

# 3M™ Scotch-Weld™ Epoxy Adhesives

## EC-3501 B/A Gray

### Technical Data Sheet

#### Introduction

3M™ Scotch-Weld™ Epoxy Adhesive EC-3501 B/A Gray is a rapid room temperature curing, two-part epoxy adhesive for use in bonding many metals, composites, and a variety of plastics. Equal parts by volume mix ratio formula is easily mixed to produce strong, impact-resistant bonds.

#### Features

- Two-part room temperature curing structural adhesive with high shear strength.
- Fast cure.
- Controlled flow/thixotropic.
- Good environmental resistance.
- Excellent for repair of surface porosity and pinholes on cured fiber reinforced composites.

#### Typical Uncured Physical Properties

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

Color	Base Accelerator	White Black
Base Resin	Base Accelerator	Epoxy Amine
Viscosity Press Flow @ 75°F (24°C) Seconds to deliver 20 g at 60 psi through 0.104" orifice	Base Accelerator	15 - 40 35 - 60
Viscosity (Centipoise) Brookfield RVF, #7 spindle, 2 RPM at 75°F (24°C)	Base Accelerator	> 1,000,000 > 1,000,000
Net Weight (lbs./gallon)	Base Accelerator	12.6 ± .2 11.9 ± .2
Mix Ratio (B:A) (By Weight)	Volume Weight	1 : 1 1.05 : 1
Worklife at 75°F (24°C)		6-10 minutes in 20 g mass

## Typical Cured Properties

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

### Physical

Color	Gray
Shore D Hardness	75-80

### Thermal

Thermal Coefficient of Expansion (in/in/°C)	60 x 10 <sup>-6</sup> (-50 to 10°C range) 234 x 10 <sup>-6</sup> (50 to 110°C range)
Thermal Conductivity btu - ft./ft. <sup>2</sup> - hr. - °F	0.193

### Electrical

Dialectic Strength	700 volts/mil
Volume Resistivity	1.2 x 10 <sup>13</sup> ohm - cm

## Handling/Curing Information

### Directions for Use

3M™ Scotch-Weld™ Epoxy Adhesive EC-3501 is supplied in bulk kits as well as side by side dual syringe plastic cartridges. To use the cartridge system, simply insert the cartridge into the applicator. Next, remove the cartridge cap and expel a small amount of adhesive to be sure both sides of the cartridge are flowing evenly and freely. If simultaneous mixing of Part A and Part B is desired, attach the mixing nozzle to the cartridge and begin dispensing the adhesive.

When mixing Part A and Part B manually the components must be mixed in the ratio indicated in the typical uncured properties section of this data sheet. Complete mixing of the two components is required to obtain optimum properties.

Two-part mixing/proportioning/dispensing equipment is available for intermittent or production line use. These systems are ideal for line uses because of their variable shot size and flow rate characteristics and are adaptable to most applications.

Apply adhesive to clean, dry surfaces, join parts and secure until adhesive sets (see rate of strength build up).

These products may be applied by spatula, trowel, or flow equipment.

### Surface Preparation

For highest strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. The amount of surface preparation depends on the required bond strength and environmental aging resistance.

The following cleaning methods are suggested for these common surfaces. ASTM D2651 is suggested as a reference guide for surface preparation for adhesive bonding for various substrates.

#### Steel

1. Wipe free of dust with oil-free solvent such as Methyl Ethyl Ketone (MEK).\*
2. Sandblast or abrade using clean fine grit abrasives.
3. Wipe again with solvent to remove loose particles.

#### Aluminum

1. Wipe free of dust with oil-free solvent such as Methyl Ethyl Ketone (MEK).\*

- The best performance will be achieved with the surface preparation by alkaline degreasing, then FPL etching according to ASTM D2674, and followed by phosphoric acid anodizing according to ASTM D3933.
- If primer is to be used, it should be applied within 4 hours after etching or within 24 hours after phosphoric acid anodizing.

**Plastics**

- Wipe free of dust with oil-free solvent such as Methyl Ethyl Ketone (MEK).\*
- Sandblast or abrade using clean fine grit abrasives.
- Wipe again with solvent to remove loose particles.

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

**Typical Performance Characteristics**

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

**A. Aluminum Overlap Shear**

Overlap shear strength was measured on FPL etched 1" wide by 1/2" overlap specimens. The bonds were made from 2 panels of 4" x 7" x 0.063", 2024 T-3 clad aluminum bonded together and cut into 1" wide specimens. The separation rate of the testing jaws was 0.1"/minute. Tests similar to ASTM D1002.

<u>Test Temp</u>	<u>Overlap Shear (PSI)</u>
-67°F (-55°C)	1500
75°F (24°C)	3200
180°F (82°C)	500

**B. Aluminum T-Peel**

T-Peel bonds were measured on 1" wide specimens cut from two FPL etched 8" x 8" x 0.032", 2024 T-3 clad aluminum panels bonded together. The separation rate of the testing jaws was 20"/minute. Test method similar to ASTM D1876.

<u>Test Temp</u>	<u>T-Peel (PIW)</u>
75°F (24°C)	4

**Environmental Resistance**

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

The following data was developed in overlap shear on 2024 T-3 clad FPL etched aluminum after aging in the following environments for the specified times. Test method similar to ASTM D1002.

Environment	Time	Test Results 75°F (24°C)
100% Relative Humidity @ 120°F (49°C)	14 days	2030 psi
Salt Spray @ 95°F (35°C)	14 days	1895 psi
Tap Water @ 75°F (24°C)	14 days	1810 psi

### Storage and Handling

Standard Shelf Life for 3M™ Scotch-Weld™ Epoxy Adhesive E C - 3501 B/A is 12 months from the date of shipment from 3M when stored at 60 to 80°F (15 to 27°C) in its original unopened container.

During the storage, crystallization of the epoxy resin may occur, giving the epoxy resin (Part B) a grainy appearance. This condition is reversible by heating the adhesive typically in the range of 120 to 140 °F (49 to 60 °C) for about 15 to 30 minutes and return epoxy resin to a smooth appearance. No change in physical or mechanical properties will result from this reheating process.

### Precautionary Information

Refer to Product Label and 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, and visit [www.3m.com/3M/en\\_US/company-us/SDS-search/](http://www.3m.com/3M/en_US/company-us/SDS-search/)

### For Additional information

In the U.S., call toll free 1-800-235-2376, or fax 1-800-435-3082 or 651-737-2171. For U.S. Military, call 1-866-556-5714. If you are outside of the U.S., please contact your nearest 3M office or one of the following branches:

### Authorization to Use

Ensure products meet all applicable specifications, standards, and maintenance manual requirements for the platform being worked on and validate all aircraft approvals against current technical documentation.

*\*These products were manufacture under a 3M Quality Management System registered to the AS9100 standard*

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