AEROSPACE MATERIAL SPECIFICATION

AMS3100	REV. D

Issued 1986-07
Reaffirmed 2000-08
Revised 2013-11

Superseding AMS3100C

Adhesion Promoter
For Polysulfide Sealing Compounds

RATIONALE

AMS3100D primarily clarifies the VOC content and the composition control requirements, and corrects an error in Table 4.

1. SCOPE

This specification covers adhesion promoters in liquid form for use with aerospace sealing compounds.

1.1 Application

This product has been typically used to enhance the adhesion of polysulfide sealing compounds or adhesives to AMS-C-27725 integral fuel tank coating, MIL-PRF-23377 epoxy primer, MIL-PRF-85582 waterborne primer, and bare titanium alloy substrates, but usage is not limited to such applications. Care should be exercised around plastic substrates (e.g. polycarbonates, acrylics) as the formulary solvents may tend to craze these surfaces.

1.2 Precautions

AMS3100 Class 2 may contain halogenated solvents that could cause stress-corrosion cracking when used on titanium alloys which will be subjected to temperatures above 450 °F (232 °C) or on high strength steels. Users of this specification should be attentive to reference the appropriate class of promoter for their specific applications.

1.3 Safety - Hazardous Materials

Shall be in accordance with AS5502 (1.1).

1.4 Classification

Adhesion promoters shall be classified by formulary ingredient(s) and volatile organic compound (VOC) content as follows (See 8.4):

Class 1 - Nonhalogenated organic solvent(s)
Class 2 - Nonrestricted organic solvent(s)
Class 3 - Water-based composition
Type 1 – Standard VOC content (greater than 250 g/l)
Type 2 – Low VOC content (250 g/l or less)

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
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SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS3100D

2. APPLICABLE DOCUMENTS

Shall be in accordance with AS5502 (2.).

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.

AMS2473	Chemical Treatment for Aluminum Alloys, General Purpose Coating
AMS2629	Fluid, Jet Reference
AMS2825	Material Safety Data Sheets
AMS3276	Sealing Compound, Integral Fuel Tanks andGeneral Purpose, Intermittent Use to 360 °F (182 °C)
AMS4045	Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, 7075: (-T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
AMS4911	Titanium Alloy, Sheet, Strip, and Plate, 6A1 - 4V, Annealed
AMS-C-27725	Coating, Corrosion Preventive, for Aircraft Integral Fuel Tanks, for Use to 250 °F (121 °C)
AMS-S-8802	Sealing Compound, Temperature Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion
AMS-QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
AS5127	Methods For Testing Aerospace Sealants
AS5127/1	Methods For Testing Aerospace Sealants, Two-Component Synthetic Rubber Compounds
AS5502	Standard Requirements for Aerospace Sealants

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 D1193	Reagent Water
ASTM D3960	Volatile Organic Compound (VOC) Content of Paint and Related Coatings

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

MIL-PRF-5425	Plastic, Sheet, Acrylic, Heat Resistant
MIL-PRF-23377	Primer Coatings: Epoxy, High-Solids
MIL-PRF-85582	Primer Coatings: Epoxy, Waterborne

2.4 PRI Publications

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

PD2000 Procedures for an Industry Qualified Product Management Process

PD2001 Manufacturer Request for Product Approval and Qualification Process

PD2103 Aerospace Quality Assurance, Product Standards, Qualification Procedure, Sealants

PRI-QPL-AMS3100 Products Qualified Under AMS3100

3. TECHNICAL REQUIREMENTS

3.1 Material

Class 1 - The adhesion promoter composition shall contain no halogenated compounds. It shall be tinted, imparting a stain on the substrate. (See 4.5.4)

Class 2 - The adhesion promoter composition has no restrictions in regards to halogenated compounds. The manufacturer shall identify any halogenated compounds contained in Class 2 promoters. It shall be tinted, imparting a stain on the substrate. (See 4.5.4)

Class 3 - The adhesion promoter composition shall be primarily distilled water, with minor nonhalogenated solvent additions allowed (less than 5% by volume). It shall be tinted, imparting a stain on the substrate. (See 4.5.4)

3.2 VOC Content

The adhesion promoter VOC content shall meet the limits specified by Type classification per 1.4. (See 4.5.10)

3.3 Composition Control

A Fourier transform infrared spectroscopy (FT-IR) analysis shall be conducted on the adhesion promoter at the time of qualification testing. (See 4.5.11) This spectrum shall be retained by the supplier for the purpose of qualitative comparison should the composition of subsequent batches be called into question.

3.4 Quality and Appearance

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

3.5 Shelf Life

The adhesion promoter shall have a minimum shelf life of 6 months from the date of manufacture. Promoter may be retested for shelf life extension per 4.3.3.

3.6 Properties

The adhesion promoter shall conform to requirements of, and determined in accordance with, test procedures specified in Table 1.

TABLE 1 - PROPERTIES

Property	Requirement	Test Procedures (Paragraph)
Peel Strength	See Table 2	4.5.5
Long-Term Storage Stability	See Table 4	4.5.7
Short-Term Storage Stability	See Table 4	4.5.8
Aging After Application	See Table 4	4.5.9

TABLE 2 - PEEL STRENGTH REQUIREMENTS

Applicable Class	Panel Material and Preparation (5)	Adhesion Promoter Applied	Immersion Medium (6)	Minimum Peel Strength, Pounds Force/Inch	Minimum Peel Strength, N/m	Cohesive Failure, %
1, 2, 3	4.5.3.1.5	Yes	None	20	3500	100
1, 2	4.5.3.1.3	Yes	None	20	3500	100
3	4.5.3.1.2	Yes	None	20	3500	100
1, 2, 3	4.5.3.1.5	Yes	(1)	20	3500	100
1, 2, 3	4.5.3.1.4	Yes	(1)	20	3500	100
1, 3	4.5.3.1.2	Yes	(1)	20	3500	100
1, 2, 3	4.5.3.1.5	Yes	(2)	20	3500	100
1, 2, 3	4.5.3.1.4	Yes	(2)	20	3500	100
1, 3	4.5.3.1.2	Yes	(2)	20	3500	100
1, 2, 3	4.5.3.1.6	Yes	(3)	20	3500	100
1, 2, 3	4.5.3.1.7	Yes	(3)	20	3500	100
1, 2, 3	4.5.3.1.6	Yes	(4)	20	3500	100
1, 2, 3	4.5.3.1.7	Yes	(4)	20	3500	100

(1) 7 days immersion in equal parts of AMS2629, Type I, Jet Reference Fluid and 3% aqueous solution of sodium chloride.
(2) 70 days immersion in equal parts of AMS2629, Type I, Jet Reference Fluid and 3% aqueous solution of sodium chloride.
(3) 7 days immersion in ASTM D1193, Type IV, water.
(4) 7 days immersion in 3% aqueous solution of sodium chloride.
(5) A minimum of 2 panels for each condition shall be tested.
(6) Panels shall be conditioned in immersion media at elevated temperature of 140 °F (60 °C) for specified time, then cooled in immersion media for 24 hr ± 0.5 at standard test conditions.

TABLE 3 - ACCEPTANCE PEEL STRENGTH REQUIREMENTS

Applicable Class	Panel Material and Preparation (2)	Adhesion Promoter Applied	Immersion Medium (3)	Minimum Peel Strength, Pounds Force/Inch	Minimum Peel Strength, N/m	Cohesive Failure, %
1, 2, 3	4.5.3.1.5	Yes	None	20	3500	100
1, 2, 3	4.5.3.1.4	Yes	(1)	20	3500	100
1, 2, 3	4.5.3.1.5 or	Yes	(1)	20	3500	100
1, 2	4.5.3.1.3	Yes	None	20	3500	100
1, 2	4.5.3.1.4	Yes	(1)	20	3500	100

(1) 7 days immersion in equal parts of AMS2629, Type I, Jet Reference Fluid and 3% aqueous solution of sodium chloride.
(2) A minimum of 2 panels for each condition shall be tested.
(3) Panels shall be conditioned in immersion media at elevated temperature of 140 °F (60 °C) for specified time, then cooled in immersion media for 24 hr ± 0.5 at standard test conditions.

TABLE 4 - LONG-TERM STORAGE STABILITY, SHORT-TERM STORAGE STABILITY, AND AGING AFTER APPLICATION REQUIREMENTS

Applicable Class	Panel Material and Preparation (2)	Adhesion Promoter Applied (3)	Immersion Medium (4)	Minimum Peel Strength, Pounds Force/Inch	Minimum Peel Strength, N/m	Cohesive Failure, %
1, 2, 3	4.5.3.1.5	Yes	None	20	3500	100
1, 2	4.5.3.1.3	Yes	None	20	3500	100
3	4.5.3.1.2	Yes	None	20	3500	100
1, 2, 3	4.5.3.1.5	Yes	(1)	20	3500	100
1, 2	4.5.3.1.4	Yes	(1)	20	3500	100
3	4.5.3.1.2	Yes	(1)	20	3500	100

(1) 7 days immersion in equal parts of AMS2629, Type I, Jet Reference Fluid and 3% aqueous solution of sodium chloride.
(2) A minimum of 2 panels for each condition shall be tested.
(3) Reference 4.5.7, 4.5.8, and 4.5.9 for adhesion promoter conditioning prior to test.
(4) Panels shall be conditioned in immersion media at elevated temperature of 140 °F (60 °C) for specified time, then cooled in immersion media for 24 hr ± 0.5 at standard test conditions.

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

All technical requirements (See 3.) are mandated for product qualification. Tests shall be performed on the initial production of the adhesion promoter prior to inclusion on the Qualified Products List, PRI-QPL-AMS3100, as well as other circumstances noted in AS5502 (4.2.1).

4.2.1.1 Qualification

All products sold to this specification shall be listed, or approved for listing, on PRI-QPL-AMS3100, per AS5502 (4.7), unless otherwise specified herein. The qualified products list shall be in accordance with PD2000, PD2001, and PD2103 unless otherwise specified herein.

4.2.1.2 Re-approval

Qualification shall be re-approved every 7 years.

4.2.2 Initial Acceptance Tests

Requirements shown in Table 5 are initial acceptance tests and shall be performed on each batch. A batch shall be defined as the quantity of material run through a mixer at one time.

TABLE 5 - INITIAL ACCEPTANCE TESTS

Requirement	Paragraph/Table
Color	3.1, 4.5.4
Quality and Appearance	3.4
Acceptance Peel Strength	4.5.6, Table 3

4.2.3 Final Acceptance Tests

Requirements shown in Table 6 are final acceptance tests and shall be performed on each lot. A lot shall be defined as the quantity of material from one batch of finished product packaged in one size and/or type of container at the same time.

TABLE 6 - FINAL ACCEPTANCE TESTS

Requirement	Paragraph/Table
Color	3.1, 4.5.4
Quality and Appearance	3.4

4.3 Sampling and Testing

Shall be in accordance with AS5502 (4.3).

4.3.1 For Qualification Tests

Samples shall consist of three brown glass small-mouth bottles, with the exception that Class 3 samples may consist of plastic bottles (See 5.1.1). Each bottle shall contain at least 16 ounces (454 g) of adhesion promoter. Samples shall be identified as specified herein and forwarded to the activity responsible for qualification testing. Samples for qualification shall be identified as follows:

ADHESION PROMOTER FOR POLYSULFIDE SEALING COMPOUND

Specification AMS3100D Class Type _____
Manufacturer's Number _____
Name of Manufacturer _____
Submitted by (Name) (Date) for qualification tests in accordance with AMS3100D _____

4.3.2 For Initial and Final Acceptance Tests

Sufficient adhesion promoter for initial acceptance shall be packaged in the same type containers that are being procured. After successful completion of the initial acceptance tests, the batch shall be released for final packaging. Packaged adhesion promoter shall be taken at random from each lot to perform final acceptance testing. 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.

4.3.2.1 When a statistical sampling plan has been agreed upon by purchaser and supplier, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.2 and the report of 4.6 shall state that such plan was used.

4.3.3 For Shelf Life Extension

At expiration of shelf life, adhesion promoter meeting requirements of the initial acceptance tests (Table 5) may have its shelf life extended two months. Up to two extensions are acceptable.

4.4 Approval

Shall be in accordance with AS5502 (4.4).

4.4.1 Purchaser Approval

Shall be in accordance with AS5502 (4.4.1).

4.4.2 Methods of Inspection

Shall be in accordance with AS5502 (4.4.2).

4.5 Test Methods

Standard test methods are in accordance with AS5127 (8.) “Test Methods” and 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.

4.5.1 Standard Tolerances

Unless otherwise specified herein, standard tolerances of AS5127 (3.) “Standard Tolerances” shall apply.

4.5.2 Standard Test Conditions

Unless otherwise specified herein, test specimens shall be prepared and cured, and all tests performed, at standard laboratory conditions as specified in AS5127 (4.) “Standard Test Conditions”.

4.5.3 Preparation of Test Specimens

4.5.3.1 Panel Material, Size, and Coating

Shall be as follows:

4.5.3.1.1 Aluminum Alloy

AMS-QQ-A-250/4 aluminum alloy sheet, -T81 or -T3 temper or AMS4045 aluminum alloy sheet, -T6 temper, nominally 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm) with chemical film applied in accordance with AMS2473.

4.5.3.1.2 Titanium Alloy

AMS4911 titanium alloy sheet or strip, nominally 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm).

4.5.3.1.3 Acrylic

MIL-PRF-5425 acrylic plastic sheet, nominally 0.22 x 2.75 x 6 inches (5.58 x 69.8 x 152 mm). As an alternate, 0.040 to 0.060 inch (1.02 to 1.52 mm) acrylic sheet may be used with an adjacent aluminum backing plate of 0.040 inch (1.02 mm) minimum thickness.

4.5.3.1.4 AMS-C-27725 Coating

Aluminum alloy panels as in 4.5.3.1.1 shall be coated with AMS-C-27725 corrosion preventive coating, in accordance with manufacturer’s instructions, to produce a dry film thickness of 0.0008 to 0.0015 inch (20 to 38 µm) and cured for not less than 14 days at standard test conditions. Alternatively, the cure may be accelerated by allowing an initial flash at standard test conditions, followed by a minimum 24 hour cure at 120 °F (49 °C) and a minimum relative humidity of 25%.

4.5.3.1.5 Aged AMS-C-27725 Coating

Panels prepared as in 4.5.3.1.4 shall be aged, immediately after curing, by immersion in AMS2629 Type I jet reference fluid for 12 days at 140 °F (60 °C), followed immediately by 60 hours at 160 °F (71 °C), followed immediately by 6 hours at 180 °F (82 °C), followed immediately by air drying in a circulating-air oven for 66 hours at 200 °F (93 °C), followed by air drying for 5 hours at 255 °F (124 °C), followed by air drying for 4 hours at 280 °F (138 °C), and finally air drying for 72 minutes at 300 °F (149 °C).

4.5.3.1.6 MIL-PRF-23377 Primer

Aluminum alloy panels as in 4.5.3.1.1 shall be coated with MIL-PRF-23377 epoxy primer, in accordance with manufacturer’s instructions, to produce a dry film thickness of 0.0006 to 0.0009 inch (15 to 23 µm), and cured for not less than 14 days at standard test conditions.

4.5.3.1.7 MIL-PRF-85582 Primer

Aluminum alloy panels as in 4.5.3.1.1 shall be coated with MIL-PRF-85582 epoxy primer, in accordance with manufacturer's instructions, to produce a dry film thickness of 0.0006 to 0.0009 inch (15 to 23 µm), and cured for not less than 14 days at standard test conditions.

4.5.3.2 Cleaning of Test Panels

Test specimens shall be cleaned in accordance with AS5127 (6.) "Preparation of Test Specimens".

4.5.3.3 Application of Adhesion Promoter

Test specimens shall be treated with AMS3100 adhesion promoter in accordance with AS5127 (6.7) "Application of Adhesion Promoter".

4.5.3.4 Application of Sealing Compound

Unless otherwise specified herein, freshly mixed sealing compound shall be applied to test specimens in accordance with AS5127 (6.8) "Application of Sealing Compound". Sealing compounds for preparing peel strength test specimens shall conform to either AMS3276 or AMS-S-8802, Class B. Sealing compounds shall be within their application time and specified shelf life when used.

4.5.3.5 Curing of Sealing Compounds

Shall be in accordance with AS5127 (6.9) "Curing of Sealing Compounds."

4.5.3.5.1 Cure the sealing compound for 14 days at standard test conditions.

4.5.3.5.2 A cure of 48 hours at standard test conditions followed by 24 hours at 140 °F (60 °C) may be used for acceptance tests.

4.5.3.6 Preparation of Peel Strength Test Specimens

Test panel configuration shall be in accordance with AS5127/1 (8.) "Peel Strength Properties", (8.1) "Peel Strength Testing", and Figure 23 "Four-Inch Peel Specimen Configuration".

4.5.4 Color

Adhesion promoter shall be applied in accordance with manufacturer's instructions, to test specimens as in 4.5.3.1.4, allowed to air dry at standard test conditions for not less than 30 minutes, and visually inspected for color.

4.5.5 Peel Strength

Shall be determined on panels specified in Table 2, using specimens prepared in accordance with 4.5.3, and tested in accordance with AS5127/1 (8.1) "Peel Strength Testing".

4.5.6 Acceptance Peel Strength

Shall be determined on panels specified in Table 3, using specimens prepared in accordance with 4.5.3, and tested in accordance with AS5127/1 (8.1) "Peel Strength Testing".

4.5.7 Long-Term Storage Stability

After 120 days storage at 80 °F (27 °C) in the original unopened container, a sample of adhesion promoter shall be withdrawn and used to prepare specimens specified by 4.5.3 and Table 4, for peel tests conducted in accordance with AS5127/1 (8.1) "Peel Strength Testing".