

3M

Scotch-Weld™

Structural Adhesive

EC-3964

Technical Data

Issue No. 2

Product Description

3M™ Scotch-Weld™ EC-3964 is a solution version of 3M™ Structural Adhesive Film AF 147. Typical use is to bond screen in sound suppression panels on aircraft engine nacelles.

Features

- Can be sprayed on screen without filling holes
- Cured bonds have high shear and peel strength
- Excellent performance to 350°F
- Can be sprayed, brushed, or flow applied

Typical Physical Properties

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

Base	Modified epoxy in solution
Density	7.0 to 7.5 lb/gal (.84 - .90 g/cc)
Consistency	Thin liquid (sprayable)
Flash Point (Closed Cup)	20°F (-6.7°C)
Viscosity	18 to 23 cps
Brookfield Viscometer	RVF #1 at 20 rpm
Color	Light tan
Solids Content	18 to 22%
Viscosity Zahn No. 1 Cup	27 to 42 seconds

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Mechanical Properties:
Typical Performance

Note: The following performance data have been obtained in the 3M laboratory and tested in accordance with ASTM D 1002.

	Test Temperature		Typical Value	
	°F	(°C)	psi	(MPa)
Lap Shear Strength 	-67	(-55)	4700	(32.4)
	75	(24)	4700	(32.4)
	300	(149)	1800	(12.4)

Note: The following performance data have been obtained in the 3M laboratory and tested in accordance with ASTM D 3167.

	Test Temperature	Typical Value
Floating Roller Peel 	75°F (24°C)	31 piw (138 N/25 mm)

Procedure: Above tests were conducted on optimized FPL etched 2024-T3 Alclad aluminum. The adhesive was applied, dried and cured as outlined in the product application section. The lap shear specimens were tested at 0.10 inches/minute and the floating roller peel specimens were tested at 12 inches/minute. The 300°F lap shear specimens were held at 300 ± 5°F for 15 to 30 minutes prior to test.

Product Application

Note: While this information is provided as a general application guideline based upon typical conditions, it is recognized that no two applications are identical due to differing assemblies, methods of heat and pressure application, production equipment and other limitations. It is therefore suggested that experiments be run, within the actual constraints imposed by purchasers' or customers' facilities, to determine optimum conditions for user's specific application and to determine suitability of product for particular intended use.

A. **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.

1. **Aluminum.**

Optimized FPL Etch - 3M Company AdhD Method C-2803 or ASTM D 2651.

- a. Alkaline degrease - Oakite 164* solution 9-11 oz./gallon of water at 190°F (87°C) ± 10°F (± 5.6°C) for 10-20 minutes. Rinse immediately in large quantities of cold running water.
- b. 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

To prepare 1 liter of this solution, dissolve sodium dichromate in 700 ml of distilled water. Add sulfuric acid and mix well. Add additional 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.

Note: Review and follow all safety and precautionary information supplied by chemical supplier prior to preparing this etch solution.

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Product Application (continued)

- c. Rinse immediately in large quantities of clear running tap water.
- d. Dry-Air dry approximately 15 minutes followed by a forced air dry at 140°F (60°C) maximum for 10 minutes (minimum).
- e. Current theory suggests that both surface structure and chemistry play a significant role in determining the strength and permanence of bonded structure. It is therefore advisable to bond or prime freshly cleaned surfaces as soon as possible after preparing to avoid contamination and/or mechanical damage.

Spray Procedure

EC-3964 has been designed for spray application. Prior to use EC-3964 must be thoroughly agitated to re-disperse the pigmentation which settles upon storage. Agitation of small containers on a vibrating paint shaker for approximately 5 minutes is suggested. If EC-3964 has been frozen, small white crystals will be present. These crystals should be filtered from EC-3964 before spraying to prevent spray gun blockage. Removing crystals will not adversely affect the performance of EC-3964.

1. Spray Equipment and Procedure

Spray Gun	Binks Model #62 or 2001
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	2 to 3 mils (51-76 micron)

2. Adhesive Dry

Air dry at 75 ± 5°F (24 ± 2°C) for a minimum of 1 hour, plus force 1 hour dry at 200 ± 5°F (93 ± 2°C).

Clean-Up:

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

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

3. Cure Cycle

The following cure cycle is suggested to obtain optimum performance.

Cure Cycle

- 1. Bonding Pressure: Apply at ambient temperature and maintain throughout cycle 50 ± 5 psig (3.4 ± 3 bar)
- 2. Bondline temperature rise rate 4-5°F (2-3°C)/minute
- 3. Cure 60 minutes at 350 ± 5°F (177 ± 2°C)
- 4. Temperature at which pressure is released 150°F (66°C) or below

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Storage and Handling	Store EC-3964 at 0°F (-18°C) for maximum storage life. 3M Standard shelf life for EC-3964 is 6 months from date of shipment from 3M when stored at 0°F (-18°C) or lower in the original unopened container.
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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