Scotch-Weld™
Structural Adhesive Solution
EC-3984

Technical Data **Issue No. 1**

Introduction

3M™ Scotch-Weld™ Structural Adhesive Solution EC-3984 is a liquid, sprayable modified version of 3M™ Scotch-Weld™ Structural Adhesive Film AF 3109-2 . It has improved high temperature performance compared to conventional 250°F (121°C) curing adhesives. Scotch-Weld EC-3984 is commonly used for bonding wire mesh on engine nacelles, thrust reversers, and acoustic panels for aircraft and aircraft engines.

Advantages

- Cure temperature ranges from 225°F (107°C) to 350°F (177°C).
- Excellent strength from -67°F (-55°C) to 300°F (149°C) in either metal to metal or honeycomb sandwich applications. Compatible with most epoxy-graphite composites.
- Easily applied by spraying.
- Low volatiles during cure permits low pressure bonding.
- Viscosity of Scotch-Weld EC-3984 minimizes blockage on perforated acoustic components.

Product Description

Form:	Thin liquid
Composition:	Modified epoxy
Color:	Blue
Solids Content:	20 ± 2%
Flash Point:	20°F [-6.67°C] (CC)

Product Performance

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

Aluminum to Aluminum Bonds

The following data show values obtained with Scotch-Weld EC-3984 on aluminum in 3M laboratory testing. All panels were FPL etched. The bonds were cured 1 hour at 250°F (121°C) and 40 psi (275.6 MPa) pressure with a rise rate to temperature of 5°F/minute (3°C/minute).

Test Temperature	Overlap Shear Strength
75°F (24°C)	5000 psi (34.5 MPa)
300F (149°C)	1400 psi (9.7 MPa)
	Metal to Metal Floating Roller Peel
	40 piw (178 N/25 mm)

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Product Application

Scotch-Weld EC-3984 will give excellent properties under many application conditions. Variations from these suggested procedures should be fully evaluated to ensure bond properties sufficient to meet the requirements of your particular assembly.

I. Surface Preparations

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. Surface preparations should be fully evaluated with the adhesive especially if resistance to specific environments are anticipated.

Suggested Cleaning Procedure for Aluminum

A. *Aluminum Sheet*

1. Alkaline Degrease – Oakite No. 164 solution (9-11 oz/gallon [67.4-82.4 g/liter] water) at 180°F ± 10°F (82°C ± 6°C) for 10 minutes. Rinse immediately in large quantities of cold running water.
2. Optimized FPL Etch Solution (1 liter):*

Material	Amount
Distilled Water	700 ml plus balance of liter (see below)
Sodium Dichromate	28 to 67.3 grams
Sulfuric Acid	287.9 to 310.0 grams
Aluminum Chips	1.5 grams/liter of mixed solution

*__Note:__ Review and follow suppliers environmental, health and safety recommendations prior to preparing this etch solution.

To prepare 1 liter of this solution, dissolve sodium dichromate in 700 ml of distilled water. Add sulfuric acid and mix well. Add additional distilled water to fill to 1 liter. Heat mixed solution to 66 to 71°C (150 to 160°F). Dissolve 1.5 grams of 2024 bare aluminum chips per liter of mixed solution. Gentle agitation will help aluminum dissolve in about 24 hours.

To FPL etch panels, place them in the above solution at 150 to 160°F (66 to 71°C) for 12 to 15 minutes.

3. Rinse – Rinse panels in clear running water.
4. Dry – Air dry 15 minutes; force dry 10 minutes (minimum) at 140°F (60°C) maximum.
5. It is advisable to coat the freshly cleaned surfaces within 4 hours after surface preparation.

B. *Honeycomb Core*

1. Rinse in naphtha.√
2. Dry – Air dry 15 minutes; force dry 10 minutes at 150°F ± 10°F (66°C ± 6°C).

√**Note:** When using solvents, extinguish all sources of ignition and follow manufacturer's precautions and directions for use.

Product Application
(continued)

II. Adhesive Application

Scotch-Weld EC-3984 has been designed for spray application. Prior to use, Scotch-Weld EC-3984 must be thoroughly agitated to redisperse the pigmentation which settles upon storage. Agitation of small containers on a vibrating paint shaker for approximately 5 minutes is suggested.

A. *Spray Equipment and Procedure*

Spray Gun	Binks Model #62
Air Cap	66S
Fluid Tip and Needle	66-365
Cup Pressure	0, Siphon Feed
Line Pressure	30-35 psi (2-2.4 bar)
Fan Adjustment	Wide open
Fluid Adjustment	One turn open
Distance from panel	9-12 inches (23-30 cm)
Adhesive Thickness (dry)	2 to 3 mils (50.8-76.2 mm)

B. *Adhesive Dry*

Adhesive Air Dry Cycle – 1 hour at 75°F (24°C) followed by 60 minutes at 150°F (66°C).

The adhesive surface should be protected from contamination introduced by dust, fingerprints, and oil.

C. *Cleanup*

Excess adhesive and equipment may be cleaned up, prior to curing with methyl ethyl ketone.*

***Note:** When using solvents, extinguish all sources of ignition and follow manufacturer's precautions and directions for use.

Product Application ***(continued)***

III. Flow Reduction and Cure Cycle

Customers commonly ask how to reduce or eliminate the flow of Scotch-Weld EC-3984. The following aging tables are useful to determine flow reduction at various times and temperatures.

Scotch-Weld EC-3984 Flow Properties

All samples were dried 1 hour at 75°F (24°C) and 150°F (66°C) prior to the below aging periods. Samples were aged in an air circulating oven. Temperatures measured by thermocouple adjacent to the samples.

	Time	% Flow
160°F (71°C) Aging	0 1 hour 2 hour 3 hour 4 hour 5 hour 6 hour	100 85.8 76.2 68.7 54.5 34.3 11.7
180°F (82°C) Aging	0 30 minutes 45 minutes 60 minutes 75 minutes 90 minutes	100 78.9 68.7 52.4 37.3 19.2
200°F (111°C) Aging	0 10 minutes 15 minutes 20 minutes 30 minutes 40 minutes	100 78.8 71.4 60.2 38.6 3.9

Tests run on 5 mil (dry) films using a cure of 60 minutes at 250°F, 40 psi, 4-5°F/minute rise (121°C, 275.6 MPa, 2-3°C/minute rise).

The following cure cycle is suggested to obtain optimum performance.

	Cure Cycle
1. Bonding Pressure: Apply at ambient temperature and maintain throughout cycle.	40 psig (275.6 KPa [gage])
2. Bondline temperature rise rate.	4-5°F (2-3°C)/minute
3. Cure.	60 minutes at 250°F (121°C)
4. Temperature at which pressure is released.	150°F (66°C) or below

Handling and Storage

Storage and Aging Precautions – Avoid heat and dampness in storage. Store new shipments behind older lots. Refrigerated storage, 0 ± 5°F (-18 ± 3°C) is required. Rotate stock on a “first-in - first-out” basis.

The 3M Standard shelf life for Scotch-Weld EC-3984 is 6 months from date of shipment from 3M when stored at 0°F (-18°C) or below.

Caution: Adhesive should be permitted to thoroughly warm to room temperature before being used in order to prevent moisture condensation.

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Precautionary Information

See 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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ISO 9002

This Engineered Adhesives Division product was manufactured under a 3M quality system registered to ISO 9002 standards.

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