

AEROSPACE MATERIAL SPECIFICATION	AMS1389™	
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Sealing Compound, Polythioether Rubber Light-Cured, for Integral Fuel Tanks and General Purpose, Intermittent use to 360 °F (182 °C)		

RATIONALE

New specification for light cured polythioether cure on demand (CoD) integral fuel tank and general purpose sealing compounds.

1. SCOPE

1.1 Form

This specification covers polythioether rubber fuel resistant sealing compounds, supplied as a two-component system, which cure rapidly when exposed to a cure on demand (CoD) light source used to initiate a reaction that generates crosslinking of sealant polymers. Type 2 compounds also cure at ambient conditions, without light exposure.

1.2 Application

This product is intended for use on aircraft integral fuel tanks and fuselage for repair of fillet and fastener seals as well as initial sealing of fasteners and sealing of seams and joints (non-faying surfaces), for service from -80 to +320 °F (-62 to +160 °C), with short-term exposures (approximately 6 cumulative hours) up to 360 °F (182 °C), but usage is not limited to such applications. This product is not recommended for use on aircraft windshields or canopies, or other applications where crazing or degradation of plastic components may occur. Sealing compound must be applied at temperatures above 50 °F (10 °C) but will cure at temperatures as low as 20 °F (-7 °C) when exposed to a light source in accordance with manufacturer instructions. Sealing compound applied to exterior surfaces shall be overcoated with applicable coatings.

1.2.1 Notice

This material is mixing ratio sensitive.

The light source required for cure on demand shall be within the range of visible through UV-A (780 to 315 nm) and use shall be in accordance with manufacturer instructions (4.5.4.5). Ambient light sources must be taken into consideration during application processes as they may decrease worklife and affect sealing compound cure.

All sealing compounds covered by this specification require an adhesion promoter as recommended by the manufacturer for proper adhesion.

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Documents

Document Sharing Hub

1.3 Classification

All sealing compounds covered by this specification are classified as follows:

Type 1 – Two-part, cures only when activated by exposure to a designated light source.

Type 2 – Two-part, cures when activated by exposure to a designated light source or after a designated time without exposure to light (hereafter also referred to as ambient cure).

1.3.1 Grades

The material shall be supplied in the following Grades:

Grade 1 – Cured specific gravity from 1.21 to 1.50 Max

Grade 2 – Cured specific gravity of 1.20 Max

1.3.2 Classes

Class B – Suitable for application by extrusion gun or spatula.

B-CoD Cures only by exposure to light source (Type 1 material)

B-2 Cures by exposure to light source or by chemical reaction with no light source required (Type 2 material)

B-8 Cures by exposure to light source or by chemical reaction with no light source required (Type 2 material)

Class R – Suitable for robotic applications.

R-CoD Cures only by exposure to light source (Type 1 material)

1.4 Safety - Hazardous Materials

Shall be in accordance with AS5502 (1.1).

2. APPLICABLE DOCUMENTS

Shall be in accordance with AS5502 (Section 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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2629	Fluid, Jet Reference
AMS3020	Oil, Reference, for "L" Stock Rubber Testing
AMS3021	Fluid, Reference, for Testing Di-Ester (Polyol) Resistant Material
AMS3276	Sealing Compound, Integral Fuel Tanks and General Purpose, Intermittent Use to 360 °F (182 °C)
AMS3277	Sealing Compound, Polythioether Rubber Fast Curing for Integral Fuel Tanks and General 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, 6Al - 4V, Annealed
AMS5516	Steel, Corrosion-Resistant, Sheet, Strip, and Plate, 18Cr - 9.0Ni (SAE 30302), Solution Heat Treated

- AMS-C-27725 Coating, Corrosion Preventive, Polyurethane For Aircraft Integral Fuel Tanks for Use to 250 °F (121 °C)
- AS5127 Aerospace Standard Test Methods for Aerospace Sealants Methods for Preparing 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 U.S. Government Publications

Copies of these documents are available online at <http://quicksearch.dla.mil>.

- MIL-PRF-23377 Primer Coating, Epoxy High Solids
- MIL-PRF-85285 Coating, Polyurethane, Aircraft and Support Equipment
- MIL-PRF-85582 Primer Coatings: Epoxy, Waterborne

2.3 PRI Publications

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

- OP 2007 Appendix G9 Additional Requirements for the Aerospace Sealants and Associated Materials (G9) QPG
- PRI-QPL-AMS1389 Products Qualified Under AMS1389

2.4 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 D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
- ASTM D2240 Standard Test Method for Rubber Property-Durometer Hardness
- ASTM D5032 Standard Practice for Maintaining Constant Relative Humidity by Means of Aqueous Glycerin Solutions

3. TECHNICAL REQUIREMENTS

3.1 Materials

The basic sealing compound ingredient shall be polythioether synthetic rubber. The sealing compound shall cure rapidly by exposure to a light source according to manufacturer instructions. Type 2 shall also cure by the addition of a curing agent as a backup curing mechanism in lieu of light exposure. 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 shall be a minimum of 9 months from date of packaging when stored between 60 °F and 80 °F (16 °C and 27 °C). Material may be retested for shelf life extension per 4.3.3.

3.5.1 Premixed Frozen Material

Shelf life of premixed and frozen material shall be a minimum of 30 days at -80 °F (-62 °C). The date of mix/freeze shall be within the shelf life of the unmixed material.

3.6 Properties

The sealing compound shall be mixed and cured using CoD light exposure in accordance with 4.5.4.5 for Type 1 and for Type 2. Type 2 shall also be mixed and cured without light exposure where marked. Both types shall conform to the requirements shown in Table 1 as determined in accordance with specified test methods:

Table 1 - Properties

Paragraph	Property	Requirement	Test Method
3.6.1	Nonvolatile Content, (% by weight), min Class B Class R	97 % 85 %	AMS1389 4.6.1
3.6.2	Flow Class B, max Class R, max	0.30 inch (7.6 mm) 0.10 inch (2.5 mm)	AS5127/1 (5.5.1) AS5127/1 (5.5.2)
3.6.3	Application Time, min		AS5127/1 (5.6.2)
3.6.3.1	Class B-CoD – From the beginning of mixing, not less than 15 grams per minute shall be extruded.	8 hours	
3.6.3.2	Class B-2 – From the beginning of mixing, not less than 15 grams per minute shall be extruded.	2 hours	
3.6.3.3	Class B-8 - From the beginning of mixing, not less than 15 grams per minute shall be extruded.	8 hours	
3.6.3.4	Class R-CoD - From the beginning of mixing, not less than 15 grams per minute shall be extruded.	8 hours	
3.6.4	Tack-Free Time, max		AS5127/1 (5.8)
3.6.4.1	Standard Conditions All Types and Classes (measured from end of CoD light exposure) Type 2 only (measured from beginning of mixing, no light exposure) Class B-2 Class B-8	10 minutes 96 hours 120 hours	

3.6.4.2	Low-Temperature, 20 °F (-7 °C) (measured from end of CoD light exposure) All Types, Class B only	10 minutes	
3.6.5	Curing – Time to Achieve 25 Durometer Type A Hardness, min		AMS1389 4.6.2
3.6.5.1	Standard Conditions (measured from end of CoD light exposure) All Types and Classes	10 minutes	AMS1389 4.6.2.1
3.6.5.2	Standard Conditions, Type 2 only (measured from beginning of mixing, no light exposure) Class B-2 Class B-8	96 hours 168 hours	AMS1389 4.6.2.1
3.6.5.3	Low Temperature 20 °F (-7 °C), (measured from end of CoD light exposure) Class B-CoD only	10 minutes	AMS1389 4.6.2.2
3.6.6	Depth of Cure (measured from end of CoD light exposure plus 10 minutes) Bottom Surface (tape side), min	25 Durometer Type A Hardness and 90% of top surface (3.6.5.1) hardness	AMS1389 4.6.18
3.6.7	Specific Gravity Grade 1 Grade 2	1.21 to 1.50 max 1.20 max	AMS1389 4.6.3
3.6.8	Ultimate Hardness		
3.6.8.1	Ultimate Hardness (measured from end of CoD light exposure plus 24 hours), all Types and Classes		
3.6.8.1.1	Top Surface	40 Durometer Type A Hardness	AMS1389 4.6.4
3.6.8.1.2	Bottom Surface (tape side)	40 Durometer Type A Hardness, min and 90% of top surface, min	AMS1389 4.6.18
3.6.8.2	Ultimate Hardness, Type 2 only, no light exposure Class B-2 Class B-8	21 days 60 days	AMS1389 4.6.4
3.6.9	Resistance to Thermal Expansion	Sealant flush with groove within +0.010 and -0.050 inch (+0.25 and -1.3 mm) at the wide end and within +0.005 and -0.050 inch (+0.13 and -1.3 mm) at the narrow end of the test block	AS5127/1 (6.4) Standard Heat Cycle in accordance with AMS1389 4.5.3

3.6.10	Hydrolytic Stability, min	20 Durometer Type A Hardness	AMS1389 4.6.5
3.6.11	Shaving and Sanding	No rolling or tearing of sealant, smooth finish	AMS1389 4.6.6
3.6.12	Paintability	No separation from sealant	AMS1389 4.6.7
3.6.13	Chalking	No visual chalk	AMS1389 4.6.8
3.6.14	Resistance to Thermal Rupture	No blistering or sponging, 0.156 inch (3.96 mm) deformation, max	AMS1389 4.6.9 Air aging at 320 °F (160 °C), 10 psi (69 kPa), 30 minutes
3.6.15	Resistance to Hydrocarbons		
3.6.15.1	Weight Loss, max	8%	AMS1389 4.6.10
3.6.15.2	Flexibility	No cracking or checking	AMS1389 4.6.10
3.6.15.3	Volume Swell, max	25%	AMS1389 4.6.11
3.6.16	Low Temperature Flexibility	No visual evidence of cracking, checking, or loss of adhesion	AMS1389 4.6.12
3.6.17	Tensile Strength and Elongation, Class B only, min		AMS1389 4.6.13 AS5127/1 (7.7)
3.6.17.1	Cure per 4.5.4.5	250 psi (1724 kPa)/250% elongation	
3.6.17.2	Cure per 4.5.4.5 + 2 hours at 360 °F (182 °C)	150 psi (1034 kPa)/50% elongation	
3.6.17.3	Cure per 4.5.4.5 + 12 days at 140 °F (60 °C) + 60 hours at 160 °F (71 °C) + 6 hours at 180 °F (82 °C), all in AMS2629 Type 1	125 psi (862 kPa)/100% elongation	
3.6.17.4	Cure per 4.5.4.5 + 12 days at 140 °F (60 °C) + 60 hours at 160 °F (71 °C) + 6 hours at 180 °F (82 °C) all in AMS2629 Type 1 + 24 hours at 120 °F (49 °C) + Standard Heat Cycle as in 4.5.3	100 psi (689 kPa)/50% elongation	
3.6.17.5	Cure per 4.5.4.5 + 72 hours at 140 °F (60 °C) in AMS2629 Type 1 + 72 hours air dry at 120 °F (49 °C) + 7 days heat aging at 285 °F (141 °C)	150 psi (1034 kPa)/50% elongation	
3.6.17.6	Cure per 4.5.4.5 + Standard Heat Cycle as in 4.5.3	100 psi (689 kPa)/50% elongation	