3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR

Product Description

3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR is a two-component epoxy adhesive that cures at room temperature or with heat to form a tough, impact-resistance bond. It has excellent adhesion to many metal and plastic substrates with a work life of 4-8 minutes after mixing. It meets the 14 CFR 25.853 (a) (d), test requirements and is an ideal solution for many applications requiring a self-extinguishing structural epoxy adhesive system.

Scotch-Weld EC-3531 B/A FR Adhesive is a cream color adhesive designed for structural bonding of metal, honeycomb/composite structure and insert bonding

Key Features

- Cream color adhesive
- Meets the flammability requirements of 14 CFR 25.853 (a) (d)
- Easy mixing (duo-pack cartridges)
- 4 - 8 minute work life
- Available in dual-chamber cartridges for use with manual or pneumatic dispensing equipment
- Does not contain brominated or antimony-based flame retardants

General Information

3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR is designed for honeycomb sandwich constructions typically found in aircraft interiors such as galley structures, luggage bins, partition walls, lavatory structures, crew rest compartments, seating structures, ceiling panels, closets, stowage compartments, sidewall panels, cargo bay panels, bar units, coatrooms and passenger doors.

Product Description & Properties

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

	3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR	
	Part B	**Part A**
Chemistry	Epoxy	Amine
Color	White	Translucent
Typical Uncured Density	1.28 ± 0.02 g/cc (10.7 ± 0.2 lb/gal)	1.23 ± 0.02 g/cc (10.3 ± 0.2 lb/gal)
Mix Ratio by Weight	100	96
Mix Ratio by Volume	100	100
Viscosity @ 23°C ± 2°C (73°F ± 3°F)[1]	35,000 - 85,000 cps	40,000 - 100,000 cps
Color	Off-white[2]	
Cured Density	1.26 ± 0.02 g/cc (10.5 ± 0.2 lb/gal)	
Work Life @ 23°C ± 2°C (73°F ± 3°F) – 20 g mixed	4 - 8 minutes	
Shore D Hardness[3]	87	
Time to Handling Strength[4]	10 - 20 min @ 23°C ± 2°C (73°F ± 3°F)	
Cure Time[5]	24 - 48 h @ 23°C ± 2°C (73°F ± 3°F)	
Glass Transition Temperature (Tg)[6]	61°C (142°F)	

[1] Brookfield RVF #7 Spindle at 20 rpm

[2] Colors may vary from nearly white to yellow/amber. Adhesive performance is not affected by color variation

[3] ASTM D2240

[4] Time to develop 50 psi overlap shear properties

[5] Time to develop maximum overlap shear properties

[6] Determined using DSC and heating rate of 20°C (68°F)

Typical Product Performance

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

A. Overlap Shear/ Aluminum to Aluminum Bonds

The following data shows typical values obtained with 3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR in aluminum overlap shear bonds. All specimens were 2024-T3 bare aluminum panels which had been FPL etched and phosphoric acid anodized. Bonds were cured for 5 hours at 21°C - 27°C (70°F - 80°F) under 2 psi pressure and then post cured for 1 hour at 66°C (150°F) with no additional pressure. Sample preparation and testing was conducted per ASTM D1002-10.

Test Temperature	Result MPa (psi)
-55°C ± 2°C (-67°F ± 3°F)	14.8 (2150)
23°C ± 2°C (73°F ± 3°F)	24.1 (3500)
79°C ± 2°C (175°F ± 3°F)	11.0 (1600)
121°C ± 2°C (250°F ± 3°F)	2.3 (330)

B. Overlap Shear

The following data shows typical values obtained with Scotch-Weld EC-3531 B/A FR Adhesive in overlap shear bonds. Bonds were cured for 5 hours at 21°C - 27°C (70°F - 80°F) under 2 psi pressure and then post cured for 1 hour at 66°C (150°F) with no additional pressure. Sample preparation and testing was conducted per ASTM D1002-10.

Bonded Material	Test Temperature	Result MPa (psi)
Ultem® 1010[1]	23°C ± 2°C (73°F ± 3°F)	4.8 (700)
KYDEX™ 1000[2]		3.8 (550)

[1] Ultem® is a family of Polyetherimide (PEI) products. PEI is an amorphous, amber-to-transparent thermoplastic with characteristics similar to the related plastic PEEK. Ultem® resins have heat resistance, solvent resistance, flame resistance, high dielectric strength, natural flame resistance, and extremely low smoke generation.

[2] KYDEX™ is a line of thermoplastic acrylic-polyvinyl chloride materials. It is frequently used as an alternative to leather. Engineered for thermoforming fabrication, KYDEX™ sheet combines the advantageous properties of both the acrylic and the polyvinyl chloride components. From acrylic, it obtains superior rigidity and formability; from PVC, outstanding toughness, chemical resistance and good interior finish ratings.

C. Cured Compression

The compression testing was completed per ASTM D695-10. Specimens were machined to a nominal 0.50" ± 0.05" x 0.50" ± 0.05" x 1.00" ± 0.05" (width x length x height) from a larger homogeneous block of cured adhesive. Specimen Cure: 16 hours at 24°C (75ºF), 1 hour at 66°C (150ºF). Specimen Test Speed: 0.5 inch/min.

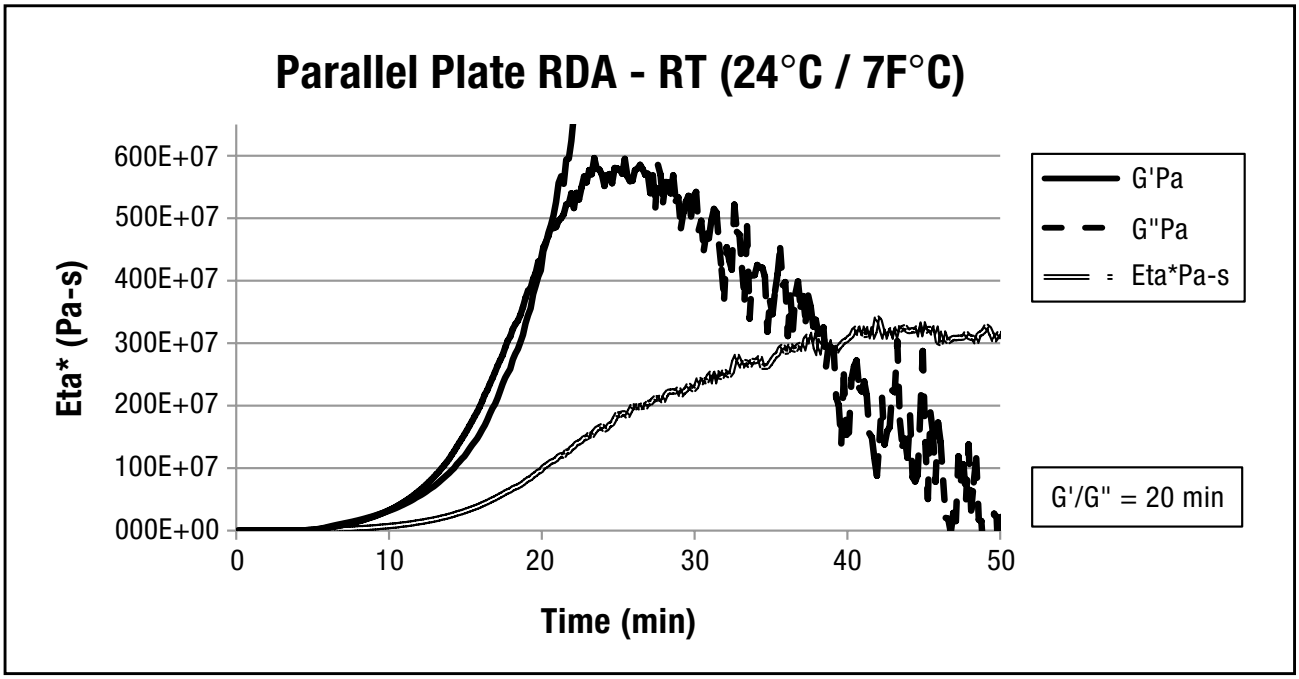
Test Temperature	Peak Load N (lbf)	Peak Stress MPa (psi)	Modulus (psi)
-55°C ± 2°C (-67°F ± 3°F)	24450 (5500)	15.2 (2200)	700
23°C ± 2°C (73°F ± 3°F)	11100 (2500)	67.6 (9800)	550
79°C ± 2°C (175°F ± 3°F)	1800 (400)	10.3 (1500)	18
121°C ± 2°C (250°F ± 3°F)	1100 (250)	6.2 (900)	11

Typical Product Performance (continued)

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

D. Parallel Plate RDA

Test Equipment: Rheometric Dynamic Analyzer (RDA)
1 Hz frequency, isothermal, 25 mm parallel plates, 1% initial strain, strain adjustment 100%.



Handling/Application Information

Directions for Use

For high strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. However, the amount of surface preparation necessary depends on the required bond strength and the environmental aging resistance desired by user. For specific surface preparations on some common substrates, see the section on surface preparation..

3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR is supplied in a dual syringe plastic duo-pak cartridge as part of the 3M™ EPX™ Applicator System. To use, simply insert the duo-pak cartridge into the EPX Applicator and start the plunger into the cylinders using light pressure on the trigger. Next, remove the duo-pak cartridge cap and expel a small amount of adhesive to be sure both sides of the duo-pak cartridge are flowing evenly and freely. If simultaneous mixing of Part A and Part B is desired, attach the EPX mixing nozzle to the duo-pak 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 Physical Uncured Properties section. Thorough mixing of the two components is required to obtain optimum properties.

Typical Product Application

Aluminum 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. Optimized FPL performed per ASTM D2651-01 and phosphoric acid anodization performed per ASTM D3933-98.

Primer Application:
Although 3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR gives excellent performance on unprimed surfaces, the use of 3M™ Scotch-Weld™ Structural Adhesive Primer EW-5000 corrosion inhibiting primer is suggested for maximum long-term durability and environmental resistance. See the Scotch-Weld EW-5000 Primer data sheet for complete application instructions. These primers must be cured for one hour at 121°C (250°F) prior to bonding. Review and follow MSDS prior to use.

Fiber Reinforced Epoxy Laminate Surface and Plastic Surface Preparation:
Abrade surfaces to be bonded with 180 grit sandpaper or a Scotch-Brite® General Purpose Hand Pad 7447 (do not cut through resin into reinforcing fibers). Wipe with clean rag or paper towel soaked with Ketone type solvent**** such as methyl ethyl ketone (MEK). Thoroughly dry the surface before application of the adhesive. A cleaned, dry, contamination free surface is essential for maximum performance. For repeatable results the epoxy adhesive and the surfaces should have a temperature between 20°C - 25°C (68°F -77°F).

Mixing:
3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR compound can be mixed manually or automatically (using static mixer, minimum 18 elements). For repeatable performance keep mixing ratio in a range of ± 5%.

Dual Cartridge application provides maximum accuracy and ease of handling. Scrap the first 2 cc or until you have a uniform color when using a new static mixer. From the start of mixing the work life refer to “Handability” on “Product Description & Properties” table above. For ease of extrudability the product should be at the temperature of 24°C (75°F) but not greater than 52°C (125°F).

Adhesive Cure Conditions:
A minimum cure time of 48 hours at room temperature or 24 hours at room temperature followed with a 1 hour at 66°C (150°F) post cure cycle to obtain the optimum mechanical properties of the product. Heat application accelerates the curing cycle.

Clean up of Epoxy Adhesive:
Uncured epoxy adhesive can be wiped with solvent e.g. Methylethyl-ketone (M.E.K).**** Cured material can be cleanly removed mechanically.

****Note:** When using solvents, extinguish all ignition sources, including pilot lights, and follow the manufacturer’s precautions and direction for use. Use solvents in accordance with local regulations.

Storage Stability

Storage Stability - Store 3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR between 7°C and 25°C (44°F and 77°F) in original unopened container. Rotate stock on “first in - first out” basis.

Shelf Life

Standard shelf life for 3M™ Scotch-Weld™ Epoxy Adhesive EC-3531 B/A FR is 15 months from date of shipment when stored between 7°C and 25°C (44°F and 77°F) in original unopened container.

Precautionary Information

Refer to Product Label and Safety Data Sheet (SDS) for health and safety information before using this product. For additional health and safety information, please visit www.3Ms.com/msds or call 1-800-364-3577 or (651) 737-6501.

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:

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Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use

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This product was manufactured under a 3M Quality Management System registered to the AS9100 standard.

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