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3M™ Scotch-Weld Epoxy Adhesives

EC-2214 Regular, EC-2214 Hi-Density, EC-2214 Hi Temp and EC-2214 Hi-Temp New Formula

Technical Data Sheet

Product Description

One part 250°F (121°C) curing 100% solids, 3M™ Scotch-Weld™ Epoxy Adhesive EC-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 EC-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).

3M™ Scotch-Weld™ Adhesive EC-2214 High Density (HD) is a deaerated version of Scotch-Weld adhesive EC-2214 regular for use where a very dense, void free bondline is required.

3M™ Scotch-Weld™ Adhesive EC-2214 High Temperature (HT) and High Temperature New Formula (HT NF) are aluminum filled, deaerated products for use where higher strengths are required between 180°F to 350°F (82°C to 177°C).

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.

	3M™ Scotch-Weld™ Epoxy Adhesive EC-2214			
	Regular	Hi-Density	Hi-Temp	Hi-Temp New Formula
Viscosity (Approx.) time to deliver 20 grams @ 50 psi thru a .104" orifice (seconds)	60-200	60-200	15-30	100-250
Viscosity (Brookfield)	Because of Thixotropic paste nature of these products Brookfield viscosity will be over 1,000,000 cps.			
Color	Gray	Gray	Gray	Gray
Base	Modified Epoxy	Modified Epoxy	Modified Epoxy	Modified Epoxy
Weight per Gallon (lbs/gal)	12.0	12.6	12.0	13.8

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.

	3M™ Scotch-Weld™ Epoxy Adhesive EC-2214			
	Regular	Hi-Density	Hi-Temp	Hi-Temp New Formula
Color	Gray	Gray	Gray	Gray Brown
Shore D Hardness (Approx.)	85	85	88	85
Elongation (Approx. %)	<2	<2	1	1
Ultimate Tensile (Approx. psi)	10,000	10,000	8,000	–
Modulus Elasticity (Approx. psi)	750,000	750,000	800,000	–

Typical Thermal Properties (Cured)

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

	Thermal Conductivity	Coefficient of Thermal Expanse (in./in./°C)
3M™ Scotch-Weld™ Adhesive EC-2214 Regular	.231	49×10^{-6} (between 0-80°C)
3M™ Scotch-Weld™ Adhesive EC-2214 Hi-Density	.231	49×10^{-6} (between 0-80°C)
3M™ Scotch-Weld™ Adhesive EC-2214 Hi-Temp	.189	48×10^{-6} (between 0-80°C)
3M™ Scotch-Weld™ Adhesive EC-2214 Hi-Temp New Formula	.244	44×10^{-6} (between -60 - +80°C)

Typical Electrical Properties (Cured)

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes. Dielectric Constant (1) ASTM-D-150 Dissipation Factor (2) ASTM-D-150

Power Range 1.00 KC Test Temperature		73°F (23°C)	140°F (60°C)	194°F (90°C)	219°F (104°C)
Scotch-Weld EC-2214 Regular	(1)	10.5	11.1	16.7	24.0
	(2)	0.126	0.463	0.346	0.515
Scotch-Weld EC-221 Hi-Density	(1)	10.5	11.1	16.7	24.0
	(2)	0.126	0.463	0.346	0.515
Scotch-Weld EC-2214 Hi-Temp	(1)	6.2	7.6	7.8	8.0
	(2)	0.021	0.023	0.025	0.025
Scotch-Weld EC-2214 Hi-Temp	(1)	–	–	–	–
New Formula	(2)	–	–	–	–

Arc Resistance	ASTM-D-495-61	Surface Resistivity	ASTM-D-257
Dielectric Strength	ASTM-D-149	Volume Resistivity	ASTM-D-257

Typical Electrical Properties (Cured) *continued*

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™ EC-2214	ARC Resistance (Seconds)	Dielectric Strength (Volts Per Mil Thickness)		Surface Resistivity (500 Volts-	Volume Resistivity (500 Volts-
		Volts/Mil	Sample Thickness Inches	Ohms/Square 73°F (23°C)	Ohms-CM 73°F (23°C)
Regular	76	77	0.0366	9.8×10^{12}	2.8×10^{13}
Hi-Dense	76	77	0.0366	9.8×10^{12}	2.8×10^{13}
Hi-Temp	119	347	0.038	1.1×10^{17}	9.4×10^{14}

Handling/Curing Information

Directions for Use

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 following bondline temperature and time for the specific product being used.

Any of the following cure cycles will result in a full cure:

3M™ Scotch-Weld™ EC-2214 Regular	40 min @ 250°F (121°C)
3M™ Scotch-Weld™ EC-2214 High Density	10 min @ 300°F (149°C)
3M™ Scotch-Weld™ EC-2214 High Temperature (HT)	5 min @ 350°F (177°C)
3M™ Scotch-Weld™ EC-2214 Hi-Temperature New Formula (HT NF)	60 min @ 250°F (121°C) 15 min @ 300°F (149°C)

6. Keep parts from moving during cure as contact pressure is necessary.
7. Cleanup can be accomplished with solvent such as 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 SDS 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. Optimized Acid (FPL) Etch – Per ASTM D2651 .
2. 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 SDS and product label.

Application/Equipment Information

These products may be applied by spatula, trowel, or flow equipment.

Typical Adhesive Performance Characteristics

Note: All of the following data was developed using a cure cycle of 40 minutes @ 250°F (121°C) under 25 psi pressure except Scotch-Weld adhesive EC-2214 Hi-Temp New Formula which was 60 minutes at 250°F (121°C).

A. Aluminum Overlap Shear

Overlap shear strength was measured on FPL etched 1" wide by 1/2" overlap specimens. The bonds were made from 2 panels of 4" x 7" x .063", 2024 T3 clad aluminum bonded together and cut into 1" wide specimens. The separation rate of the testing jaws was .1"/minute. Tests similar to ASTM D-1002. (All data in psi).

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

Test Temperature	3M™ Scotch-Weld™ EC-2214				
	Regular	Hi-Dense	Hi-Temp	Hi-Temp New Formula	Non-Metallic Filled
-67°F (-53°C)	3000	3000	2000	2800	3000
75°F (24°C)	4500	4500	2000	2800	4000
180°F (82°C)	4500	4500	3000	2800	4500
250°F (121°C)	1500	1700	2500	2500	1500
300°F (149°C)	600	600	2500	2000	600
350°F (177°C)	400	400	900	1200	400

B. Aluminum T-Peel

T-Peel bonds were measured on 1" wide specimens cut from two FPL etched 8" x 8" x .032" 2024 T3 clad aluminum panels bonded together. The separation note of the testing jaws was 20"/minute. Tests similar to ASTM D-1876. (All data in lbs./in. of width.)
Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Test Temperature	3M™ Scotch-Weld™ EC-2214				
	Regular	Hi-Dense	Hi-Temp	Hi-Temp New Formula	Non-Metallic Filled
75°F (24°C)	5	5	2	2	7

C. Steel Overlap Shear

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 which was MEK solvent wiped prior to bonding. The separation rate of the testing jaws was .1"/min. Tests similar to ASTM D-1002. (All data in psi.)

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

Test Temperature	3M™ Scotch-Weld™ EC-2214				
	Regular	Hi-Dense	Hi-Temp	Hi-Temp New Formula	Non-Metallic Filled
-67°F (-53°C)	3000	3000	1650	2000	3000
75°F (24°C)	2500	2500	2400	2500	2200
180°F (82°C)	2000	2000	2000	2000	2000
250°F (121°C)	800	800	2000	2000	400
300°F (149°C)	200	200	2000	2000	200
350°F (177°C)	100	100	500	700	100

D. Steel T-Peel

T-Peel bonds were measured on two 1" wide x 8" long specimens bonded together. These bonds were made on MEK wiped .035" steel. After bonding they were then pulled apart in 180° Peel at a jaw separation rate of 20"/minute rate. Tests similar to ASTM D-1876. (All data in lbs./in. of width.)

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

Test Temperature	3M™ Scotch-Weld™ EC-2214				
	Regular	Hi-Dense	Hi-Temp	Hi-Temp New Formula	Non-Metallic Filled
75°F (24°C)	50	50	5	5	12

Environmental Resistance

Note: The following data is overlap shear after aging for 365 days in the specified environment. Tests were run on FPL etched aluminum and solvent degreased, sandblasted .035" thick cold rolled steel. Bonds and tests similar to ASTM D-1002. (All data in psi.)

	3M™ Scotch-Weld™ EC-2214			
	Regular	Hi-Dense	Hi-Temp	
	Aluminum	Steel	Aluminum	Steel
Tap Water @ 75°F (24°C)	4630	1620	3060	1580
100% relative humidity @ 120°F (49°C)	1900	1910	3120	2090
Ethyl Gasoline @75°F (24°C)	4690	2310	2620	1870

Shelf Life and Storage Conditions

The shelf life of the Scotch-Weld™ EC-2214 adhesives is 8 months when at 39°F (4°C) or below; or 12 months at 0°F (-18°C) or below from date of shipment when stored in their unopened containers. 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.

Precautionary Information

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

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 representative.

Authorization to Use

Ensure products meet all applicable specifications, standards, and maintenance manual requirements for the platform being worked on and validate all aircraft approvals against current technical document.

These products are manufactured under a 3M Quality Management System registered to the AS9100 standard

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