Scotch-Weld™
Structural Adhesive Film
AF 143-2

Technical Data **June, 2002**

Introduction

3M™ Scotch-Weld™ Structural Adhesive Film AF 143-2 is designed for the bonding of honeycomb and metal to metal components where high strengths at 350°F (177°C) are required. Preliminary indications are that Scotch-Weld AF 143-2 will give excellent performance in the -67°F to 350°F (-55°C to 177°C) temperature range. Scotch-Weld AF 143-2 has an embossed liner which yields improved porosity control in metal to metal applications

Product Description

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Color:	Tan
Base:	Modified Epoxy
Form:	Flexible Supported Adhesive Film
Weight:	0.95 - 0.110 lbs./sq. ft.
Nominal Thickness:	0.016 inches

Product Application

I. Surface Preparation

A thoroughly cleaned, dry grease-free surface is essential for maximum performance. Cleaning methods which will produce a break-free water film on metal surfaces are generally satisfactory.

A. **Aluminum** (optimized FPL etch – 3M test method C-2803)

1. Vapor Degrease – Perchloroethylene condensing vapors for 5-10 minutes.
2. Alkaline Degrease – Oakite 164 solution (9-11 oz./gallon water) at 190°F ± 10°F (88°C ± 5°C) for 10-20 minutes. Rinse immediately in large quantities of cold running water.
3. Acid Etch*: Place panels in the following solution for 10 minutes at 150°F ± 5°F (66°C ± 2°C).

Sodium Dichromate ($Na_2Cr_2O_7 2H_2O$)	4.1 - 4.9 oz./gallon
Sulfuric Acid, 66° Be	38.5 - 41.5 oz./gallon
2024T-3 aluminum (dissolved)	0.2 oz./gallon minimum
Tap Water as needed to balance	

4. Rinse panels in clear running tap water.
5. Air dry 15 minutes; force dry 10 minutes at 150°F ± 10°F (66°C ± 5°C).
6. It is advisable to coat the freshly cleaned surface with adhesive within 4 hours after surface preparation.

***CAUTION:** Use adequate eyes, skin and respiratory protection when using etch solutions.

B. **Aluminum Honeycomb Core**

1. Soak in clean aliphatic naphtha (to conform to TT-N-95A) for five minutes at room temperature. Dry 10 minutes at 150°F ± 5°F (66°C ± 2°C).
2. Optional – Immerse in etching solutions for 2 minutes at 150°F ± 5°F (66°C ± 2°C). Rinse, air dry and force dry in similar manner to skin panels.

II. Primer Application

3M™ Scotch-Weld™ Structural Adhesive Primer EC-3917 corrosion inhibiting primer has been successfully used with 3M™ Scotch-Weld™ Structural Adhesive Film AF 143-2 using the following procedure:

Spray Application: Refer to the Scotch-Weld EC-3917 Primer Product Specification Sheet for equipment and technique.

Primer Dry Cycle: Air Dry: 30 minutes at ambient temperature.

Force Dry: 60 minutes at 250°F (121°C) in an air circulating oven.

Primer Thickness: Approximately 0.1 mils dry.

Caution: Scotch-Weld EC-3917 is flammable. See Primer Introductory Data Sheet for application techniques and precautionary measures.

Product Application

II. Adhesive Layup

Care should be taken to avoid contaminating adhesive and cleaned aluminum by any substance which will hinder wetting action of the adhesive.

A. **Film Application**

1. Cut portion of film to be used from roll with protective liners in place.
2. Remove paper liner from one side of the film.
3. Place film on metal using a separating liner as a protective cover.
4. Roll film into position with a rubber roller, insuring that no air is trapped between film and panel.
5. Remove second protective liner.
6. Assemble parts and cure.

IV. Cure Cycle

A cure of 60 minutes at 350°F (177°C) and 45 ± 5 psi pressure is suggested where maximum results are desired.

Cure Cycle (Autoclave or Platen Press)

The following cure cycle has been used to obtain dense glue lines.

Cure Cycle (Autoclave or Platen Press)	Cure Cycle
1. Bonding pressure: Apply before starting rise rate cycle and maintain throughout.	45 ± 5 psi
2. Bond line temperature rise rate.	4 to 5°F (2 to 3°C) / minute
3. Cure.	60 minutes at 350°F (177°C)
4. Temperature at which pressure is released.	200°F (93°C) or below

Product Performance

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

The following product performance data has been obtained in the 3M Laboratory under the conditions specified. Test specimens are prepared using the general application methods and procedures described in the product application section of this data sheet.

All data reported in this section were developed using 3M™ Scotch-Weld™ Structural Adhesive Primer EC-3917 primed aluminum panels and an adhesive cure of 60 minutes at 350°F (177°C) and 45 psi. A 4-5°F (2-3°C) minute rise rate to cure temperature was used. Parts were cooled below 200°F (93°C) before removing from autoclave.

1. Metal to Metal – Overlap Shear

All properties were measured on 1" wide, 1/2" overlap specimens cut from 0.063" thick 4" x 7" bonded panels of 2024T-3 alclad aluminum. Tests were conducted per MMM-A-132.

Test Temperature	Shear Strength
-67°F (-55°C)	3000 psi
75°F (24°C)	3250 psi
300°F (149°C)	2700 psi
350°F (177°C)	2300 psi

Product Performance ***(continued)***

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2. Metal to Metal Floating Bell Peel

Peel strength was measured on 1" wide specimens cut from a 3" x 8" x .063" 2024T-3 bare aluminum panel bonded to a 3" x 10" x .025" 2024T-3 bare panel.

Test Temperature	Peel Strength
75°F (24°C)	18 lb./inch width

3. Metal to Honeycomb – Climbing Drum Peel. Peel strength was measured on 3" x 8" honeycomb sandwich panels containing a 3" x 10" peel face sheet. Tests were conducted per MIL-A-25463.

Skins: .020" thick, 2024T-3 bare aluminum
Core: 0.50" thick, 1/4" cell, 4 mil, 5052 aluminum

Test Temperature	Sandwich Peel Strength
75°F (24°C)	40 in. lb./3 inch width

4. Metal to Honeycomb – Flatwise Tensile. All properties were measured on 2" x 2" honeycomb sandwich panels using procedures of MIL-A-25463.

Skins: .020" thick, 2024T-3 bare aluminum
Honeycomb Core: 0.05" thick, 1/4" cell, 4 mil foil, 5052 aluminum

Test Temperature	Flatwise Tensile Strength
75°F (24°C)	1100 psi
300°F (149°C)	700 psi

Storage

Storage Stability – Storage at 0 °F (-18°C) or below is recommended for 3M™ Scotch-Weld™ Structural Adhesive Film AF 143-2 to obtain maximum storage life.

CAUTION: Scotch-Weld AF 143-2 film should be permitted to thoroughly warm to room temperature before being used in order to prevent moisture condensation. (Do not open protective container prior to reaching ambient conditions).

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Precautionary Information

Refer to Product Label and Material Safety Data Sheet for health and safety information before using this product. For additional health and safety information, call 1-800-364-3577 or (651) 737-6501.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free (800) 235-2376. Our fax number is (417) 869-5219. Address correspondence to: 3M Aerospace Central, 3211 E. Chestnut Expressway, Springfield, MO 65802.

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Aerospace Department
Engineered Adhesives Division
3M Center, Building 220-8E-05
St. Paul, MN 55144-1000
www.3M.com/aerospace

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