Technisches Datenblatt

Produkt:	2216
Hersteller:	3M DEUTSCHLAND GMBH
Warengruppe:	KLEBSTOFF
Artikelgruppe:	2-K KLEBSTOFF
Download:	28.03.2024

SCOTCH-WELD 2216 B/A

Dieses Datenblatt wurde Ihnen von der Firma tewipack Uhl GmbH zur Verfügung gestellt. Die Firma tewipack Uhl GmbH übernimmt keinerlei Verantwortung für die Aktualität und die Richtigkeit der enthaltenen Informationen. Die Eigenschaften der Produkte können sich aufgrund verschiedener Einflüsse wie beispielsweise Zusammensetzung und Zustand des Substrats, Unreinheiten in oder auf dem Substrat, Temperatur und Luftfeuchtigkeit bei der Lagerung und Umgebungsbedingungen während der Anwendung ändern. Bei Verwendung dieses Produkts in Kombination mit anderem Material ist der Kunde dafür verantwortlich, durch eigene Tests zu prüfen, ob das Produkt für die geplante Kombination geeignet ist und ob diese Kombination die erwarteten Ergebnisse liefert

tewipack Uhl GmbH
Industriestraße 15
D-75382 Althengstett

Telefon:
+49(0)7051/9297-0
Telefax:
+49(0)7051/9297-99

E-Mail:
info@tewipack.de
Internet:
www.tewipack.de

Geschäftsführer:
Alexander Uhl, Michael Uhl
HRB 330424
Amtsgericht Stuttgart

Bankverbindungen:
Sparkasse
Pforzheim Calw
BLZ 666 500 85
Konto 17 787

Commerzbank
Sindelfingen
BLZ 603 400 71
Konto 8 001 166

Vereinigte Volksbank AG
Böblingen
BLZ 603 900 00
Konto 80 089 003

Postbank
Stuttgart
BLZ 600 100 70
Konto 146 294 70

3M

Scotch-Weld™

Epoxy Adhesive

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

Technical Data **March, 2002**

Product Description

3M™ Scotch-Weld™ Epoxy Adhesive 2216 B/A Gray, Tan NS and Translucent are flexible, two-part, room temperature curing epoxies with high peel and shear strengths.

Advantages

- 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.
- 2216 B/A Gray Adhesive meets MIL-A-82720 and DOD-A-82720.
- 2216 B/A Tan NS Adhesive is non-sag for greater bondline control.
- 2216 B/A Translucent can be injected.

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.

Product	2216 B/A Gray		2216 B/A Tan NS		2216 B/A Translucent	
	Base	Accelerator	Base	Accelerator	Base	Accelerator
Color:	White	Gray	White	Tan	Translucent	Amber
Base:	Modified Epoxy	Modified Amine	Modified Epoxy	Modified Amine	Modified Epoxy	Modified Amine
Net Wt.: (lb/gal)	11.1-11.6	10.5-11.0	11.1-11.6	10.5-11.0	9.4-9.8	8.0-8.5
Viscosity: (cps) (Approx.) Brookfield RVF #7 sp. @ 20 rpm	75,000 - 150,000	40,000 - 80,000	75,000 - 150,000	550,000 - 900,000	11,000 - 15,000	5,000 - 9,000
Mix Ratio: (by weight)	5 parts	7 parts	5 parts	7 parts	1 part	1 part
Mix Ratio: (by volume)	2 parts	3 parts	2 parts	3 parts	1 part	1 part
Work Life: 100 g Mass @ 75°F (24°C)	90 minutes	90 minutes	120 minutes	120 minutes	120 minutes	120 minutes

Scotch-Weld™
Epoxy Adhesives
2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

Typical Cured Physical Properties

Product	2216 Gray	2216 Tan NS	2216 Translucent
Color	Gray	Tan	Translucent
Shore D Hardness ASTM D 2240	50-65	65-70	35-50
Time to Handling Strength	8-12 hrs.	8-12 hrs.	12-16 hrs.

Typical Cured Electrical Properties

Product	2216 Gray	2216 Translucent
Arc Resistance	130 seconds	
Dielectric Strength	408 volts/mil	630 volts/mil
Dielectric Constant @ 73°F (23°C)	5.51–Measured @ 1.00 KHz	6.3 @ 1 KHz
Dielectric Constant @ 140°F (60°C)	14.17–Measured @ 1.00 KHz	—
Dissipation Factor 73°F (23°C)	0.112 Measured @ 1.00 KHz	0.119 @ 1 KHz
Dissipation Factor 140°F (60°C)	0.422–Measured @ 1.00 KHz	—
Surface Resistivity @ 73°F (23°C)	5.5×10^{16} ohm–@ 500 volts DC	—
Volume Resistivity @ 73°F (23°C)	1.9×10^{12} ohm-cm–@ 500 volts DC	3.0×10^{12} ohm-cm @ 500 volts DC

Typical Cured Thermal Properties

Product	2216 Gray	2216 Translucent
Thermal Conductivity	0.228 Btu-ft/ft²h°F	0.114 Btu-ft/ft²h°F
Coefficient of Thermal Expansion	102×10^{-6} in/in/°C between 0-40°C 134×10^{-6} in/in/°C between 40-80°C	81×10^{-6} in/in/°C between -50-0°C 207×10^{-6} in/in/°C between 60-150°C

Typical Cured Outgassing Properties

Outgassing Data
NASA 1124 Revision 4

	% TML	% CVCM	% Wtr
2216 Gray	.77	.04	.23

2216 Gray was cured in air for 7 days @ 77°F (25°C).

Handling/Curing 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.

Handling/Curing Information *(continued)*

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. The following times and temperatures will result in a full cure:

Product	2216 Gray	2216 Tan NS	2216 Translucent
Cure Temperature	**Time**	**Time**	**Time**
75°F (24°C)	7 days	7 days	30 days
150°F (66°C)	120 minutes	120 minutes	240 minutes
200°F (93°C)	30 minutes	30 minutes	60 minutes

7. 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.
8. 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

Application and Equipment Suggestions

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.

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. If 3M™ Scotch-Weld™ Structural Adhesive Primer EC-1945 B/A is used, apply a thin coating (0.0005") on the metal surfaces to be bonded, air dry for 10 minutes, then cure for 30 minutes at 180°F (82°C) prior to bonding.

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

Surface Preparation ***(continued)***

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 and follow the manufacturer's precautions and directions for use. Use solvents in accordance with local regulations.

Typical Adhesive Performance Characteristics

A. Typical Shear Properties on Etched Aluminum
ASTM D 1002
Cure: 2 hours @ 150 ± 5°F (66°C ± 2°C), 2 psi pressure

	Overlap Shear (psi)		
Test Temperature	**2216 B/A Gray Adhesive**	**2216 B/A Tan NS Adhesive**	**2216 B/A Trans. Adhesive**
-423°F (-253°C)	2440	—	—
-320°F (-196°C)	2740	—	—
-100°F (-73°C)	3000	—	—
-67°F (-53°C)	3000	2000	3000
75°F (24°C)	3200	2500	1700
180°F (82°C)	400	400	140

Test Temperature	Shear Modulus (Torsion Pendulum Method)
-148°F (-100°C)	398,000 psi (2745 MPa)
-76°F (-60°C)	318,855 psi (2199 MPa)
-40°F (-40°C)	282,315 psi (1947 MPa)
32°F (0°C)	218,805 psi (1500 MPa)
75°F (24°C)	49,580 psi (342 MPa)

B. Typical T-Peel Strength
ASTM D 1876

	T-Peel Strength (piw) @ 75°F (24°C)		
Test Temperature	**2216 B/A Gray Adhesive**	**2216 B/A Tan NS Adhesive**	**2216 B/A Trans. Adhesive**
75°F (24°C)	25	25	25

Typical Adhesive Performance Characteristics (*continued)*

C. Overlap Shear Strength After Environmental Aging-Etched Aluminum

		Overlap Shear (psi) 75°F (24°C)		
Environment	**Time**	**2216 B/A Gray Adhesive**	**2216 B/A Tan NS Adhesive**	**2216 B/A Trans. Adhesive**
100% Relative Humidity @ 120°F (49°C)	14 days 30 days 90 days	2950 psi 1985 psi 1505 psi	3400 psi 2650 psi	1390 psi
*Salt Spray @ 75°F (24°C)	14 days 30 days 60 days	2300 psi 500 psi 300 psi	3900 psi 3300 psi	1260 psi
Tap Water @ 75°F (24°C)	14 days 30 days 90 days	3120 psi 2942 psi 2075 psi	3250 psi 2700 psi	1950 psi
Air @ 160°F (71°C)	35 days	4650 psi	4425 psi	
Air @ 300°F (149°C)	40 days	4930 psi	4450 psi	3500 psi
Anti-icing Fluid @ 75°F (24°C)	7 days	3300 psi	3050 psi	2500 psi
Hydraulic Oil @ 75°F (24°C)	30 days	2500 psi	3500 psi	2500 psi
JP-4 Fuel	30 days	2500 psi	2750 psi	2500 psi
Hydrocarbon Fluid	7 days	3300 psi	3100 psi	3000 psi

*Substrate corrosion resulted in adhesive failure.

D. Heat Aging of 2216 B/A Gray
(Cured for 7 days @ 75°F [24°C])

Overlap Shear (psi)	**Time aged @ 300°F (149°C)**			
Test Temperature	**0 days**	**12 days**	**40 days**	**51 days**
-67°F (-53°C)	2200	3310	3120	2860
75°F (24°C)	3100	5150	4930	4740
180°F (82°C)	500	1000	760	1120
350°F (177°C)	420	440	560	—

Typical Adhesive Performance Characteristics (*continued)*

E. Overlap Shear Strength on Abraded Metals, Plastics, and Rubbers.

Overlap shear strengths were measured on 1" x 1/2" overlap specimens. These bonds were made individually using 1" by 4" pieces of substrate (Tested per ASTM D 1002).

The thickness of the substrates were: cold rolled, galvanized and stainless steel – 0.056-0.062", copper – 0.032", brass – 0.036", rubbers – 0.125", plastics – 0.125". All surfaces were prepared by solvent wiping/abrading/ solvent wiping.

The jaw separation rate used for testing was 0.1 in/min for metals, 2 in/min for plastics, and 20 in/min for rubbers.

	Overlap Shear (psi) @ 75°F (24°C)	
Substrate	**2216 B/A Gray Adhesive**	**2216 B/A Tan NS Adhesive**
Aluminum/Aluminum	1850	2350
Cold Rolled Steel/Cold Rolled Steel	1700	3100
Stainless Steel/Stainless Steel	1900	
Galvanized Steel/Galvanized Steel	1800	
Copper/Copper	1050	
Brass/Brass	850	
Styrene Butadiene Rubber/Steel	200*	
Neoprene Rubber/Steel	220*	
ABS/ABS Plastic	990*	1140*
PVC/PVC, Rigid	940*	
Polycarbonate/Polycarbonate	1170*	1730*
Acrylic/Acrylic	1100*	1110*
Fiber Reinforced Polyester/ Reinforced Polyester	1660*	1650*
Polyphenylene Oxide/PPO	610	610
PC/ABS Alloy / PC/ABS Alloy	1290	1290

*The substrate failed during the test.

Storage and Shelf Life

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

Shelf Life: When stored at the recommended temperatures in the original, unopened containers, the 3M Standard shelf life is two years from date of shipment from 3M.

Note

2216 B/A is identical to 3M™ Scotch-Weld™ Epoxy Adhesive EC-2216 B/A in chemical composition. EC-2216 B/A has been labeled, packaged, tested, and certified for aircraft and aerospace applications. 2216 B/A may be used for aircraft and aerospace applications if proper Certificates of Test have been issued and material meets all aircraft manufacturer's specification requirements.

Scotch-Weld™
Epoxy Adhesives
2216 B/A Gray • 2216 B/A Tan NS • 2216 B/A Translucent

Precautionary Information

Refer to Product Label and Material Safety Data Sheet for Health and Safety Information before using this product.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-362-3550 or visit www.3M.com/adhesives. Address correspondence to: 3M Engineered Adhesives Division, 3M Center, Building 220-7E-01, St. Paul, MN 55144-1000. Our fax number is 651-733-9175. In Canada, phone: 1-800-364-3577. In Puerto Rico, phone: 1-787-750-3000. In Mexico, phone: 52-70-04-00.

Important Notice

3M MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's method of application. Please remember that many factors can affect the use and performance of a 3M product in a particular application. The materials to be bonded with the product, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a 3M product. Given the variety of factors that can affect the use and performance of a 3M product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

Limitation of Remedies and Liability

If the 3M product is proved to be defective, THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M PRODUCT. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including, but not limited to, contract, negligence, warranty, or strict liability.

ISO 9002

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

3M

Engineered Adhesives Division
3M Center, Building 220-7E-01
St. Paul, MN 55144-1000

Recycled Paper
40% pre-consumer
10% post-consumer

Printed in U.S.A.
©3M 2002 78-6900-9583-7 (3/02)