Technical Data Sheet

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

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 Mixed Physical Properties

Property	Values	Additional Information
Open Time (min)	90 min	View
Notes: 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 1/8" bead of molten adhesive on a non-metallic surface.		
Worklife, 100g mixed	90 min	View
Temp C: 23C Temp F: 73F		
Time to Handling Strength	8 to 12 hr	View
Temp C: 23C Temp F: 73F		
Time to Full Cure	7 day	View
Temp C: 23C Temp F: 73F		
Time to Full Cure	120 min	View

Temp C: 66C
Temp F: 150F

Time to Full Cure	30 min	View

Temp C: 93C
Temp F: 200F

Typical Physical Properties

Property	Values	Additional Information
Color	Gray	View

Test Name: Cured

Typical Uncured Physical Properties

Property	Values	Additional Information
Base Color	White	
Accelerator Color	Gray	
Base Viscosity	75,000-150,000 cP	View

Temp C: 23C
Temp F: 72F

Notes: Brookfield RVF #7 spindle at 20 rpm.

Accelerator Viscosity	40,000-80,000 cP	View

Temp C: 23C
Temp F: 72F

Notes: Brookfield RVF #7 spindle at 20 rpm.

Base Resin	Modified Epoxy
Accelerator Resin	Modified Amine
Base Net Weight	11.1 to 11.6 lb/gal
Accelerator Net Weight	10.5 to 11.0 lb/gal
Mix Ratio by Volume (B:A)	2:3

Mix Ratio by Weight (B:A)	5:7

Typical Cured Characteristics

Property	Values	Additional Information
Shore D Hardness	57	View

Test Method: ASTM D2240

Temp C: 23C

Temp F: 73F

Outgassing Data	0.77	View

Test Method: NASA 1124 Revision 4

Dwell/Cure Time: 7.0
Dwell Time Units: day
Temp C: 23C
Temp F: 72F
Test Condition: % TML

Outgassing Data	0.04	View

Test Method: NASA 1124 Revision 4

Dwell/Cure Time: 7.0
Dwell Time Units: day
Temp C: 23C
Temp F: 72F
Test Condition: % CVCM

Outgassing Data	0.23	View

Test Method: NASA 1124 Revision 4

Dwell/Cure Time: 7.0
Dwell Time Units: day
Temp C: 23C
Temp F: 72F
Test Condition: % Wtr

Shear Modulus	2745 MPa	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ -148°F(-100°C)
Substrate: Etched Aluminum

Shear Modulus	398000 lb/in²	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ -148°F(-100°C)
Substrate: Etched Aluminum

Shear Modulus	2199 MPa	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ -76°F(-60°C)
Substrate: Etched Aluminum

Shear Modulus	318855 lb/in²	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ -76°F(-60°C)
Substrate: Etched Aluminum

Shear Modulus	1947 MPa	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ -40°F(-40°C)
Substrate: Etched Aluminum

Shear Modulus	282315 lb/in²	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ -40°F(-40°C)
Substrate: Etched Aluminum

Shear Modulus	1500 MPa	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ 32°F(0°C)
Substrate: Etched Aluminum

Shear Modulus	218805 lb/in²	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: @ 32°F(0°C)
Substrate: Etched Aluminum

Shear Modulus	342 MPa	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: Room Temperature
Substrate: Etched Aluminum

Shear Modulus	49580 lb/in²	View

Test Method: ASTM D1002

Dwell/Cure Time: 2.0
Dwell Time Units: hr
Temp C: 66C
Temp F: 150F
Environmental Condition: +2 psi
Test Condition: Room Temperature
Substrate: Etched Aluminum

Electrical and Thermal Properties

Property	Values	Additional Information
Dielectric Constant 1KHz	5.51	View

Test Method: ASTM D150

Temp C: 23C
Temp F: 72F
Test Condition: 1 KHz

Dissipation Factor 1KHz	0.112	View

Test Method: ASTM D150

Temp C: 23C
Temp F: 72F
Test Condition: 1 KHz

Thermal Conductivity	0.228 (btu-ft)/(h-ft²-°F)

Volume Resistivity	1.9 x 10^12 Ω-cm	View

Test Method: ASTM D257

Temp C: 23C
Temp F: 73F

Surface Resistivity	5.5 x 10^16 Ω	View

Test Method: ASTM D257

Test Condition: @ 500 volts DC, Room Temperature

Coefficient of Thermal Expansion	102 x 10^-6 m/m/°C	View

Test Condition: between 0-40°C

Coefficient of Thermal Expansion	134 x 10^-6 m/m/°C	View
Test Condition: between 40-80°C		
Arc Resistance	130 s	View
Test Method: ASTM D495		

Typical Performance Characteristics

Property	Values	Additional Information
T-Peel Adhesion 23C	25 lb/in	View
Test Method: ASTM D1876 Test Name: T-Peel Adhesion Temp C: 23C Temp F: 73F		

Storage and Shelf Life

Store products at 60-80°F (16-27°C) for maximum storage life.

When stored at the recommended temperatures in the original, unopened containers, the shelf life is 24 months from date of manufacture from 3M.

Industry Specifications

UL 94 HB

DOD-A-82720

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.

Bottom Matter

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Trademarks

3M and Scotch-Weld are trademarks of 3M Company.

Handling/Application Information

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.

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.

References

Property	Values
3m.com Product Page	https://www.3m.com/3M/en_US/p/d/b40066446/
Safety Data Sheet SDS	https://www.3m.com/3M/en_US/company-us/SDS-search/results/?gsaAction=msdsSRA&msdsLocale=en_US&co=ptn&q=2216 B/A Gray

Family Group

Link Tags:

2216 B/A Gray | 2216 B/A Tan NS | 2216 B/A Translucent

Products	Open Time (min)	Color	Time to Handling Strength	Shore D Hardness
2216 B/A Gray	90 min	Gray	8 to 12 hr	57
2216 B/A Tan NS	120 min	Tan	N/A	67
2216 B/A Translucent	N/A	N/A	N/A	N/A

ISO Statement

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001 standards.

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.

Information

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