

3M

Scotch-Weld™

Structural Adhesive Primer

EC-2333

Technical Data

Issue No. 3

Introduction

3M™ Scotch-Weld™ Structural Adhesive Primer EC-2333 is a primer for 3M™ Scotch-Weld™ film adhesives where it is desired to obtain improved adhesion or improved resistance to environmental exposure. It is especially designed for use with the 3M™ Scotch-Weld™ Adhesive Films AF-130 and AF-143. Specific data has been obtained with the Scotch-Weld AF-130 and AF-143 film adhesives and can be found under the test results section of those data sheets.

Properly applied Scotch-Weld EC-2333 offers the following advantages:

- Ensures complete wetting of film adhesive to adherend surfaces.
- Protects cleaned surfaces until the bonding operations can be completed.
- Imparts corrosion protection to metal.
- Non-chromated.

Description

Color:	Yellow
Base:	Synthetic resin
Sediment:	Preservative which imparts greater moisture resistance
Viscosity:	5 ± 2 cps (Brookfield RVF, No. 1 spindle, 20 rpm at 80°F [27°C])
Active Content:	12% (approx.)
Net Weight:	7.5 ± .2 lb/gal
Flash Point:	47°F (8.3°C) (COC)

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Product Performance

The following product performance has been obtained in the 3M Laboratory under the conditions specified. Test specimens were prepared using the General Application Methods and Procedures in the Product Application Section of this data sheet.

All data reported in this section were developed using Scotch-Weld EC-2333 primed aluminum panels and adhesive cure of 60 minutes at 350°F (177°C) and 45-50 psi (310.1-344.5 MPa). A 4-5°F (2.2-2.8°C)/minute rise rate to cure temperature was used. Parts were cooled below 200°F (93°C) before removing from the autoclave.

1. Metal to Metal – Overlap Shear

All properties were measured on 1" (25.4 mm) wide, 1/2" (12.7 mm) overlap specimens cut from 0.063" (1.600 mm) thick 4" x 7" (101.6 mm x 177.8 mm) bonded panels or 2024T3 bare (with AF-130) or Alclad (with AF-143 aluminum). Tests were conducted per MMM-A-132.

Test Temperature	Scotch-Weld AF 130 0.09 Wt. (441 g/m ²) (Supported)		Scotch-Weld AF 143 0.1 Wt. (490 g/m ²) (Supported)	
	-67°F (-55°C)	2250 psi	(15.5 MPa)	—
68-73°F (20-22.7°C)	2600 psi	(17.9 MPa)	3190 psi	(22.0 MPa)
250°F (121°C)	2600 psi	(17.9 MPa)	2610 psi	(18.0 MPa)
300°F (149°C)	1400 psi	(9.6 MPa)	—	—

2. Honeycomb Sandwich – Flatwise Tensile

All properties were measured on 2" x 2" (50.8 mm x 50.8 mm) honeycomb sandwich panels using the procedure MIL-A-25463.

Skin – 2024T-3 clad aluminum; .063" thick.

Honeycomb Core – 5052, 0.004" foil, 1/2" (12.7 mm) thick, 1/4" (6.35 mm) cell, non perforated.

Test Temperature	Scotch-Weld AF 130 0.09 Wt. (441 g/m ²) (Supported)	
68°F (20°C)	580 psi	(4.0 MPa)

3. Additional Honeycomb Sandwich Performance Data

The following data shows the range of strength obtained from Scotch-Weld EC-2333/AF-130 on typical core constructions:

Core:	1/8" cell, non-perforated. 1/2" thick, 5052 alloy, 0.002" foil
Skins:	2024T-3 clad .020" x 3" x 8" (.508mm x 76.2mm x 203.2mm) [Honeycomb peel] 2024T-81 bare .064" x 3" x 8" (1.626mm x 76.2mm x 203.2mm) [Pi Tension] 2024T-81 bare .064" x 3" x 8" (1.626mm x 76.2mm x 203.2mm) [Beam Flexure]
Cure:	Autoclave cure 350°F ± 2°F (177°C ± 1.1°C) 60 minutes, 50 psi. 10°F ± 1°F (-12.2 ± 0.6°C)/minute bond line, temperature rise rate from 80°F (27°C) to 350°F (177°C).

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Product Performance
(continued)

A. Pi Tension

Test Method: Pi Tension consists of circular bonds with an area of Pi (3.14 sq. inches) made from honeycomb panels using 1/8" (3.18 mm) cell, non.perf. 5052 alloy aluminum, 1/2" thick (12.7 mm), 0.002" (.0508 mm) foil core bonded to 0.063" (1.6 mm) 2024 T81 bare face sheets. After cure the discs are milled out of the honeycomb construction and bonded to the test block – 1/2 hour cure at 350°F (177°C). Loading rate 4000 lbs./minute (17.8 kN/min.).

Test Results:

Test Temperature	Scotch-Weld AF 130 Wt. 0.09 (441 g/m ²) with EC-2333 Primer (lbs./3.14 sq. in.) = kN/2025.8 mm ²		Type Failure
	Force (lbs.)	Force (kN)	
-67°F (-55°C)	3600	16 kN/2026 mm	Cohesive
75°F (24°C)	3800	16.9 kN/2026 mm	50% core 50% cohesive
270°F (132°C)	3900	17.3 kN/2026 mm	50% core 50% cohesive
350°F (177°C)	2600	11.6 kN/2026 mm	50% core 50% cohesive
400°F (204°C)	1800	8.0 kN/2026 mm	Cohesive
500°F (260°C)	500	2.2 kN/2026 mm	Cohesive

B. Honeycomb Peel Strength

Test Method: Honeycomb Peel Strength – MIL-A-25463 (1/8" cell) (Para 4.6.1-4.4.)

Test Results:

Test Temperature	Average Load to Fail Scotch-Weld AF-130 Wt. 0.09 (441 g/m ²) with Scotch-Weld EC-2333 Primer		Type Failure
	Force (lbs.)	Force (N)	
-67°F (-55°C)	4 in•lb/inch	44.5 N/inch	Cohesive
75°F (24°C)	5 in•lb/inch	55.6 N/inch	Cohesive

C. Beam Flexure Strength – Scotch-Weld AF 130 (.09 Wt.)/EC-2333

Test Method: Beam Flexure Strength – Tested as per MIL-A-25463 method with .020" (.508 mm)/minute crosshead speed and double point loading.

Test Results:

Test Temperature	Average Load to Fail (lbs./3 inch width) Wt. 0.09 (441 g/m ²) with Scotch-Weld EC-2333 Primer		Type Failure
	Force (lbs.)	Force (kN)	
-67°F (-55°C)	2600	11.6 kN/76 mm	Core
75°F (24°C)	2400	10.7 kN/76 mm	Core
270°F (132°C)	2100	9.3 kN/76 mm	Core
350°F (177°C)	1700	7.6 kN/76 mm	Core
400°F (204°C)	1300	5.8 kN/76 mm	Core
500°F (260°C)	400	1.8 kN/76 mm	Adhesive

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Application Proper adhesive application is as important as proper bond design and adhesive choice to obtain maximum joint properties. Improper adhesive application techniques can result in partial or complete failure of an assembly.

Scotch-Weld EC-2333 primer will give excellent results under the following suggested procedures. Variations from these procedures should be fully evaluated to ensure bond properties sufficient to meet the requirements of your particular assembly.

Surface Preparation **Suggested Cleaning Procedures for Aluminum**

A thoroughly cleaned, dry, grease-free surface is essential for maximum performance. Cleaning methods which will produce a breakfree water film on metal surfaces are generally satisfactory. Surface preparation should be fully evaluated with the adhesive, especially if resistance to specific environments is anticipated.

1. Alkaline Degrease – Oakite 164 solution (9-11 oz./gal. water) at 190°F ± 10°F (87.8°C ± 5.6°C) for 10-20 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 component 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.

Note: Read and follow component suppliers environmental safety, and health recommendations prior to preparing this etch solution.

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

3. Rinse – Rinse panels in clear running water.
4. Dry – Air dry 30 minutes; force dry 30 minutes at 140°F (60°C) maximum.
5. It is advisable to coat the freshly cleaned surfaces with Scotch-Weld EC-2333 within four (4) hours after surface preparation.
6. Care should be taken to avoid contaminating the cleaned aluminum by any substance which will hinder the wetting action of Scotch-Weld EC-2333.

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Surface Preparation (continued)

Primer Application

Scotch-Weld EC-2333 has been applied successfully by flow coating, brushing and spraying. The following is suggested for spray application.

Spray Gun	DeVilbiss MBC	
Air Cap	No. 78	
Needle-Nozzle	AV-15 FX	
Line Pressure	60-80 lbs.	(270-360N)
Pot Pressure	1-2 lbs.	(4.45-8.90N)
Distance from Panel	14 inches ± 2 inches	(355.6 ± 50.8 mm)
Primer Thickness (Dry)	.0001 - .0003 inches	(0.00254 mm - .0762 mm)

Primer Dry

Air Dry – Air Dry at 75°F - 80°F (23.9°C - 27°C) for a minimum of 30 minutes.

Force Dry – Circulating air oven 160°F (71.1°C) for 30 minutes.

The primed surface, after cooling to ambient temperatures, is ready for adhesive bonding. The primed surface should be protected from contamination introduced by dust, fingerprints, oil, etc.

If extended periods of storage are contemplated, wrap the parts in unplasticized Kraft paper. If the primer surface is contaminated with dust, it may be cleaned prior to bonding by wiping with clean, unsized cheesecloth. Data developed to date indicates no degradation in properties after 2 weeks aging of primed panels at 73°F (22.8°C).

Cleanup

Excess primer and equipment can be cleaned up, prior to curing, with ketone* type solvent.

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

Storage

Store product at 60°F - 80°F (15°C - 27°C) for maximum storage life. Higher temperatures reduce normal storage life. Lower temperatures cause increased viscosity of a temporary nature. Care should be taken to protect Scotch-Weld EC-2333 from moisture.

NOTE: Do not agitate the primer before application. The sediment in the primer is necessary to give greater moisture resistance.

Shelf Life

The 3M Standard shelf life for Scotch-Weld EC-2333 is 6 months from date of shipment from 3M when stored at 60°F - 80°F (15°C - 27°C).

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

For Additional Product Safety and Health Information, See Material Safety Data Sheet, or call:



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