AEROSPACE MATERIAL SPECIFICATION

AMS3381™	REV. B
Issued 2014-05 Revised 2020-10 Superseding AMS3381A	

Sealing Compound, Flame Resistant, Non-Silicone

RATIONALE

Revise specification deleting requirement for AS5127/2 flame tolerant testing. Update specification requirements for sealant flame resistant testing that include application, panel preparation, burner equipment and calibration, test procedures, and test reporting.

1. SCOPE

1.1 Form

This specification covers non-silicone synthetic rubber sealing compounds supplied as a two-component system that cures at room temperature.

1.2 Application

These products are used primarily for sealing aircraft structures against passage of air, vapors, and flames, but usage is not limited to such applications. The sealing compounds are effective at all temperatures from -65 to 400 °F (-54 to 204 °C) and can withstand flash temperatures of up to 2000 °F (1093 °C). Sealants qualified to this specification are defined as flame resistant and can prevent flame penetration from incidental exposure to smaller fires. Users should evaluate their specific flame-resistant requirements prior to specifying any sealing compound. The ultimate determination of acceptability should be based on the ability of the sealant to withstand exposure to the flame without resulting in a condition that will further increase hazard to the aircraft. If it is intended to use these products for aircraft firewall structures, users are advised to evaluate their design to the applicable FAR requirements of FAA AC 20-135.

1.3 Classification

None.

1.4 Safety - Hazardous Materials

Shall be in accordance with AS5502 (1.1).

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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 examption 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.

AMS2629	Fluid, Jet Reference
AMS3021	Fluid, Reference for Testing Di-Ester (Polyol) Resistant Material
AMS4462	Aluminum Alloy, Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024, -T3 Sheet, -T351 Plate), Solution Heat Treated, Cold Worked and Naturally Aged
AMS4911	Titanium Alloy, Sheet, Strip, and Plate, 6Al-4V, Annealed
AMS5517	Steel, Corrosion Resistant, Sheet and Strip, 18Cr-8Ni (301), Cold Rolled, 125 ksi (862 MPa) Tensile Strength
AS1241	Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft
AS5127	Aerospace Standard Test Methods for Aerospace Sealants, Methods for Preparing Aerospace Sealant Test Specimens
AS5127/1	Aerospace Standard Test Methods for Aerospace Sealants, Two-Component Synthetic Rubber Compounds
AS5502	Standard Requirements for Aerospace Sealants and Adhesion Promoters

2.2 PRI Publications

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

PD2103	Aerospace Quality Assurance, Product Standards, Qualification Procedure, Sealants
PRI-QPL-AMS3381	Products Qualified under AMS3381

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257. For FAA documents, go to www.faa.gov.

FAA AC 20-135	Powerplant Installation and Propulsion System Component Fire Protection Test Methods, Standards and Criteria

3. TECHNICAL REQUIREMENTS

3.1 Materials

The basic ingredients shall not contain silicone compounds. The base compound and curing agent shall possess enough color contrast to permit easy identification of an unmixed or incompletely mixed sealing compound. Neither the base compound nor the cured sealant shall be red or pink in color.

3.2 Date of Packaging

Shall be in accordance with AS5502 (3.1).

3.3 Toxicological Formulations

Shall be in accordance with AS5502 (3.2).

3.4 Quality

Shall be in accordance with AS5502 (3.3).

3.5 Shelf Life

Shelf life of sealing compounds shall be a minimum of 12 months from date of packaging when stored below 80 °F (27 °C).

3.6 Properties

Shall conform to the following requirements and test methods shown in Table 1.

Table 1 - Properties

	Property	Requirement	Test Procedures (Paragraph)
3.6.1	Nonvolatile content (% by weight), min	65%	AS5127/1 (5.1)
3.6.2	Flow, max	1.5 inches (38 mm)	AS5127/1 (5.5.1)
3.6.3	Application time, min, not less than 15 g/min shall be extruded	1.5 hours	AS5127/1 (5.6.2)
3.6.4	Tack-free time, hours, max	24 hours	AS5127/1 (5.8)
3.6.5	Specific gravity, max	1.5	AS5127/1 (6.1)
3.6.6	Curing - time to achieve 30 Scale A durometer hardness, max	48 hours	AS5127/1 (5.9)
3.6.7	Resistance to thermal rupture, max deformation		AS5127/1 (7.2)[1]
3.6.7.1	Oven air aging at 400 °F ± 10 °F (204 °C ± 5 °C), 5 psi ± 0.5 psi (34 kPa), 15 minutes	0.125 inch (3.2 mm) No blistering or sponging	
3.6.7.2	Room temp test of 2000 °F flame-tested panel, max deformation	0.125 inch (3.2 mm)	
3.6.8	Low temperature flexibility	No cracking, checking, or loss of adhesion	AS5127/1 (7.6.1)[1]
3.6.9	Oil resistance	No loss of adhesion, softening, blistering or reversion	AMS3381 (4.5.1)
3.6.10	Corrosion resistance	No loss of adhesion, softening, blistering or leaching of the sealing compound or corrosion of the panel under the sealant	AMS3381 (4.5.2)

	Property	Requirement	Test Procedures (Paragraph)
3.6.11	Flame resistant	Sealing compound shall not burn through to panel and shall not continue to burn after a flame exposure of 15 minutes	AMS3381 (4.5.3)
3.6.12	Peel strength, min	10 lbf/in (1750 N/m) 100% cohesive failure	AS5127/1 (8.1)[2]
3.6.13	Repairability	Adhere, shall meet 3.6.12 requirement	AS5127/1 (8.2)[3]
3.6.14	Storage stability		
3.6.14.1	Accelerated storage		AS5127/1 (9.1)[4]
	Flow	Same as 3.6.2	
	Application time	Same as 3.6.3	
	Tack-free time	Same as 3.6.4	
	Curing	Same as 3.6.6	
3.6.14.2	Long term storage		AS5127/1 (9.2)
	Application time	Same as 3.6.3	
	Tack-free time	Same as 3.6.4	
	Curing	Same as 3.6.6	

[1] Test control specimens only, no AMS2629 exposure requirement.
[2] Test using two each AMS4462 aluminum alloy anodized per AS5127 (6.3), AMS4911 titanium alloy, and AMS5517 stainless steel panels only. Test control specimens and specimens aged in air at 400 °F ± 10 °F (204 °C ± 5 °C) for 72 hours ± 1 hour.
[3] Omit AMS2629 fluid soak from panel preparation.
[4] Use AS5127/1 (9.1) for sealing compound material conditioning only.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Shall be in accordance with AS5502 (4.1).

4.1.1 Source Inspection

Shall be in accordance with AS5502 (4.1.1).

4.2 Classification of Tests

Shall be in accordance with AS5502 (4.2).

4.2.1 Qualification Tests

Shall be in accordance with AS5502 (4.2.1). Any changes in ingredients and/or processing of an adhesion promoter used to qualify sealing compounds shall require retesting of all technical requirements in Table 1 which rely on the use of an adhesion promoter for qualification (low temperature flexibility [3.6.8], oil resistance [3.6.9], corrosion resistance [3.6.10], peel strength [3.6.12], and repairability [3.6.13]).

4.2.2 Acceptance Tests

4.2.2.1 Initial Acceptance Tests

Requirements shown in Table 2 are initial acceptance tests and shall be performed in accordance with AS5502 (4.2.2.1).

Table 2 - Initial acceptance tests

Test	Requirement Paragraph
Nonvolatile content	3.6.1
Flow	3.6.2
Application time	3.6.3
Tack-free time	3.6.4
Curing	3.6.6
Peel strength[1]	3.6.12

[1] Test only using AMS4462 aluminum alloy substrate anodized per AS5127 (6.3).

4.2.2.2 Final Acceptance Tests

Requirements shown in Table 3 are final acceptance tests and shall be performed in accordance with AS5502 (4.2.2.2).

Table 3 - Final acceptance tests

Test	Requirement Paragraph
Flow	3.6.2
Application time	3.6.3
Tack-free time	3.6.4
Curing	3.6.6

4.3 Sampling and Testing

Shall be in accordance with AS5502 (4.3).

4.3.1 For Qualification Tests

Samples shall consist of six containers of sealing compound. Purchaser and manufacturer shall agree upon the container size. Samples shall be identified as:

SEALING COMPOUND, AIRCRAFT FIREWALL, NON-SILICONE
AMS3381B
Manufacturer's Identification _____
Name of Manufacturer _____
Batch/Lot Number _____
Date of Packaging _____
Shelf Life Expiration Date _____
Store below 80 °F (27 °C)

4.3.2 Acceptance Tests

Shall be in accordance with AS5502 (4.3.1).

4.3.2.1 Batch and Lot

Shall be in accordance with AS5502 (4.3.1.1).

4.3.2.2 Initial and Final Acceptance Tests

Shall be in accordance with AS5502 (4.3.1.2).

4.3.2.3 Final Acceptance Test Option

Shall be in accordance with AS5502 (4.3.1.3).

4.3.3 Shelf-Life Surveillance and Updating

4.3.3.1 Sampling

An inspection lot shall consist of items produced by a single manufacturer and bearing the same lot or batch identification number. The minimum number of samples to be tested from each inspection shall be in accordance with AS5502 (4.1.2).

4.4 Test Methods

4.4.1 Standard Tolerances

Unless otherwise specified herein, standard tolerances of AS5127 (Section 3) shall apply.

4.4.2 Standard Conditions

Standard laboratory conditions shall be as specified in AS5127 (Section 4).

4.4.3 Preparation of Test Specimens

Test specimens shall be prepared in accordance with AS5127 (Section 6) unless otherwise specified herein.

4.4.3.1 Cleaning of Test Panels

Test panels shall be cleaned in accordance with AS5127 (Section 6).

4.4.3.2 Preparation of Peel Strength Test Panels

Test panel configuration shall be in accordance with AS5127/1 (Section 8 and 8.1) and as in Figure 22.

4.4.4 Application of Adhesion Promoter

When required by the sealant manufacturer, apply the recommended adhesion promoter in accordance with AS5127 (6.9). Any adhesion promoter used for qualification must be documented and will be included on any qualification approval documentation.

4.4.5 Application of Sealing Compound

Unless otherwise specified herein, freshly mixed or opened sealing compound shall be applied to test panels in accordance with AS5127 (6.10).

4.4.6 Curing of Sealing Compound

Shall be in accordance with AS5127 (6.11). The sealing compound shall be cured at standard conditions for 14 days for qualification and preproduction testing. An accelerated cure of 24 hours at standard conditions (4.4.2) plus 4 hours at 120 °F (49 °C) may be used for acceptance testing.

4.5 Test Procedures

Standard test methods are in accordance with AS5127 and AS5127/1. In the event of a conflict between the text of this document and any of the aforementioned documents, the text of this document takes precedence.

4.5.1 Oil Resistance

Prepare two 0.040 x 2.75 x 6 inch (1.0 x 69.8 x 152 mm) panels of AMS4462 aluminum alloy anodized per AS5127 (6.3). Apply two 0.188 x 0.75 x 5 inch (4.77 x 19 x 127 mm) parallel strips of sealing compound; each strip shall extend to within 0.5 inch (12.7 mm) of the edge of the panel. After cure of sealing compound, immerse panels vertically in AMS3021 fluid at 140 °F (60 °C) for 72 hours. Examine sealing compound to requirements of Table 1 (3.6.9).

4.5.2 Corrosion Resistance

Perform in accordance with AS5127/1 (7.9), except substitute a 3% NaCl in distilled water solution for the AMS2629 Type 1/3% NaCl conditioning fluid solution and cured test fillet shall be 0.062 +0.003/-0.000 inch (1.57 +0.07/-0.00 mm) thick. Note: Use of an adhesion promoter is allowed only if recognized within this document and included in the qualification test report.

4.5.3 Flame Resistant

4.5.3.1 Test Panel Preparation

Prepare two 0.040 x 2.875 x 6.0 inch (1.0 x 73 x 152 mm) panels of AMS5517 stainless steel. Apply a 0.125 inch (3.17 mm) thick coating of sealing compound over the entire panel on one side unless sealant manufacturer recommends an alternate coating thickness. Cure sealing compound in accordance with 4.4.6.

4.5.3.2 Test Burner

A standard laboratory Bunsen burner shall be used. The burner used shall be capable of delivering a flame temperature of 2000 °F ± 100 °F (1093 °C ± 38 °C).

4.5.3.3 Burner Fuel

Natural gas, methane, or propane shall be used.

4.5.3.4 Thermocouple

A Chromel-Alumel (Type K) nominal 22 to 30 AWG conductor thermocouple shall be provided.

4.5.3.5 Test Stand

A test stand shall be provided to maintain the position of the thermocouple and test specimen. The test stand shall also include a provision for positioning the thermocouple with the junction centered on the burner. Suitable test setup is shown in Figure 1.

4.5.3.6 Timer

A stop watch or other device, calibrated and graduated to the nearest 1 second, shall be used to measure the time of application of the burner flame.

4.5.3.7 Calibration Procedure

4.5.3.7.1 Place the thermocouple on the test stand above the centerline of the burner, approximately 1 inch (25 mm) from the burner tip. Connect the thermocouple to a suitable recording device.

4.5.3.7.2 Light the burner, allow a 5 minute warm up, and move the burner into calibration position.

4.5.3.7.3 Begin monitoring the temperatures indicated by the thermocouple after 2 minutes. Adjust as necessary to the air flow to the burner in order to achieve a thermocouple reading of 2000 °F ± 100 °F (1093 °C ± 38 °C).

4.5.3.7.4 Move the burner out of calibration without turning the flame off and remove the thermocouple.

4.5.3.8 Test Procedure

4.5.3.8.1 Place the test panel in position at the same distance from the burner the thermocouple was placed during calibration.

4.5.3.8.2 Move the burner into test position.

4.5.3.8.3 Start the timer when the burner flame is positioned with the test panel. The critical area of the test panel shall be over the center of the burner flame.

4.5.3.8.4 Terminate the test by moving the burner flame out of test position after 15 minutes ± 10 seconds.

4.5.3.8.5 Note the condition of both faces of the test panel.

4.5.3.8.6 Without adjusting the burner flame, repeat the temperature measurement described in 4.5.3.7.1 through 4.5.3.7.3. If the temperature has decreased by more than 150 °F (65 °C), readjust the burner and repeat the test. If the temperature has increased by more than 150 °F (65 °C), note the temperature reading on the test report.

4.5.4 Flame Resistant Reporting

4.5.4.1 Record the following information for each panel evaluated.

4.5.4.2 Full identification of sealant being tested, and any conditioning performed.

4.5.4.3 Include the average flame temperature data for pre-test calibration, and the average temperature for post-test calibration.

4.5.4.4 Report the exposure time, and whether the material is flame resistant.

4.5.4.5 Describe the condition of both the flame side and the non-flame side of the test panel after test.

4.5.4.6 Report “Pass” or “Fail”

The following criteria will be used for judging the acceptability of the sealant. These criteria are not necessarily all inclusive; other criteria may be required by the approving agency or documents which reference this test method specification.

4.5.4.6.1 The sealing compound shall not burn through to the panel and shall extinguish itself within 20 seconds after a flame exposure of 15 minutes.

4.5.4.6.2 Burning on the backside of the panel is not acceptable. Significant burning on the side of the flame impingement shall be investigated to determine if a potential increase in hazard exists. Minor flashing on the side of flame impingement is acceptable.

4.6 Approval

Shall be in accordance with AS5502 (4.4).

4.7 Reports

Shall be in accordance with AS5502 (4.5).

4.8 Resampling and Retesting

Shall be in accordance with AS5502 (4.6).

4.9 Qualification

Shall be in accordance with AS5502 (4.7). All products sold to this specification shall be listed, or approved for listing on the Qualified Products List, PRI-QPL-AMS3381.

5. PREPARATION FOR DELIVERY

Shall be in accordance with AS5502 (Section 5).