November, 2013

3M™ Scotch-Weld™ Epoxy Adhesive 2214 Regular

Product Description

• One part 250°F (121°C) curing 100% solids, 3M™ Scotch-Weld™ Epoxy Adhesive 2214 is a paste consistency epoxy adhesive designed for bonding metals and many high temperature plastics such as fiberglass reinforced plastic, polyester, and phenolics.
• 3M™ Scotch-Weld™ Adhesive 2214 Regular is an aluminum filled general purpose product for use in applications where high strength bonds are needed in a temperature range of -67°F to 250°F (-53°C to 121°C).
• Recognized as meeting UL 94 HB

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

Property	Values	Notes
Color	Gray	
Viscosity	60 to 200 s	Time to deliver 20 gms@ 50 psi thru a 0.10in orifice
Viscosity	>1,000,000 cP	Because of Thixotropic paste nature of these products Brookfield viscosity will be over 1,000,000 cps.
Base	Modified Epoxy	
Net Weight	12 lb/gal	

Typical Mixed Physical Properties

Time to Full Cure: 40 min

Conditions
Test Condition : @ 250°F(121°C)

Typical Cured Characteristics

Property	Values	Test Condition	Method
Modulus	750000 lb/in²		
Tensile Strength at Break	10000 lb/in²		
Color	Gray	Cured	
Shore D Hardness	85	Room Temperature	ASTM D2240

Typical Performance Characteristics

Property	Values	Method	Test Condition	Substrate	Notes	Substrate Notes	Surface Preparation
Elongation at Break	<2 %						
T-Peel Adhesion	5 lb/in width	ASTM D1876	Room Temperature	Aluminum	T-Peel bonds were measured on 1 in. wide specimens cut from two FPL etched 8 in. x 8 in. x .032 in., 2024 T3 clad aluminum panels bonded together. The separation note of the testing jaws was 20 in./minute.		

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Typical Performance Characteristics (continued)

Property	Values	Method	Test Condition	Substrate	Notes	Substrate Notes	Surface Preparation
T-Peel Adhesion	50 lb/in width	ASTM D1876	Room Temperature	Steel	T-Peel bonds were measured on two 1" wide x 8" long specimens bonded together. After bonding they were then pulled apart in 180° Peel at a jaw separation rate of 20"/minute rate.	0.035in thick	MEK wipe

Overlap Shear Strength (On Aluminum)	Test Condition
3000 lb/in²	@ -67°F(-55°C)
4500 lb/in²	Room Temperature
4500 lb/in²	@ 180°F(82°C)
1500 lb/in²	@ 250°F(121°C)
600 lb/in²	@ 300°F(149°C)
400 lb/in²	@ 350°F(177°C)

Property: Overlap Shear Strength (On Aluminum)
Method: ASTM D1002
Substrate: FPL Etched Aluminum
notes: Overlap shear strength was measured on FPL etched 1 in. wide by 1/2 in. overlap specimens. The bonds were made from 2 panels of 4 in. x 7 in. x .063 in., 2024 T3 clad aluminum bonded together and cut into 1 in. wide specimens. The separation rate of the testing jaws was .1 in./minute.

Overlap Shear Strength (On Steel)	Test Condition
3000 lb/in²	@ -67°F(-55°C)
2500 lb/in²	Room Temperature
2000 lb/in²	@ 180°F(82°C)
800 lb/in²	@ 250°F(121°C)
200 lb/in²	@ 300°F(149°C)
100 lb/in²	@ 350°F(177°C)

Property: Overlap Shear Strength (On Steel)
Method: ASTM D1002
Substrate: Cold Rolled Steel
Surface Preparation: MEK wipe
notes: Overlap shear strength was measured on 1" wide by 1/2" overlap specimens. These bonds were made on 1" x 4" x .035" thick cold rolled steel. The separation rate of the testing jaws was .1"/min.

Environmental Resistance (OLS)	Environmental Condition
4630 lb/in²	Tap Water @ Room Tempterature
1900 lb/in²	100% Relative Humidity @ 120°F(49°C)
4690 lb/in²	Ethyl Gasoline @Room Tempterature

Property: Environmental Resistance (OLS)
Method: ASTM D1002
Substrate: FPL Etched Aluminum
notes: The following data is overlap shear after aging for 365 days in the specified environment.

Electrical and Thermal Properties

Dielectric Constant	Test Condition
10.5	Power Range 1.00 KC @ Room Temperature
11.1	Power Range 1.00 KC @ 140°F(60°C)
16.7	Power Range 1.00 KC @ 194°F(90°C)
24	Power Range 1.00 KC @ 219°F(104°C)

Property: Dielectric Constant
Method: ASTM D150

Dissipation Factor	Test Condition
0.126	Power Range 1.00 KC @ Room Temperature
0.463	Power Range 1.00 KC @ 140°F(60°C)
0.346	Power Range 1.00 KC @ 194°F(90°C)
0.515	Power Range 1.00 KC @ 219°F(104°C)

Property: Dissipation Factor
Method: ASTM D150

Property	Values	Test Condition	Method
Thermal Conductivity (k value)	0.231 (btu-ft)/(h-ft²-°F)		
Coefficient of Thermal Expansion	49 × 10^-6 m/m/°C	between 0 - 80°C	
Arc Resistance	76 s		ASTM D495

Handling/Application Information

Application Equipment

These products may be applied by spatula, trowel, or flow equipment.
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 most applications. For more information, contact your local 3M sales representative.
Note: Minimum pumping temperature is 65°F (18°C) for all products.
3M™ Scotch-Weld™ Epoxy Adhesive 2214 Regular Production Extrusion Equipment
- Pump: Ratio 55:1 with a chopping check valve and priming piston, 8 in. air motor. 3.7in³ cycle
- Ram: Pneumatic type capacity-12 psi on material surface
- Hose: Super high pressure with standard lining
- Flow Gun: High pressure type

Output based on 1/4 in tip flow gun (material temperature 65°F [18°C]) (minimum pumping temperature is 65°F [18°C])

Hose Assembly	Material Pressure (psi)	(Output lb/min)
Length-20', I.D.-1/2 in	4800*	.36
Length-20', I.D.-3/4 in	4800*	1.0

3M™ Scotch-Weld™ Epoxy Adhesive 2214 Non-Metallic Filled Production Extrusion Equipment
- Pump: Ratio 38:1 with a chopping check valve and priming piston
- Ram: Pneumatic type capacity-10 psi on material surface
- Hose: Super high pressure with standard lining
- Flow Gun: High pressure type

Output based on 1/4 in tip flow gun (material temperature 65°F [18°C]) (minimum pumping temperature is 65°F [18°C])

Hose Assembly	Material Pressure (psi)	(Output lb/min)
Length-10', I.D.-3/4 in	3000	2.3
Length-20', I.D.-3/4 in	3000	1.6
Length-20', I.D.-3/4 in +10, I.D.-1/2 in	3000	1.2
Length-20', I.D.-1/2 in	3000	0.84

3M™ Scotch-Weld™ Epoxy Adhesive 2214 Hi-Temp Production Extrusion Equipment
- Pump: Ratio 40:1 with a chopping check valve and priming piston, 6 in. air motor. 2in³/cycle
- Ram: Pneumatic type capacity-12 psi on material surface
- Hose: Super high pressure with standard lining
- Flow Gun: High pressure type

Output based on 1/4 in tip flow gun (material temperature 65°F [18°C])

Hose Assembly	Material Pressure (psi)	(Output lb/min)
Length-20', I.D.-1/2 in	2400	0.4
Length-20', I.D.-3/4 in	2400	1.1

3M™ Scotch-Weld™ Epoxy Adhesive 2214 Hi-Dense Production Extrusion Equipment
- Pump: Ratio 55:1 with a chopping check valve and priming piston, 8 in. air motor. 3.7in³/cycle
- Ram: Pneumatic type capacity-12 psi on material surface
- Hose: Super high pressure with standard lining
- Flow Gun: High pressure type

Output based on 1/4 in tip flow gun (material temperature 65°F [18°C]) (minimum pumping temperature is 65°F [18°C])

Hose Assembly	Material Pressure (psi)	(Output lb/min)
Length-20', I.D.-1/2 in	4500*	0.45
Length-20', I.D.-3/4 in	4500*	0.9

3M™ Scotch-Weld™ Epoxy Adhesive 2214 Hi-Temp New Formula Production Extrusion Equipment
- Pump: Ratio 55:1 with a chopping check valve and priming piston, 8 in. air motor. 3.7in³/cycle
- Ram: Pneumatic type capacity-12 psi on material surface
- Hose: Super high pressure with standard lining
- Flow Gun: High pressure type

Output based on 1/4 in tip flow gun (material temperature 65°F [18°C]) (minimum pumping temperature is 65°F [18°C])

Hose Assembly	Material Pressure (psi)	(Output lb/min)
Length-20', I.D.-1/2 in	4800*	0.36
Length-20', I.D.-3/4 in	4800*	1.0

*These pressures will require a special consideration during hose selection. They are actual working pressures.

Handling/Application Information (continued)

Directions for Use

CAUTION: Use caution if your bond line is thicker than 1 mm as an exothermic reaction may occur during cure with production of intense heat and smoke. The likelihood of this happening depends on your joint design, the mass of material cured, and the ability for heat to be dissipated by the substrates.
1. Warm products to room temperature before opening containers to restore proper application consistency and to prevent moisture condensation on adhesive surface. Containers may be stored at room temperature for 1-2 days to thaw. Do not warm at temperatures above 80°F (27°C).
2. 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 substrates, the required bond strength, environmental aging resistance, and requirements determined by the user in light of the user's particular purpose and method of application. For specific surface preparations on common substrates, see the section on surface preparation.
3. Use gloves to minimize skin contact and do not use solvents for cleaning hands.
4. For maximum bond strength, apply product evenly to both surfaces to be joined.
5. Join the adhesive coated surfaces and heat cure using the appropriate bondline temperature and time for the specific product being used.
6. Keep parts from moving during cure as contact pressure is necessary.
7. Cleanup can be accomplished with solvent such as 3M™ Scotch-Grip™ Solvent No. 3 or Methyl Ethyl Ketone.*
*Note: Prior to use of these solvents, extinguish or eliminate any ignition sources and read and follow supplier's environmental, health, and safety recommendations listed on the MSDS and product label.

Surface Preparation

The following cleaning methods are suggested for common surfaces:
Steel:
1. Wipe free of dust with oil-free solvent such as Methyl Ethyl Ketone.*
2. Sandblast or abrade using clean fine grit abrasives.
3. Wipe again with solvent to remove loose particles.
Aluminum:
1. Vapor Degrease – Perchloroethylene* condensing vapors for 5-10 minutes.
2. Alkaline Degrease – Oakite 164 solution (9-11 oz./gallon water) at 190°F ± 10°F (87°C ± 5°C) for 10-20 minutes. Rinse immediately in large quantities of cold running water.
3. Acid (FPL) Etch – Place panels in their following solution for 10 minutes at 150°F ± 5°F (66°C ± 2°C).
Sodium Dichromate 4.1-4.9 oz./gallon
Sulfuric Acid, 66°Be 38.5-41.5 oz./gallon 2024-T3 aluminum (dissolved) 0.2 oz./gallon minimum Tap water as needed to balance
4. Rinse – Rinse panels in clear running tap water.
5. Dry – Air dry 15 minutes; force dry 10 minutes at 150°F ± 10°F (66°C ± 5°C).
6. If primer is to be used, it should be applied within 4 hours after surface preparation.
Plastics:
1. Solvent wipe with Isopropyl Alcohol.*
2. Abrade using clean fine grit abrasives.
3. Solvent wipe with Isopropyl Alcohol.*
Rubbers:
1. Solvent wipe with Methyl Ethyl Ketone.*
2. Abrade using clean fine grit abrasives.
3. Solvent wipe with Methyl Ethyl Ketone.*
Glass:
1. Solvent wipe with acetone or Methyl Ethyl Ketone.*
Note: For glass applications which will be subjected to high moisture/humidity conditions, 3M™ Scotch-Weld™ Primer EC-3901 should be used to prime the glass.
*Note: Prior to use of these solvents, extinguish or eliminate any ignition sources and read and follow supplier's environmental, health, and safety recommendations listed on the MSDS and product label.

Storage and Shelf Life

Store products at 40°F (4°C) or below for maximum storage life. Higher temperatures reduce normal storage life. Rotate stock on a “first-in-first-out” basis.
CAUTION: Products are heat sensitive. Storage above 130°F (54°C) may cause an exothermic reaction resulting in evolution of excessive heat, noxious fumes, and possibly fire.
All of these products have a shelf life of 12 months from the date of manufacture when stored in their unopened containers @ 40°F (4°C) or below; or 18 months @ 0°F (-20°C) or below.

Industry Specifications

UL 94 HB

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.

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Trademarks

References

Safety Data Sheet (SDS)

https://www.3m.com/3M/en_US/company-us/SDS-search/results/?gsaAction=msdsSRA&msdsLocale=en_US&co=ptn&q=2214 Regular

3M™ Scotch-Weld™ Epoxy Adhesive 2214 Regular

Family Group

	2214 Regular	2214 Hi-Dense	2214 Hi-Temp	2214 Hi-Temp New Formula	2214 Non-Metallic Filled
Color Test Condition: Cured	Gray	Gray	Gray	Gray Brown	Cream to Tan
Shore D Hardness Test Condition: Room Temperature	85	85	88	85	85

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.

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