality Acceptance Criteria |

2.4 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.pri-network.org.

| | |
|--------|---|
| PD2000 | Procedures for an Industry Qualified Product Management Process |
| PD2102 | Aerospace Quality Assurance, Product Standards, Qualification Procedure, Elastomeric Seal |

2.5 ASQ Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 (United States or Canada), 001-800-514-1564 (Mexico), or +1-414-272-8575 (all other locations), www.asq.org.

| | |
|---------------|---|
| ANSI/ASQ Z1.4 | Sampling Procedures and Tables for Inspection by Attributes |
|---------------|---|

3. TECHNICAL REQUIREMENTS

3.1 Compound

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 Qualification Properties

The material as processed by the molder in the form as defined in Table 1 (test sample) shall conform to the requirements shown in Table 1. Calculations of tensile strength and elongation may be made in accordance with AIR851.

Material shall be tested on the part standard 7XXX-214 pertaining to this material specification; if no part standard exists, then testing shall be on size standard AS568-214 O-rings to determine the qualification properties.

Table 1 - Qualification properties

| Paragraph | Property | Test Sample | Requirements | Test Method |
|-----------|--|--|---|--|
| 3.2.1 | As received | | | |
| 3.2.1.1 | Hardness, Durometer Type "A" | AS568-214 O-rings | 75 ± 5 | ASTM D1414 (D2240) |
| 3.2.1.1.a | Hardness, Durometer Type "A" | Hardness solid button or plied specimens | 75 ± 5 | ASTM D2240 |
| 3.2.1.2 | Tensile strength, min | AS568-214 O-rings | 650 psi (4.48 MPa) | ASTM D1414 |
| 3.2.1.3 | Elongation, min | AS568-214 O-rings | 125 % | ASTM D1414 |
| 3.2.1.4 | Specific gravity/relative density | AS568-214 O-rings | Preproduction value ±0.02 | ASTM D1414 (D297) Hydrostatic Method |
| 3.2.2 | Acceptance test (short term), compression set, percent of original deflection, max | AS568-214 O-rings | 60 max | ASTM D1414 (D395, Method B) Temperature: 437 °F ± 5 °F (225 °C ± 3 °C) Time: 22 hours ± 0.25 hour |
| 3.2.3 | Temperature retraction test [TR-10], max | AS568-214 O-rings | -44 °F (-42 °C) | ASTM D1414 (D1329) |
| 3.2.4 | Dry Heat Resistance ASTM D573 | | | |
| 3.2.4.1 | Hardness, Durometer Type "A" change | AS568-214 O-rings | -5 to +10 | ASTM D1414 (D573) Temperature: 482 °F ± 5 °F (250 °C ± 3 °C) Time: 70 hours ± 0.5 hour |
| 3.2.4.2 | Tensile strength change, max | AS568-214 O-rings | -30 max | |
| 3.2.4.3 | Tensile elongation change, max | AS568-214 O-rings | -45 max | |
| 3.2.5 | Fluid IRM-901 Oil Resistance ASTM D471 | | | |
| 3.2.5.1 | Hardness, Durometer Type "A" change | AS568-214 O-rings | -10 to +5 | ASTM D1414 (D471) Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 70 hours ± 0.5 hour IRM-901 fluid |
| 3.2.5.2 | Tensile strength change, max | AS568-214 O-rings | -30 max | |
| 3.2.5.3 | Tensile elongation change, max | AS568-214 O-rings | -30 max | |
| 3.2.5.4 | Volume change | AS568-214 O-rings | 0 to +15 | |
| 3.2.6 | Compression-deflection at 20% deflection | ASTM D395 Method B, type 1 buttons | 200 psi min (1.38 MPa) at 60 to 85 °F (20 to 30 °C) | ASTM D575 with modifications; see 4.5.1 |
| 3.2.7 | Compression-deflection at 20% deflection | ASTM D395 Method B, buttons | 150 psi min (1.04 MPa) at 482 °F ± 5 °F (250 °C ± 3 °C) | ASTM D575 with modifications; see 4.5.1 |

3.3 Quality

All product, as received by purchaser, shall be as specified in the AS9385 or AS9386 parts standards, drawing, or purchase document (see 1.3). If not specified, O-ring surface quality shall conform to ISO 3601-3 Grade S requirements. For all other compression seal geometries, the parts other than O-rings, shall meet AS5752 Type 2 requirements.

3.4 Dimensions and Tolerances

All dimensions and tolerances shall be as specified in the AS9385 or AS9386 parts standards, drawing, or purchase document (see 1.3). If not specified, O-rings standard sizes and tolerances shall be per AS568. The procedures outlined in Annex B of ISO 3601-1 shall be followed for dimensional inspection.

3.5 Qualification

Qualification shall consist of a supplier test report covering all requirements in 3.2. Product qualification shall be as agreed between the purchaser and manufacturer until a QPL is established.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the product shall be responsible for performing all required tests. Purchaser reserves the right to sample and perform any testing deemed necessary to ensure that the product conforms to the AMS7XXX requirements.

4.2 Classification of Tests

4.2.1 Batch Testing

AS6414 defines batch testing. Testing on the same batch and state of cure are acceptable as long as the AS568-214 O-rings are cured and tested within 90 days of the manufacture of the subject lot.

Batch and the blending of compound as defined in AS6414. All incoming batches and/or blended batches shall be tested per Table 2.

Table 2 - Batch test

| Paragraph | Property | Test Sample | Requirements | Test Method |
|-----------|--|-------------------|---------------------------|---|
| 3.2.1 | As received | | | |
| 3.2.1.1 | Hardness, Durometer Type "A" | AS568-214 O-rings | 75 ± 5 | ASTM D1414 (D2240) |
| 3.2.1.2 | Tensile strength, min | AS568-214 O-rings | 650 psi (4.48 MPa) | ASTM D1414 |
| 3.2.1.3 | Elongation, min | AS568-214 O-rings | 125% | ASTM D1414 |
| 3.2.1.4 | Specific gravity/relative density | AS568-214 O-rings | Preproduction value ±0.02 | ASTM D1414 (D297) Hydrostatic Method |
| 3.2.2 | Acceptance test (short term), compression set, percent of original deflection, max | AS568-214 O-rings | 60 | ASTM D1414 (D395, Method B) Temperature: 437 °F ± 5 °F (225 °C ± 3 °C) Time: 22 hours ± 0.25 hour |
| 3.2.5 | Fluid IRM-901 oil resistance | ASTM D471 | | |
| 3.2.5.4 | Volume change | AS568-214 O-rings | 0 to +15 | ASTM D1414 (D471) Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 70 hours ± 0.5 hour IRM-901 fluid |

4.2.2 Acceptance Lot Tests (O-Rings)

4.2.2.1 Acceptance Lot Tests for O-Rings

Requirements shown in Table 3 are acceptance lot tests and shall be performed on each lot on the O-rings being supplied.

The term "part" in Table 3 shall be interpreted to mean the O-ring shipped. It shall be permitted to use multiple such O-rings which shall be made from the same lot and batch to perform the applicable test.

O-ring sizes that are suitable for testing (tensile and elongation) are shown in ARP3050.

Table 3 - Acceptance lot test for O-rings

| Paragraph | Property | Test Sample | Requirements | Test Method |
|-----------|--|-------------|---------------------------|---|
| 3.2.1 | As received | | | |
| 3.2.1.1 | Hardness, Durometer Type "A" | Part | 75 ± 5 | ASTM D1414 (D2240) |
| 3.2.1.2 | Tensile strength, minimum | Part | 650 psi (4.48 MPa) | ASTM D1414 |
| 3.2.1.3 | Elongation, minimum | Part | 125 % | ASTM D1414 |
| 3.2.1.4 | Specific gravity/relative density | Part | Preproduction value ±0.02 | ASTM D1414 (D297) Hydrostatic Method |
| 3.2.2 | Short term, compression set, percent of original deflection, max | Part | | ASTM D1414 (D395, Method B) Temperature: 437 °F ± 5 °F (225 °C ± 3 °C) Time: 22 hours ± 0.25 hour (max time 22 hours) |
| | O-ring cross sectional If 0.064 to 0.110 inch | Part | 70 | |
| | If over 0.110 inch | Part | 60 | |
| 3.2.5 | Fluid IRM-901 oil resistance ASTM D471 | | | |
| 3.2.5.4 | Volume change | Part | 0 to +15 | ASTM D1414 (D471) Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 70 hours ± 0.5 hour IRM-901 fluid |

4.2.2.2 Acceptance Lot Tests for All Other Seal Geometries Other Than O-Rings

The term "part" in Table 4 shall be interpreted to mean the elastomer seal part being shipped. It shall be permitted to use multiple such parts which shall be made from the same lot and batch to perform the applicable test.

Table 4 - Acceptance lot test for all other seal geometries except plate seals and O-rings

| Paragraph | Property | Test Sample | Requirements | Test Method |
|-----------|------------------------------------|-------------|---------------------------|---|
| 3.2.1 | As received | | | |
| 3.2.1.4 | Specific gravity/relative density | Part | Preproduction value ±0.02 | ASTM D1414 (D297) Hydrostatic Method |
| 3.2.5 | Fluid IRM-901 resistance ASTM D471 | | | |
| 3.2.5.4 | Volume change | Part | 0 to +15 | ASTM D1414 (D471) Temperature: 347 °F ± 5 °F (175 °C ± 3 °C) Time: 70 hours ± 0.5 hour IRM-901 fluid |

4.2.3 Plate Seal

A plate seal is defined as an elastomer bonded to any substrate material whose primary function is to perform as a seal.

4.2.3.1 For plate seals, a suitable test plan shall be agreed upon between the user and supplier; if no specific test plan is established, requirements in 4.2.1, including Table 2 tests, shall be performed.

4.2.4 Lot

AS6414 as defined.

4.2.5 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 testing in Tables 3 and 4 where applicable per the part type. The number of test specimens for each requirement shall be specified in the applicable test procedure.

4.2.6 Qualification Tests

All technical requirements shall be in accordance with applicable material specification and performed prior to the initial shipment of the product to a purchaser. Any change in process or ingredients that would require requalification are listed in the AS6414 document unless otherwise specified by the purchase order, print, or design data. For initial qualification, all specimens shall be from the same production batch and lot using test samples as specified in Table 1.

4.2.6.1 Qualification Test Report

The supplier of the product shall make a qualification test report available upon request. This report shall include, at a minimum: AMS number, manufacturer's identification and product designation, batch and lot number, date of manufacture, and the results of all qualification tests.

4.3 Inspection

Dimensional and visual inspection:

4.3.1 Prior to inspection, mold flash shall be removed from the parts in such a manner that they conform to the requirements specified herein. For end of process inspection, each individual part (100%) shall be visually inspected at 1X magnification for mold flash, backrind, parting line projection, non-fills, flow lines, and other significant defects in accordance with ISO 3601-3, Grade S or AS5752 requirements.. The entire part surface shall be inspected.

4.3.2 For final inspection, the sample size shall be in accordance with ANSI/ASQ Z1.4 single sampling plan inspection Level II with an AQL 1.0, except that the acceptance number shall be zero.

The sample unit shall be one part. Inspection shall be according to ISO 3601-3, Grade S or AS5752 requirements as applicable under 2X magnification. In case of disagreement, the visual inspection at 2X magnification shall govern. The entire part surface shall be manually inspected. The procedures outlined in Annex B of ISO 3601-1 shall be followed for dimensional inspection. If the purchaser requires a different sampling plan or visual inspection criteria, the manufacturer shall be informed prior to the time of order

4.4 Approval

Unless otherwise specified by purchase order, print, or design data, when a change per AS9100, PD2102, or AS6414 occurs in ingredients, manufacturing, and/or processing, reapproval to this material standard shall be required.

4.5 Test Methods

4.5.1 Compression-Deflection

Shall be determined in accordance with ASTM D575, Method A on ASTM D395, Method B, Type 1 molded buttons, except using a compression rate of 0.10 in/min \pm 0.02 in/min (0.04 mm/s \pm 0.008 mm/s) and omitting buffing of the surfaces. For tests at 250 °C (482 °F), the compression apparatus shall be surrounded by a suitable heater and the specimen and test fixture stabilized at test temperature for 60 minutes \pm 5 minutes before applying the load.

4.6 Process Control

The manufacturer shall establish, for each size of seal, parameters for the process control factors which will produce seals meeting the technical requirements per 4.2.1 of this specification. Control factors for producing seals shall be per AS6414. If any change in ingredients, type of equipment for processing, or manufacturing procedures is necessary, the manufacturer shall submit for reapproval a statement of the proposed changes and, when requested, sample product. Production product made by the revised procedure shall not be shipped prior to receipt of re-approval.