# AEROSPACE STANDARD

| AS5502™ | REV. F |
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Superseding AS5502E

## Standard Requirements for Aerospace Sealants and Adhesion Promoters

RATIONALE

Provide manufacturers improved testing efficiency by reducing second conformance testing for material extension. Added to 3.1.2 defining DOP/DOM for other types of sealing materials (tapes, sheets, and gaskets), including applicable pressure-sensitive adhesives.

## 1. SCOPE

This SAE Aerospace Standard (AS) establishes standard requirements for aerospace sealants and adhesion promoters, which may be incorporated as part of SAE Aerospace Material Specifications (AMS) for such products. This document provides for commonality of methods and procedures for responsibility for inspection, source inspection, classification of tests, establishment of/and qualification to qualified products lists, approval, reports, resampling and retesting, packaging, and marking.

### 1.1 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this standard may involve the use of hazardous materials, this standard does not address the hazards that 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. Refer to the specific product's Materials Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) for health and safety information.

## 2. APPLICABLE DOCUMENTS

The following publications form a part of this document 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. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 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.

AMS3100 Adhesion Promoter for Polysulfide Sealing Compounds





**TO PLACE A DOCUMENT ORDER:** **Tel: 877-606-7323 (inside USA and Canada)**
**Tel: +1 724-776-4970 (outside USA)**
**Fax: 724-776-0790**
**Email: CustomerService@sae.org**
**SAE WEB ADDRESS:** **http://www.sae.org**

**For more information on this standard, visit**
https://www.sae.org/standards/content/AS5502F

AS9100 Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations

AS9120 Quality Management Systems - Requirements for Aviation, Space, and Defense Distributors

2.2 BSI Publications

Copies of these documents are available online at https://www.bsigroup.com.

BS EN 9100 Quality Management Systems - Requirements for Aviation, Space and Defense Organizations

BS EN ISO 10012 Measurement Management Systems Requirements for Measurement Processes and Measuring Equipment

BS EN ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

2.3 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 10012 Measurement Management Systems - Requirements for Measurement Processes and Measuring Equipment

ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

2.4 PRI Publications

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

AC7200/1 Audit Criteria for Sealants for the Sealant Manufacturers' Accreditation Program

AC7200/2 Audit Criteria for Sealants for the Sealant Repackagers' Accreditation Program

AC7200/3 Audit Criteria for Sealants for the Sealant Repackagers' Accreditation Program

OP 1114 APP SLT Nadcap Operating Procedure, Task Group Operation App SLT

OP 2004 QPL Qualification Process

OP 2007 Appendix G9 Additional Requirements for the Aerospace Sealants and Associate Materials (G9) QPG

PD2000 Governance and Administration of an Industry Managed Product Qualification Program



3. TECHNICAL REQUIREMENTS

For purposes of this standard, sealant shall be synonymous with "sealing compound."

Technical requirements for a specific class of sealant or adhesion promoter shall be defined by the AMS. In case of conflict in requirement(s), the AMS takes precedence over this AS.

3.1 Date of Manufacturing, Date of Packaging, and Conformance Testing

3.1.1 Date of Manufacturing (DOM)

DOM is defined as the last day of initial acceptance tests per 4.2.2 and shall be included on the applicable test report.

3.1.2 Date of Packaging (DOP)

For sealants, the DOP is defined as the date that bulk sealant is packaged from its components, base compound, and curing agent by the manufacturer or value-added distributor (repackager). The DOP shall be no more than 90 days from the DOM or the most recent conformance testing per 3.1.3. The material shelf life shall be limited to a maximum of two 90-day extensions and shall be limited to a maximum of 270 days from the DOM in accordance with applicable AMS specifications unless otherwise stated.

For adhesion promoters, the DOP is defined as the date that the bulk adhesion promoter is packaged into smaller container sizes per AMS3100, Section 5.

NOTE: The shelf life of the adhesion promoter is based on the DOM per AMS3100, 3.5.

For sealing materials (tapes, sheets, and gaskets), the DOP is defined as the date that material is packaged by the manufacturer or distributor (repackager). The DOP shall be no more than 90 days from the DOM or the most recent Acceptance Testing. Materials supplied with pressure-sensitive adhesives shall include shelf life requirements in accordance with applicable AMS specifications.

3.1.3 Conformance Testing (CT) for Packaging Extensions - Sealant Only

3.1.3.1 First CT Material Extension to 180 Days from DOM

First CT requires performing the final acceptance tests of the applicable AMS and shall begin to be performed toward the end of the 90 days (e.g., from 80 to 90 days) of the bulk material DOM to extend the time to a maximum of 180 days from DOM. The first CT may be performed by the manufacturer or, with the manufacturer's approval, by approved value-added distributors (repackagers). See Figure 1.

3.1.3.2 Second CT Material Extension to 270 Days from DOM

The second CT requires performing the initial acceptance tests of the applicable AMS and shall begin to be performed by the manufacturer toward the end of the 180 days (e.g., from 170 to 180 days) of the bulk material DOM to extend the time to a maximum of 270 days from DOM. With the manufacturer's approval, the tests can be performed by value-added distributors (repackagers) with a third-party accreditation in accordance with AC7200/3. See Figure 1.

Using the Qualification process per 4.7, a sealant manufacturer may request to have product approval be subject to reduced testing to perform final acceptance tests for the second CT material extension per AS5502 (3.1.3.2). The manufacturer shall submit a change notification in accordance with OP 2004 (4.2.2) and OP 2007 Appendix G9 (5.8.7) and shall state the purpose of the request. Product approval will be by Type and Class (if applicable) of the applicable AMS specification. Upon Qualified Products Group (QPG) approval, a note will be added to each application time of the product's Type and Class, if applicable, by stating "Accepted to perform reduced testing from 180-days to 270-days Packaging Extension per AS5502 (3.1.3.2)." Final Acceptance Tests may be performed by the manufacturer or, with the manufacturer's approval, by approved value-added distributors (repackagers).

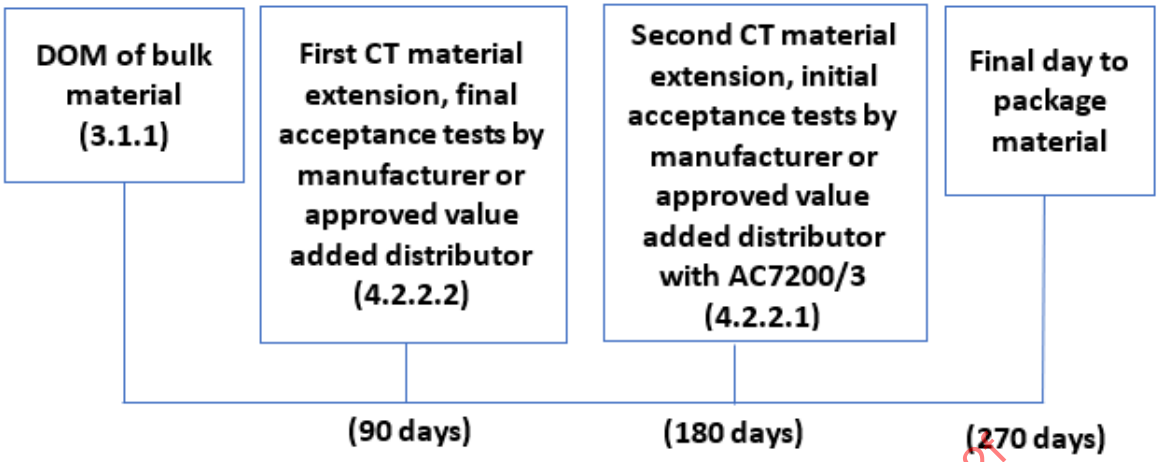


***Figure 1***

3.1.3.3 CT Material Extension if Tested After 90 Days

For the exception that the material was not tested before 90 days per 3.1.3.1, a 90-day extension from the start of the testing requires performing the initial acceptance tests of the applicable AMS and shall be performed by the manufacturer or, with the manufacturer's approval, by value-added distributors (repackagers) with a third-party accreditation in accordance with AC7200/3. After the 90-day extension, the material can be tested again for an extension to a maximum of 270 days from DOM. See Figure 2.



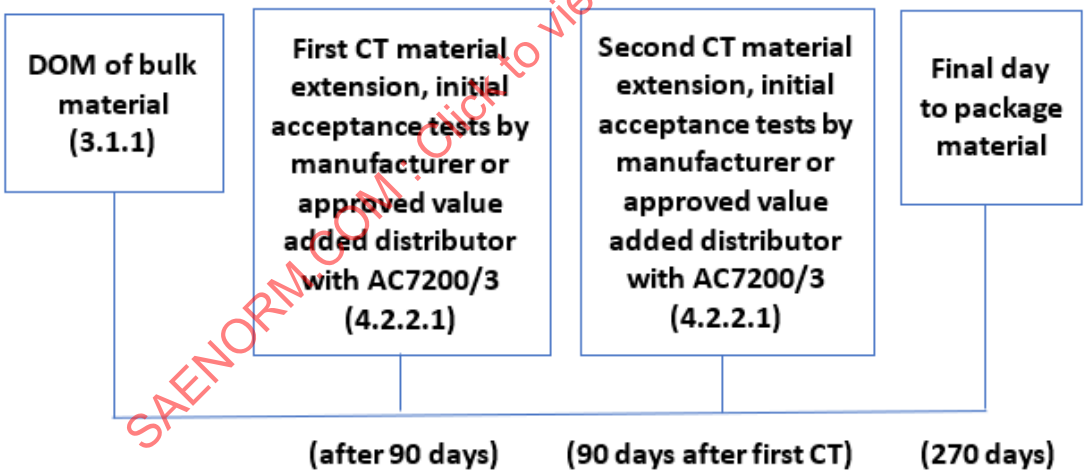


***Figure 2***

3.2 Toxicological Formulations

The material shall have no adverse effects on the health of personnel when used for its intended purpose in accordance with the manufacturer's MSDS or SDS and with appropriate handling procedures. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate medical service, which will act as an advisor to the contracting agency.

3.3 Quality

3.3.1 Sealant Quality

The sealant's base compound and curing agent, as received by the purchaser, shall each be of uniform blend and shall be free of excessive air, skins, lumps, and gelled or coarse particles that could interfere with the application of the material and its function. There shall be no separation of ingredients that cannot be easily redispersed.

3.3.2 Adhesion Promoter Quality

The adhesion promoter, as received by the purchaser, when visually examined, shall be uniform in quality and condition, free of sedimentation and turbidity, and free from foreign materials, particulate matter, and other contaminates detrimental to use of the adhesion promoter. Material packaged in aerosol containers may be sprayed into a clear glass container to determine appearance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the material shall supply all samples and shall be responsible for the performance of all required tests.

4.1.1 Source Inspection (Nadcap)

Each batch of material procured under specifications referring to this standard shall be third-party approved prior to shipment to ensure that material meets acceptance tests as defined by the specification. Third-party approval shall be by a third-party accreditation process in accordance with (PRI) OP 1114 APP SLT (4.12.1). Also, the manufacturer of the sealant or adhesion promoter shall be certified in accordance with AS9100 and hold a third-party accreditation in accordance with (PRI) AC7200/1. Value-added distributors (repackagers) and pass-through distributors supplying sealant or adhesion promoter shall supply material from an accredited manufacturer and from a batch of material that has been inspected by a third-party source. Value-added distributors shall be certified in accordance with AS9100 and hold a third-party accreditation in accordance with (PRI) AC7200/2. Pass-through distributors shall be certified in accordance with AS9100 or AS9120.

NOTE: For AS9100 and AS9120, any accreditation body under the International Aerospace Quality Group (IAQG) umbrella using a national Quality Management Systems standard (e.g., BS EN 9100) is equivalent.

4.1.2 Sampling

Shall be in accordance with 4.3.1.

4.2 Classification of Tests

4.2.1 Qualification Tests

All technical requirements are qualification tests and shall be performed prior to or on the initial shipment of the material by the manufacturer. Compliance testing is required when a change requires reapproval as in 4.4.2, or when the G-9 QPG deems it necessary per (PRI) PD2000, (PRI) OP 2004, and (PRI) OP 2007 Appendix G9. The compliance tests will be defined by the G-9 QPG.

4.2.2 Acceptance Tests

4.2.2.1 Initial Acceptance Tests

Technical requirements that are tested on each batch of material are initial acceptance tests. Initial acceptance tests are performed after production but before repackaging.

4.2.2.2 Final Acceptance Tests

Final acceptance tests shall be performed on each lot of material after packaging or repackaging, as applicable.

4.2.2.2.1 Final Acceptance Tests for Sealant Can Kits (Cans, Pails, or Drums)

4.2.2.2.1.1 No final acceptance tests are required.

4.2.2.2.1.2 A fill weight check must be performed on a minimum of one kit per production run.

4.2.2.2.2 Final Acceptance Tests for Sealant Injection or Mix on Demand Kits

4.2.2.2.2.1 Test one kit per base compound/curing agent combination, regardless of how many different sizes of kits are produced, in accordance with the following conditions:

a. Dedicated equipment: If the base compound/curing agent combination is run on dedicated equipment, kit testing does not need to be repeated if runs are done on different days.

b. Non-dedicated equipment: If another material was used on the equipment, another kit must be tested when the next run begins.

c. Hand-filling: If the material is filled by hand, kit testing does not need to be performed if the same base compound/curing agent combination packaged by another process has been tested. If the base compound/curing agent combination has not been packaged by another process, then a kit must be tested.

NOTE: A fill weight check must be done on at least one kit of each kit size per run.

4.2.2.2.2.2 The following tests are required, unless the AMS directs otherwise:

a. Application time.

b. Tack-free time.

c. Cure time.

d. Flow (if applicable).

4.2.2.2.3 Final Acceptance for Pre-Mixed and Frozen (PMF) Sealant Cartridges

4.2.2.2.3.1 Test a minimum of one PMF cartridge per run for Class B materials and three PMF cartridges (from the beginning, middle, and end of the run) for Class A and Class C materials. The classes are defined in the applicable AMS specification.

NOTE: A weight ratio check is required at the start of each production run.

4.2.2.2.3.2 The following tests are required, unless the AMS directs otherwise:

a. Application time.

b. Tack-free time.

c. Cure time.

d. Flow (if applicable).

4.2.2.2.3.3 Button Board Inspection

4.2.2.2.3.3.1 For Class B materials in cartridges 2.5 ounces or larger, the operator extrudes a small amount of product from each sequentially numbered cartridge onto a correspondingly numbered square on the button board. For Class B materials in cartridges smaller than 2.5 ounces, a small amount of product from every tenth cartridge shall be extruded onto a correspondingly numbered square on the button board.

4.2.2.2.3.3.2 Button board sealant may be subject to accelerated cure.

4.2.2.2.3.3.3 Inspection criteria for all buttons:

a. Visual: Uniform color, mix, and texture; no streaks; free of flakes, grit, or foreign objects.

b. Cure: Uniform solid rubbery state, tack-free to touch.

c. Air: No sponginess or excessive air. “Excessive air” is defined as 20% or more porosity of the internal surface area of the halved button.

NOTE: For PMF cartridges 2.5 ounces or larger being filled using a continuous mixing machine, either with dynamic or static mixing heads, the cartridge corresponding to a discrepant button and the one following shall be discarded. If another PMF cartridge filling process is used, the corresponding cartridge and the one before and after shall be discarded.

For each discrepant button of cartridges smaller than 2.5 ounces, the corresponding cartridge - and the nine before and ten after - corresponding to the fill process shall be discarded.

4.2.2.2.4 Final Acceptance Tests for PMF Sealant Used to Fill Pre-Molded Sealant Caps

The following tests are required to be performed on a sample of the PMF sealant, unless the AMS directs otherwise:

a. Application time.

b. Tack-free time.

c. Cure time.

d. Flow (if applicable).

4.2.2.2.5 Final Acceptance Tests for One Part Cartridge

The following tests are required, unless the AMS directs otherwise:

a. Tack-free time.

b. Cure time.

c. Flow (if applicable).

4.2.2.2.6 Final acceptance tests for adhesion promoter are the following, unless the AMS directs otherwise:

4.2.2.2.6.1 Color, when applicable, shall be uniform and impart a stain on the substrate when dried.

4.2.2.2.6.2 Appearance shall be uniform in quality and condition, free of sedimentation and turbidity, and free from foreign materials, particulate matter, and other contaminants detrimental to the use of the adhesion promoter.

4.3 Sampling and Testing

4.3.1 For Initial and Final Acceptance Tests

Sufficient material shall be taken at random from each batch or 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. Multiple testing is not required for color, viscosity, application time, flow, tack-free time, and cure time.

4.3.1.1 A batch shall be the quantity of material run through a mill or mixer at one time. A lot shall be defined as material from one batch of each component that is assembled (packaged) as a finished product. The lot, when used, shall be traceable to the batches of base compound and curing agent.

4.3.1.2 Sufficient material of each batch shall be prepared for initial acceptance testing in accordance with 4.2.2.1. The batch shall be released for final packaging. During packaging, test kits from each lot shall be selected at random for final acceptance testing in accordance with 4.2.2.2 (sealant can kits per 4.2.2.2.1 are exempt from final acceptance testing). Final acceptance testing shall be conducted on the final packaged product.

4.3.1.3 If the batch is being packaged in different types and/or size containers, the final acceptance tests shall be conducted on each type and/or each size container. If the sealing compound is being procured under different purchase orders, but the purchase orders call for the same type and size containers, it is only necessary to conduct the final acceptance tests one time.

4.4 Approval

4.4.1 For products without a Qualified Products List (QPL) requirement, the purchaser shall approve the sealing compound or adhesion promoter before the sealing compound or adhesion promoter is supplied for production use, unless the purchaser waives such approval. Results of tests on the production sealing compound shall be equivalent to those on the approved sample.

4.4.2 Manufacturers shall use ingredients, manufacturing procedures, processes, and methods of inspection on production materials that are the same as those used on the qualified sample. If it is necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, the manufacturer shall submit a statement of the proposed changes for reapproval and, when requested, a product sample. Products listed on AMS QPL shall be submitted for approval in accordance with (PRI) PD2103. Production products made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.4.3 The manufacturer shall use equipment that has either been calibrated using an internal calibration and/or verification process compliant with ISO/IEC 17025 or ISO 10012 or using an outside calibration source that is either performed by the original equipment manufacturer or performed by a service that is certified to ISO/IEC 17025 with the proper scope of accreditation.

NOTE: For ISO/IEC 17025, any accreditation body under the International Laboratory Accreditation Cooperation (ILAC) umbrella using a national standard (e.g., BS EN ISO/IEC 17025) is equivalent. For ISO 10012, any national accreditation standard (e.g., BS EN ISO 10012) is equivalent.

4.5 Reports

With each shipment, the supplier of the material shall furnish a report showing the results of tests to determine conformance to the initial acceptance test requirements and stating that the product conforms to the other technical requirements of the applicable AMS specification. This report shall include the purchase order number, batch/lot number, AMS designation, type, class, and grade (as defined in the AMS and manufacturer's identification). Other reports, such as the final acceptance test report and the packaging extension test report, shall be supplied upon request.

For the initial acceptance tests for batches of materials produced with source inspection, reports shall be stamped by the third-party source inspector (Nadcap). The source inspection stamp is not required for subsequent test reports.

4.6 Resampling and Retesting

If any specimen used in the tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented.