3M Scotch-Weld™ Epoxy Adhesive 1469

Technical Data **November, 2004**

Product Description

3M™ Scotch-Weld™ Epoxy Adhesive 1469 is a one-part, 100% solids, thermosetting liquid adhesive.

Advantages

- Exceptionally high strength at service temperatures from -70°F to 300°F (-57°C to 149°C).
- No volatile by-products are given off during cure. This unique property makes 1469 particularly useful for bonding impervious surfaces and enables curing under minimal pressure. Only pressures sufficient to insure contact between mating surfaces are required.
- Easy application by knife coating, trowel, roller coating, pump and high pressure injection methods.
- Excellent retention of strength after aging in typical environments.

Typical Physical Properties

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

Base:	Modified Epoxy Resin
Solvent:	None
Color:	White to Cream
Net Weight:	10.0 ± 0.2 lbs./gallon
Flash Point:	220°F (104°C) (CC)
Flow Initiation Temperature:	60°F (16°C)
Consistency:	Flowable Syrup
Viscosity:	40,000-80,000 cps
Cure Initiation Temperature:	280-300°F (138-149°C)

Application Characteristics

3M™ Scotch-Weld™ Epoxy Adhesive 1469 can be applied by a spatula, knife coating, notched trowel, or by extruding into place. Standard equipment is available which allows pumping directly from five-gallon pails. When extruded through a Pyles-Semco cartridge (3/32" orifice 55 psi line pressure), the delivery rate at 72°F (22°C) is approximately 40 grams/ minute. A lower viscosity for ease of application can be obtained by warming Scotch-Weld 1469 to 100-120°F (38-49°C).
Note: 1469 may start to thicken if held at 120°F (49°C) for more than 3 hours.

Equipment Suggestions

Pump – 9 to 1 ratio minimum, double acting, divorced design, ball type check valve, 11 cubic inch/cycle, with 4 1/4" air motor.

Primer – Disc type inductor plate.

Caution: Care should be taken not to incorporate air into the adhesive during application. Entrapped air can expand during cure to give a porous and weakened bond.

Directions for Use

Surface Preparation: A thoroughly cleaned, dry, grease free surface is essential for optimum performance. Cleaning methods which will produce a breakfree water film on metal surfaces are generally satisfactory. Surface preparations should be fully evaluated with the adhesive, especially if the need for resistance to specific environments is anticipated.

Recommended Cleaning Procedure for Aluminum:*

1. **Vapor Degrease** – Perchloroethylene condensing vapors for 5-10 minutes.
2. **Alkaline Degrease** – Oakite 164 solution (9-11 oz./gallon of water) at 190 ± 10°F (88 ± 5°C) for 10-20 minutes. Rinse immediately in large quantities of cold running water.
3. **Acid Etch** – Place panels in either of the following solutions for 10 minutes at 150 ± 5°F (67 ± 2°C).

	A (FPL Etch)	B
Distilled Water	30 parts	30 parts
Sulfuric Acid (con.)	10 parts	10 parts
Sodium Dichromate	1 part	4 parts

4. **Rinse** – Rinse panels in clear running water.
5. **Dry** – Air dry, 15 minutes. Force dry, 10 minutes at 150 ± 10°F (67 ± 5°C).
6. It is advisable to coat the freshly cleaned surfaces with adhesive within 4 hours after surface preparation.

***Note:** Prior to using degreaser or preparing and using acid etch, read and follow material suppliers environmental, health and safety recommendations. Proper protective equipment for eyes, skin, and respiratory system should be used.

Adhesive Layup:
Care should be taken to avoid contaminating adhesive and cleaned aluminum. Contamination could hinder wetting action of the adhesive and cause inferior bonds.

Bond Line Thickness:
Optimum performance is obtained with a 2-5 mil cured bond line thickness.

Cleanup:
Excess adhesive and equipment may be cleaned up, prior to curing, with ketone* type solvent.

***Note:** When using solvents, extinguish all ignition sources, including pilot lights, and follow manufacturer's precautions and directions for use.

Cure Conditions

Flow and Cure Initiation Temperatures:
Normal flow and cure initiation temperatures for 3M™ Scotch-Weld™ Epoxy Adhesive 1469 are as follows:

Flow Temperature:	60°F (16°C)
Cure Initiation Temperature:	280-300°F (138-149°C)

Cure Pressure: The only pressure needed during the cure of 1469 is that required to keep parts in alignment and to overcome distortion and thermal expansion in the adherends.

Cure Temperature: The cure temperature may be varied from 300°F to 450°F (149°C to 232°C), depending on the materials being bonded, equipment available and bond properties desired. 1469 will wet the surface to which it has been applied. Heating at temperatures above 300°F (149°C) will chemically convert the adhesive into a high strength solvent-resistant bond. Cure temperatures in excess of 400°F (204°C) yield useful, but lower than optimum strengths. At these temperatures the time cycle must be determined for specific application. Bond line temperature rise rates from 2°F to 200°F (-17°C to 93°C) per minute can be used without affecting strength properties. **Curing ovens must be vented to the outdoors.**

Caution: Large volumes of 1469, if heated rapidly at temperatures above 300°F (149°C), will exotherm and char. This will generally occur if an adhesive thickness of greater than 1/8" thick is cured.

Cure Time: Cure time depends on the cure temperature used, methods of heat application, production limitations and bond properties required. Since no two bonding operations are exactly alike, it is suggested that a few simple experiments be conducted, varying both temperature and cure time to determine optimum conditions for the particular application.

Suggested Cure Cycle

The following cure cycle is suggested to obtain dense bond lines and was used to obtain the strengths reported in the product performance section:

1. Apply a pressure of 25 psi prior to reaching a bond line temperature of 150°F (67°C) and maintain throughout the cycle. (Pressure was used to insure flat test panels.)
2. Raise the bond line temperature from ambient to 350°F (177°C). Bonds were placed in a hot press @ 350°F (177°C) and cooled to below 200°F (93°C) prior to removal.
3. Cure for 120 ± 1 minutes at 350 ± 2°F (177 ± 1°C).
4. Cool to below 200°F (93°C) bond line temperature prior to release of pressure. (In laboratory tests, panels have been removed at 350°F (177°C) with no adverse effects.)

Performance Characteristics

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

Test Condition	Test Result (Average)
A. Tensile Shear	
1. Normal Temperature (75°F [24°C])	3695 psi
2. 10 minutes @ 300°F (149°C)	3633 psi
3. 300°F (149°C) after 192 hours @ 300°F (149°C)	2260 psi
4. 10 minutes @ -67°F (-55°C)	3150 psi
5. Normal Temperature (75°F [24°C]) After 30 Days Salt Water Spray	3081 psi
6. Normal Temperature (75°F [24°C]) After 30 Days @ 120°F (49°C) & 95-100% Relative Humidity	3025 psi
7. Normal Temperature (75°F [24°C]) After 30 Days Immersion in Tap Water	3603 psi
8. Normal Temperature (75°F [24°C]) After 7 Days Immersion in JP-4 Fuel	2766 psi
9. Normal Temperature (75°F [24°C]) After 7 Days Immersion in Anti-icing Fluid	2766 psi
10. Normal Temperature (75°F [24°C]) After 7 Days Immersion in Hydraulic Oil	2659 psi
11. Normal Temperature (75°F [24°C]) After 7 Days Immersion in Type III Hydrocarbon Fluid	2651 psi
B. Creep Rupture	
12. Normal Temperature [75°F (24°C)] 192 hours @ 1600 psi	.0000"
13. 300°F (149°C) 192 hours @ 800 psi	.0000"
C. Fatigue	
14. Normal Temperature [75°F (24°C)] 750 psi @ 10^6 Cycles	No failure

Storage and Handling

Store 3M™ Scotch-Weld™ Epoxy Adhesive 1469 at 40°F (4°C) or lower for optimum storage life. 1469 should be permitted to thoroughly warm to room temperature before opening in order to prevent moisture condensation on the adhesive surface. Rotate stock on a “first in - first out” basis.

3M™ Scotch-Weld™
Epoxy Adhesive
1469

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.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free (800) 235-2376. Address correspondence to: 3M Aerospace and Aircraft Maintenance Division, 3M Center, Building 223-1N-14, St. Paul, MN 55144. If you are outside of the U.S., please contact your nearest 3M office or branch.

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.

AS 9100

This product was manufactured under a 3M quality system registered to AS9100 standards.

3M

Aerospace and Aircraft Maintenance Division
Transportation Business

3M Center, Building 223-1N-14
St. Paul, MN 55144-1000
1-800-364-3577 or 651-737-6501
www.3M.com/aerospace

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

Printed in U.S.A.
©3M 2004 78-6900-1011-7 (11/04)