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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-S-83318

Issued MAY 1999

Submitted for recognition as an American National Standard

Sealing Compound, Polysulfide Type, Low Temperature Curing, Quick Repair, Integral Fuel Tanks and Fuel Cell Cavities

FOREWORD

This document is based on MIL-S-83318A (USAF).

1. SCOPE:

1.1 Form:

This specification covers two-component polysulfide sealing compounds, temperature resistant, for use from -65 to +250 °F (-54 to 121 °C), low temperature curing from 20 °F (-13 °C) minimum, for quick repair of integral fuel tanks and fuel cell cavities. During application, the sealing compound shall exhibit suitable, fluid consistency.

1.2 Application:

The sealing compound has been used typically for quick repair of fuel tank sealing and cabin pressure sealing, but usage is not limited to such applications. It cures at room temperature and below room temperature as low as 20 °F (-13 °C). Lower temperature cures require extended periods of time. AMS 3100 adhesion promoter can be applied prior to application of the sealant.

1.3 Classification:

Sealing compounds covered by this specification are classified by method of application and application times as follows:

Class A - Suitable for brush application
Class B - Suitable for application by extrusion gun and spatula

1.3.1 Dash Numbers: The following dash numbers shall be used to designate the minimum application time in hours:

Class A - Dash number shall be 1/6
Class B - Dash number shall be 1/6

The sealing compound shall be thus identified as either A-1/6 or B-1/6.

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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 following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. Unless otherwise specified, the applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2471	Anodic Treatment of Aluminum Alloys, Sulfuric Acid Process, Undyed Coating
AMS 2629	Fluid, Jet Reference
AMS 3100/3	Adhesion Promoter for Polysulfide Sealing Compounds, Water Based
AMS 4045	Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075; -T6 Sheet/-T651 Plate), Solution and Precipitation Heat Treated
AMS 4901	Titanium, Sheet, Strip and Plate, Annealed, 70,000 psi (485 MPa) Yield Strength
AMS 5516	Steel, Corrosion Resistant, Sheet, Strip, and Plate, 18Cr - 9.0Ni, Solution Heat Treated
AMS-S-8802	Sealing Compound, Temperature Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion
AS5127	Methods for Testing Aerospace Sealants (May, 1997. See 4.5.3.1)
AS5127/1	Methods for Testing Aerospace Sealants, Two-Component Synthetic Rubber Compounds (May, 1997. See 4.5.3.1)
AS7001	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Program Description
AS7002	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Rules for Implementation
AS7003	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Program Operation
AS7200/1	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Audit and Inspection Procedures and Checklists for the Sealant Manufacturers Accreditation Program
AS7201	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Accreditation of Pass-Thru Distributors
AS7202	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Accreditation of Value Added Distributors
PD 2000	Procedures for an Industry Qualified Product Management Process

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-C-27725 Coating, Corrosion Preventive, for Aircraft Integral Fuel Tanks
MIL-S-38714 Sealant Cartridge for Two Component Materials
MIL-C-81706 Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys

3. TECHNICAL REQUIREMENTS:

3.1 Materials:

The basic ingredient used in the manufacture of these products shall be synthetic rubber of the polysulfide (T) type. The sealing compound shall cure by the addition of a curing agent to the base compound, and shall not depend on solvent evaporation for curing. The material shall contain no lead compounds. The curing agent shall possess sufficient color contrast to the base compound 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 Properties:

The sealing compound and the curing agent shall conform to the requirements shown in Table 1 when tested to the specified test methods.

3.3 Performance and Application Requirements:

Performance requirements define those properties of the cured sealant related to performance in service. Application requirements define those properties of the uncured sealant which affect the application parameters of the sealant, but have little or no effect on performance properties of the cured sealant. Minor variations in the Application requirements during quality conformance inspection such as receiving inspection tests, may not be cause for rejection if approved by the purchaser. Application requirements are listed below; all other properties are Performance requirements.

a. Viscosity of Base Compound
b. Flow
c. Application Time
d. Tack-Free Time
e. Cure Time
f. Fluid Immersion Cure Time

TABLE 1 - Properties

Paragraph	Property	Requirement	AS5127/1 Standard Test Method (paragraph)
3.3.1	Specific Gravity, max	1.65	(6.1)
3.3.2	Nonvolatile Content, by weight, min		(5.1)
	Class A	87%	
	Class B	92%	
3.3.3	Viscosity of Base Compound		(5.3)
	Class A	1000 to 4000 poises (100 to 400 Pa·S)	Use No. 6 spindle at 10 RPM
	Class B	8000 to 14000 poises (800 to 1400 Pa·S)	Use No. 7 spindle at 2 RPM
3.3.4	Flow		(5.5.1)
	(Class B only)	0.1 to 0.75 inch (2.5 to 19.1 mm)	
3.3.5	Application Time		
	Class A	100 grams per minute, min	(5.6.2)
	(Use Class B test method)		
	Class B	15 grams per minute, min	(5.6.2)
3.3.6	Tack-free Time (Measured from the beginning of mixing) Max		(5.8)
	at 77 °F (25 °C)	3 hours	
	at 40 °F (4 °C)	12 hours	
	at 20 °F (-7 °C)	48 hours	
3.3.7	Standard Cure Time, Max (30 Durometer A, min)		(5.9)
	at 77 °F (25 °C)	8 hours	
	at 40 °F (4 °C)	24 hours	
	at 20 °F (-7 °C)	96 hours	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	AS5127/1 Standard Test Method (paragraph)
3.3.8	Fluid Immersion Cure Time, min		(5.11)
	After 6 hours	25 Durometer A	
	After 24 hours	35 Durometer A	
3.3.9	Peel Strength, min /100% cohesive failure		(8.1) and Table 4
	After 7 day exposure	10 lbf/inch (3580 N/m)	
	After 70 day exposure	5 lbf/inch (3580 N/m)	
3.3.9.1	Repairability, min /100% cohesive failure	10 lbf/inch (1750 N/m)	(8.2) on itself and AMS-S-8802
3.3.10	Chalking, max Use AMS 2629 Type II JRF	Slight chalking	(7.1)
3.3.11	Air Content, (Class B only), max	4%	(5.2)
3.3.12	Weight Loss and Flexibility		(7.4)
3.3.12.1	Weight Loss, max	8%	
3.3.12.2	Flexibility	No cracking	
3.3.13	Fluid Rupture Resistance	No rupture	(7.3)
3.3.14	Tensile Strength and Elongation, min		(7.7)
3.3.14.1	Standard Cure	200 psi (1380 kPa), 150% elong.	
3.3.14.2	After 14 days immersion in AMS 2629, Type I JRF at 140 °F (60 °C)	180 psi (1240 kPa), 100% elong.	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	AS5127/1 Standard Test Method (paragraph)
3.3.14.3	After 7 days in air at 250 °F ± 5 (121 °C ± 3)	300 psi (2070 kPa), 50% elong.	
3.3.15	Low Temperature Flexibility	No visual evidence of cracking or checking. No loss of adhesion	(7.6)
3.3.16	Hydrolytic Stability, min	30 Durometer A	(6.6)
3.3.17	Corrosion	No signs of corrosion or deterioration	(7.9)
3.3.18	Storage Stability		
3.3.18.1	Accelerated Storage		(9.1)
	Appearance	No skinning, hardening or separation that cannot be restored by normal agitation	
	Application Time	Same as 3.3.5	
	Tack-Free Time	Same as 3.3.6	
	Standard Cure Time	Same as 3.3.7	
	Peel Strength	Same as 3.3.9	
3.3.18.2	Long-Term Storage (6 months)		(9.2)
	Appearance	No skinning, hardening or separation that cannot be restored by normal agitation	
	Application Time	Same as 3.3.5	
	Tack-Free Time	Same as 3.3.6	
	Standard Cure Time	Same as 3.3.7	
	Peel Strength	Same as 3.3.9	

3.4 Quality:

The sealing compound and the curing agent (accelerator), as received by purchaser, shall be of uniform blend, and shall be free of excessive air, skins, lumps, and gelled or coarse particles. There shall be no separation of ingredients that cannot be readily dispersed.

3.5 Shelf Life:

Material shall be capable of meeting all the requirements of this specification after storage in original unopened package at 80 °F or lower after 6 months from date of packaging.

3.5.1 Date of Packaging is defined as the date finished material is assembled from its components, base compound and curing agent, into a package and labeled kit or unit by the manufacturer or repackager. Date of Packaging shall be no more than 90 days from the last day of full quality conformance testing in accordance with 4.3.3. Material may be retested by the manufacturer at any time to determine conformance to full acceptance testing in accordance with 4.3.3.

3.6 Qualification:

All products sold to this specification shall be listed, or approved for listing, or the qualified products list, PRI QPL AMS XXXX. The qualified products list shall be in accordance with PD 2000.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the sealing compound shall supply all samples and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the sealing compound conforms to the requirements of this specification.

4.1.1 Source Inspection: Material procured under this specification shall be third party approved prior to shipment, to ensure that material meets acceptance tests (4.3.3). Third party approval shall be by a third party accreditation process in accordance with AS7001, AS7002, AS7003, and AS7200/1. Sealant shall be from a manufacturer that currently holds a third party accreditation and shall be from a batch of material that has been third party source inspected in accordance with AS7200/1. Distributors supplying sealant shall supply material from an accredited manufacturer and from a batch of material that has been third party source inspected. Distributors shall also be third party accredited in accordance with AS7201 or AS7202, whichever is applicable.

NOTE—4.4.2 requires the sample for quality conformance tests be packaged and mixed as much as practical in the same containers that are being procured.

4.1.2 Shelf Life Surveillance and Updating:

4.1.2.1 Sampling: The minimum number of samples to be tested during shelf-life surveillance and updating is shown in Table 2.

TABLE 2 - Sampling

Items in Stock	Samples to be Tested
Up to 100, excl	3
100 to 500, incl	5
Over 500	7

4.1.2.2 Testing: The following inspections are to be conducted for shelf-life surveillance and updating:

a. Appearance
b. Application Time (3.2.5)
c. Tack-Free Time (3.2.6)
d. Standard Cure Time (3.2.7)
e. Peel Strength - two aluminum panels coated with MIL-C-27725 Type II Class B corrosion preventive coating (See 8.6), age in AMS 2629, Type I JRF for seven days at 140 °F (60 °C) (3.2.9).

4.1.2.2.1 Tests are to be conducted in accordance with test methods outlined in this specification for acceptance tests. If the tests are being performed at the end of the stated shelf-life to update the shelf life of the sealing compound, and all tests are passed, the shelf life will be extended an additional three months. Up to three extensions will be allowed.

4.2 Classification of Tests:

4.2.1 Qualification Tests: All technical requirements are qualification tests (See 8.2) and shall be performed prior to the initial shipment of sealing compound 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.

4.2.2 Qualification Test Samples: Unless otherwise specified, qualification test samples shall consist of three 1 quart or 1 liter kits and 20 sectional type (MIL-S-38714) containers. Samples shall be identified as follows:

Samples for qualification tests:

SEALING COMPOUND, POLYSULFIDE TYPE, LOW TEMPERATURE CURING, INTEGRAL FUEL TANKS AND FUEL CELL CAVITIES
Class and Dash Number
AMS XXXX
Manufacturer's Code Number
Name of Manufacturer
Lot Number
Date of Packaging

Submitted by (name) (date) for qualification tests in accordance with AMS XXXX under authorization (reference authorizing letter)
Mixing instructions

4.3 Acceptance Tests:

4.3.1 Batch and Lot: A batch shall be defined as 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 assembled (packaged) as finished product in one size and/or type of container at the same time. The lot, when used, shall be traceable to the batches of base compound and curing agent.

4.3.2 Sampling for Acceptance Tests: Each lot shall be tested as specified in 4.3.3. Samples shall be selected from the materials which are packaged in sectional-type containers conforming to MIL-S-38714. A sufficient number of containers shall be selected from each lot in order to conduct all the tests specified.

4.3.3 Acceptance tests shall consist of the following tests:

a. Flow (Class B only) (3.3.4)
b. Application Time (3.3.5)
c. Tack-Free Time (3.3.6)
d. Standard Cure Time (3.3.7)
e. Fluid Immersion Cure Time (3.3.8)
f. Peel Strength - 4 aluminum panels, AMS 4045, coated with MIL-C-27725 Type II Class B corrosion preventive coating (See 8.6), age in AMS 2629, Type I JRF for seven days at 140 °F (60 °C) (3.3.9)
g. Chalking (3.3.10)[1]
h. Air Content (Class B only) (3.3.11)

1. In lieu of the 14 day cure specified, specimens shall be subjected to an accelerated cure of 48 hours at 77 °F (25 °C) and 50 percent relative humidity followed by 24 hours at 140 °F (60 °C).

4.4 Approval:

4.4.1 Sealing compound supplied to this specification shall be listed, or approved for listing, on the qualified products list, PRI QPL AMS-S-83318.

4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the qualified sample. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer 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.

4.5 Test Methods:

4.5.1 Standard Conditions: Standard laboratory conditions shall be 77 °F ± 2 (25 °C ± 1) and 50% ± 5 relative humidity. Except as otherwise specified herein, all test specimens shall be cured under these conditions. Test specimens shall be prepared at 77 °F ± 5 (25 °C ± 3) and immediately upon completion of preparation, shall be placed into standard conditions for cure. Except as otherwise specified herein, tests shall be performed at 77 °F ± 5 (25 °C ± 3).

4.5.1.1 Standard Tolerances: Unless otherwise specified herein, standard tolerances of AS5127 under (3.1) “Standard Tolerances” shall apply.

4.5.2 Preparation of Test Specimens: Test panel configuration shall be in accordance with AS5127/1 under (8.) “Peel Strength Properties” and (8.1) “Peel Strength Testing” and as in figures for either (Figure 23) “Four-Inch Peel Specimen Configuration” or (Figure 22) “Five-Inch Peel Specimen Configuration”.

4.5.2.1 Cleaning of Test Panels: Test panels shall be cleaned in accordance with Table 3 and methods in accordance with AS5127.

NOTE—When organic coatings are specified for the test panels, the coatings shall be fully cured as defined by the applicable coating specification before cleaning. The applied coatings shall be at least 14 days old and a maximum of 6 months old stored at ambient indoor temperatures.

TABLE 3 - Cleaning of Test Panels

Panel Material	Cleaning Method, AS5127 (paragraph)
Aluminum alloy, chemical conversion coating test surface	(6.1) “Chemical Conversion Coating Application”, including subparagraphs: (6.1.1) “Preparation of Aluminum Panel Test Surfaces” (6.1.2) “Chemical Conversion Coating” (6.1.2.1) “Panel Preparation” (6.1.2.2) “Coating Application (Immersion)”
Aluminum alloy, sulfuric acid anodized	(6.1.1) “Preparation of Aluminum Panel Test Surfaces”
AMS 5516 Stainless steel	(6.3) “Preparation of AMS 5516 Stainless Steel Panel Test Surfaces”
AMS 4901 Titanium alloy	(6.4) “Preparation of AMS 4901 Titanium Panel Test Surfaces”
Aluminum alloy, MIL-C-27725 Type II Class B (See 8.6) test surface	(6.2.1.1) “Cleaning of MIL-C-27725 Surface for Sealing”

4.5.2.2 Curing of Sealing Compound: Shall be tested in accordance with AS5127 under (6.9) “Curing of the Sealing Compounds”. For qualification testing, the sealing compound shall be cured for 14 days at Standard Conditions. For Acceptance testing, the sealing compound shall be given an accelerated cure for 48 hours minimum at Standard Conditions followed by 24 hours at 140 °F (60 °C).

4.5.3 Standard Test Methods: Standard Test Methods are in accordance with AS5127/1. In the event of a conflict between the text of this document and AS5127 and/or AS5127/1, the text of this document takes precedence.

4.5.3.1 Future Revisions of AS5127 and AS5127/1: Use of a specific issue of AS5127 and of AS5127/1 is for clarity. Future revisions of AS5127 and AS5127/1, when published, may be used providing test methods correspond in kind to those of the issues listed in 2.1.

NOTE—Tests on the cured sealing compound shall commence not more than 48 hours after the completion of the specified cure.

TABLE 4 - Peel Strength Panels

Quantity Required	Panel Thickness Inch (mm)	Panel Material	Immersion Media at 140 °F (60 °C)
4	0.040 (1.02)	Al alloy AMS 4045, chemical conversion coating per MIL-C-81706, Class 1A, Form II, Method C	2 panels into AMS 2629, Type I JRF for 7 days 2 panels into AMS 2629, Type I JRF/salt water for 7 days
4	0.040 (1.02)	Al alloy AMS 4045, -T6, sulfuric acid anodized per AMS 2471	2 panels into AMS 2629, Type I JRF for 7 days 2 panels into AMS 2629, Type I JRF/salt water for 7 days
4	0.025-0.040 (0.64-1.02)	AMS 4901 Titanium alloy	2 panels into AMS 2629, Type I JRF for 7 days 2 panels into AMS 2629, Type I JRF/salt water for 7 days
6	0.040 (1.02)	Al alloy AMS 4045 sulfuric acid anodized per AMS 2471, 0.001 inch (0.025 mm) overcoat of MIL-C-27725 Type II Class B (See 8.6). Apply the manufacturer's primer.	2 panels into AMS 2629, Type I JRF for 7 days 2 panels into equal parts AMS 2629, Type I JRF and salt water for 7 days 2 panels into AMS 2629, Type I JRF for 70 days with fluid change every 14 days

4.6 Reports:

The supplier of sealing compound shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, batch or lot number, AMS XXXX, and manufacturer's identification. Test reports shall be stamped by the third party source inspection.

4.7 Resampling and Retesting:

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