



Technical Data Sheet

3M™ Scotch-Weld™ Epoxy Adhesive 2216
B/A Gray



Product Details



Regulatory Info/SDS

Product Description

3M™ Scotch-Weld™ Epoxy Adhesive 2216 B/A is a flexible, two-part, room temperature curing epoxy with high peel and shear strength, available in three versions. 2216 B/A Gray meets DOD-A-82720.

Product Features

- Excellent for bonding many metals, woods, plastics, rubbers, and masonry products.
- Base and Accelerator are contrasting colors.
- Good retention of strength after environmental aging.
- Resistant to extreme shock, vibration, and flexing.
- Excellent for cryogenic bonding applications.
- Excellent for potting parts subject to thermal cycling.
- The tan NS Adhesive is non-sag for greater bond-line control.
- The translucent can be injected.
- Meets DOD-A-82720.

Technical Information Note

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

Typical Uncured Physical Properties

Attribute Name	Value
Mix Ratio by Volume (B:A)	2:3
Mix Ratio by Weight (B:A)	5:7

Attribute Name	Temperature	Value
Base Color		White
Accelerator Color		Gray
Base Resin		Modified Epoxy
Accelerator Resin		Modified Amine
Base Net Weight		1.33 – 1.39 g/cm ³ (11.1 – 11.6 lb/gal)
Accelerator Net Weight		1.26 – 1.32 g/cm ³ (10.5 – 11.0 lb/gal)
Base Viscosity	23 °C (73 °F)	75,000-150,000 cP ¹
Accelerator Viscosity	23 °C (73 °F)	40,000-80,000 cP ¹

¹ Brookfield RVF #7 spindle at 20 rpm.

Typical Mixed Physical Properties

Attribute Name	Temperature	Value
Open Time		90 min ¹
Time to Full Cure	66 °C (150 °F)	120 min
Time to Full Cure	93 °C (200 °F)	30 min
Worklife, 100g mixed	23 °C (73 °F)	90 min
Time to Handling Strength	23 °C (73 °F)	8 – 12 h

Attribute Name	Temperature	Value
Time to Full Cure	23 °C (73 °F)	7 d

¹ Max time allowed after applying adhesive to a substrate before bond must be closed and fixed. Cure times approximate and depend on adhesive temperature. Hotmelts: The approx. bonding range of a 3.2 mm (1/8 in) bead of molten adhesive on a non-metallic surface.

Typical Physical Properties

Attribute Name	Value
Cured Color	Gray

Typical Cured Characteristics

Shear Modulus

Substrate: Etched Aluminum

Temperature: 66 °C (150 °F)

Dwell Time: 2 h

Test Method: ASTM D1002, ISO 4587

Environmental Condition: +14 kPa (+2 psi)

Test Condition	Value
-100 °C (-148°F)	2745 MPa (398000 lb/in ²)
-60 °C (-76 °F)	2199 MPa (318855 lb/in ²)
-40 °C (-40 °F)	1947 MPa (282315 lb/in ²)
23 °C	342 MPa (49580 lb/in ²)
0 °C (32 °F)	1500 MPa (218805 lb/in ²)

Temperature: 23 °C (73 °F)

Attribute Name	Test Method	Value
Shore D Hardness	ASTM D2240	57

Outgassing Data

Temperature: 23 °C (73 °F)

Dwell Time: 7 d

Test Method: NASA 1124 Revision 4

Test Condition	Value
% CVCM	0.04
% TML	0.77
% Wtr	0.23

Typical Performance Characteristics

Temperature: 23 °C (73 °F)

Attribute Name	Test Method	Value
T-Peel Adhesion	ASTM D1876	44 N/cm (25 lb/in)

Electrical and Thermal Properties

Attribute Name	Test Condition	Value
Coefficient of Thermal Expansion	40 ~ 80 °C	134 x 10 ⁻⁶ m/m/°C
Thermal Conductivity		0.3943 W/m/K (0.228 (btu-ft)/(h-ft ² -°F))

Attribute Name	Test Method	Temperature	Test Condition	Value
Dielectric Constant	ASTM D150	23 °C (73 °F)	1 KHz	5.51
Dissipation Factor	ASTM D150	23 °C (73 °F)	1 KHz	0.112
Surface Resistivity	ASTM D257		@ 500 volts DC, Room Temperature	5.5 x 10 ¹⁶ Ω
Volume Resistivity	ASTM D257	23 °C (73 °F)		1.9 x 10 ¹² Ω-cm
Arc Resistance	ASTM D495			130 s

Handling/Application Information

Directions for Use

1. 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 directly depends on the required bond strength and the environmental aging resistance desired by user. For suggested surface preparations of common substrates, see the following section on surface preparation.
 2. These products consist of two parts. Mix thoroughly by weight or volume in the proportions specified on the product label and in the uncured properties section. Mix approximately 15 seconds after a uniform color is obtained.
 3. For maximum bond strength, apply product evenly to both surfaces to be joined.
 4. Application to the substrates should be made within 90 minutes. Larger quantities and/or higher temperatures will reduce this working time.
 5. Join the adhesive coated surfaces and allow to cure at 60°F (16°C) or above until firm. Heat, up to 200°F (93°C), will speed curing.
 6. Keep parts from moving until handling strength is reached. Contact pressure is necessary. Maximum shear strength is obtained with a 3-5 mil bond line. Maximum peel strength is obtained with a 17-25 mil bond line.
 7. Excess uncured adhesive can be cleaned up with ketone type solvents.* Adhesive Coverage: A 0.005 in thick bondline will typically yield a coverage of 320 sq. ft/gallon
- *When using solvents, extinguish all ignition sources, including pilot lights, and follow the manufacturer's precautions and directions for use. Use solvents in accordance with local regulations.

Surface Preparation

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 directly depends on the required bond strength and the environmental aging resistance desired by user.

The following cleaning methods are suggested for common surfaces.

Steel or Aluminum (Mechanical Abrasion)

1. Wipe free of dust with oil-free solvent such as acetone or alcohol solvents.
2. Sandblast or abrade using clean fine grit abrasives (180 grit or finer).
3. Wipe again with solvents to remove loose particles.
4. If a primer is used, it should be applied within 4 hours after surface preparation.

Aluminum (Chemical Etch)

Aluminum alloys may be chemically cleaned and etched as per ASTM D 2651. This procedure states to:

1. Alkaline Degrease - Oakite 164 solution (9-11 oz/gal of water) at 190°F ± 10°F (88°C ± 5°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

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 etch aluminum panels, place them in FPL etch solution heated to 66 to 71°C (150 to 160°F). Panels should soak for 12 to 15 minutes.

3. Rinse: Rinse panels in clear running tap water.
4. Dry: Air dry 15 minutes; force dry 10 minutes (minimum) at 140°F (60°C) maximum.
5. If primer is to be used, it should be applied within 4 hours after surface preparation.

Plastics/Rubber

1. Wipe with isopropyl alcohol.

2. Abrade using fine grit abrasives (180 grit or finer).
3. Wipe with isopropyl alcohol.

Glass

1. Solvent wipe surface using acetone or MEK.
2. Apply a thin coating (0.0001 in. or less) of 3M™ Scotch-Weld™ Structural Adhesive Primer EC-3901 to the glass surfaces to be bonded and allow the primer to dry a minimum of 30 minutes @ 75°F (24°C) before bonding.

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

Application Techniques

These products may be applied by spatula, trowel or flow equipment. Two-part mixing/proportioning/dispensing equipment is available for intermittent or production line use. These systems are ideal because of their variable shot size and flow rate characteristics and are adaptable to many applications.

Industry Specifications

UL 94 HB
DOD-A-82720

Storage and Shelf Life

Store under normal conditions of 16° to 27°C (60° to 80°F) in the original, unopened packaging, out of direct sunlight. For best performance, use this product within 24 months from date of manufacture.

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

Automotive Disclaimer

Select Automotive Applications:

This product is an industrial product and has not been designed or tested for use in certain automotive applications, such as automotive electric powertrain battery or high voltage applications, which may require the product to be manufactured in a IATF certified facility, meet a Ppk of 1.33 for all properties, undergo an automotive production part approval process (PPAP), or fully adhere to automotive design or quality system requirements (e.g., IATF 16949 or VDA 6.3). Customer assumes all responsibility and risk if customer chooses to use this product in these applications.

Information

Technical Information: The technical information, guidance, and other statements contained in this document or otherwise provided by 3M are based upon records, tests, or experience that 3M believes to be reliable, but the accuracy, completeness, and representative nature of such information is not guaranteed. Such information is intended for people with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license under any 3M or third party intellectual property rights is granted or implied with this information.

Product Selection and Use: Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. As a result, customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment and reviewing all applicable regulations and standards (e.g., OSHA, ANSI, etc.). Failure to properly evaluate, select, and use a 3M product and appropriate safety products, or to meet all applicable safety regulations, may result in injury, sickness, death, and/or harm to property.

Warranty, Limited Remedy, and Disclaimer: Unless a different warranty is specifically stated on the applicable 3M product packaging or product literature (in which case such warranty governs), 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. If a 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price. Warranty claims must be made within one (1) year from the date of 3M's shipment.

Limitation of Liability: Except for the limited remedy stated above, and except to the extent prohibited by law, 3M will not be liable for any loss or damage arising from or related to the 3M product, whether direct, indirect, special, incidental, or consequential (including, but not limited to, lost profits or business opportunity), regardless of the legal or equitable theory asserted, including, but not limited to, warranty, contract, negligence, or strict liability.

Disclaimer: 3M industrial and occupational products are intended, labeled, and packaged for sale to trained industrial and occupational customers for workplace use. Unless specifically stated otherwise on the applicable product packaging or literature, these products are not intended, labeled, or packaged for sale to or use by consumers (e.g., for home, personal, primary or secondary school, recreational/sporting, or other uses not described in the applicable product packaging or literature), and must be selected and used in compliance with applicable health and safety regulations and standards (e.g., U.S. OSHA, ANSI), as well as all product literature, user instructions, warnings, and limitations, and the user must take any action required under any recall, field action or other product use notice. Misuse of 3M industrial and occupational products may result in injury, sickness, or death. For help with product selection and use, consult your on-site safety professional, industrial hygienist, or other subject matter expert. For additional product information, visit www.3M.com.

ISO Statement

This product was manufactured under a 3M quality system registered to ISO 9001 standards.