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English-US

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Technical Data Sheet

3M™ Scotch-Weld™ Epoxy Adhesive 1386

Regulatory Info/SDS

Product Description

3M™ Scotch-Weld™ Epoxy Adhesive 1386 is a one-part, 100% solids, thermosetting liquid adhesive.

Product Features

• Exceptionally high strength properties at service temperatures from -70 to 250°F (-57 to 121°C).
• Higher impact, peel and bond strength properties than normally attainable in many epoxy based adhesives.
• Little or no volatile by-products given off during cure. This unique property makes Scotch Weld 1386 particularly useful for bonding many impervious surfaces and enables curing under little or no pressure.
• Only pressure sufficient to ensure contact between mating surfaces is required.
• Easy application by knife coating, trowel, rollercoating, pump and high pressure injection methods.
• Excellent retention of strength after aging in many environments.
• Recognized as meeting UL 94HB

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

Attribute Name	Value
Color	White — Cream [1]
Viscosity	75,000 — 175,000 cP [2]
Net Weight	9.4 — 9.8 lb/gal
Base Resin	Modified Epoxy

[1] Colors may vary from nearly white to yellow/amber. Adhesive performance is not affected by color variation.

[2] Brookfield RVF No. 7 Spindle @ 4 rpm

Typical Physical Properties

Attribute Name	Value
Cured Color	White — Cream

Typical Performance Characteristics

Substrate: Etched Aluminum
Temperature: 22 °C (72 °F)

Attribute Name	Test Method	Value
T-Peel Adhesion	ASTM D1876	10 lb/in width (CF) [1]

[1] T-Peel 1in x 7in bonded area from 1in x 8in x 0.020in clad 2024 T3 AL panels. 0.003-005in application on both surfaces. Jaw separation 2in/min
Cure Cycle: 1hr @ 350°F, 25 psi, 10°F/min rise
Cohesive (CF), Adhesive (AF), and Substrate (SF) Failure

Tensile Strength

Temperature: 177 °C (350 °F)
Dwell Time: 60 min

Test Condition	Value
-40°C (-40°F)	8,293 lb/in²
22°C (72°F)	10,189 lb/in²
82°C (180°F)	3,178 lb/in²

Electrical and Thermal Properties

Coefficient of Thermal Expansion

Temperature: 138 °C (280 °F)
Dwell Time: 270 min
Environmental Condition: +1 hr @ 177°C (350°F)

Test Condition	Value
-40°C ~ 44°C	0 °F
44°C ~ 116°C	0 °F

Attribute Name	Test Method	Value
Dissipation Factor		0.057
Dielectric Strength	ASTM D149	>16 V/µm

Handling/Application Information

Directions for Use

Proper adhesive application is as important as proper bond design and adhesive choice to obtain maximum joint properties. Improper adhesive application techniques can result in partial or complete failure of an assembly.

3M™ Scotch-Weld™ Epoxy Adhesive 1386 can give excellent properties under many application conditions. The product performance data reported in the Test Results section which follows here developed using the following suggested procedures. Variations from these procedures should be fully evaluated to ensure bond properties sufficient to meet the requirements of the user's particular assembly.

Surface Preparation

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

Suggested 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 (87 ± 5°C) for 10-20 minutes. Rinse immediately in large quantities of cold running water.

3. Acid Etch – Place panels in the following solution for 10 minutes at 150 ± 5°F (66 ± 5°C).*
Sodium Dichromate (Na2Cr2O72H20) 4.1 - 4.9 oz./gallon
Sulfuric Acid, 66° Be 38.5 - 41.5 oz./gallon
2024T-3 aluminum (dissolved) 0.2 oz./gallon minimum
Tap Water as needed to balance

*Note: When using etch solutions, be sure to follow the chemical manufacturer's precautions and directions for use when handling such chemicals.

4. Rinse – Rinse panels in clear running water.

5. Dry – Air dry 15 minutes.
Force dry 10 minutes at 150 ± 10°F (66 ± 5°C).

6. It is advisable to coat the freshly cleaned surfaces with primer within 4 hours after surface preparation.

Application Techniques

Adhesive Layup
Care should be taken to avoid contaminating adhesive and cleaned aluminum by any substance which will hinder wetting action.

Adhesive Application
Note: Appropriate application equipment can enhance adhesive performance. The user is responsible for evaluating application equipment in light of the user's particular purpose and method of application.

Scotch-Weld EC-1386 can be applied by a spatula, knife coat, notched trowel, or by extruding into places. Standard equipment is available which allows pumping directly from five-gallon pails. When extruded through a Pyles-Semco cartridge (3/32" orifice 70 psi line pressure), the delivery rate at 72°F (22°C) is approximately 20 grams/minute. A lower viscosity for ease of application can be obtained by warming Scotch-Weld EC-1386 to 100 - 120°F (38 - 49°C). **Note:** Scotch-Weld EC-1386 may start to thicken if held at 120°F (49°C) for more than 4 hours.

Important: Care should be taken not to incorporate air into the adhesive during application. Included air can expand during cure which can cause a porous and weakened bond.

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

Clean-up
Excess adhesive and equipment may be cleaned up, prior to curing with Ketone type solvents.*

***Note:**When using solvents extinguish all ignition source and follow manufacturer's precautions and directions for use for handling such materials.

Cure Conditions

General Cure Requirements
Time, temperature and pressure determine the final bond properties. These properties may also be affected by the type of curing equipment used for the specific application. In general, the cure properties of 3M™ Scotch-Weld™ Epoxy Adhesive 1386 are as follows.

Flow and Cure Initiation Temperatures
Normal flow and cure initiation temperatures for Scotch-Weld 1386 are as follows:
Flow Temperature:60°F (16°C)
Cure Initiation Temperature:325-335°F (163-168°C)

Cure Pressure
The pressure needed during the cure of Scotch-Weld 1386 is typically that required to keep parts in alignment and to overcome distortion and thermal expansion in the adherents.

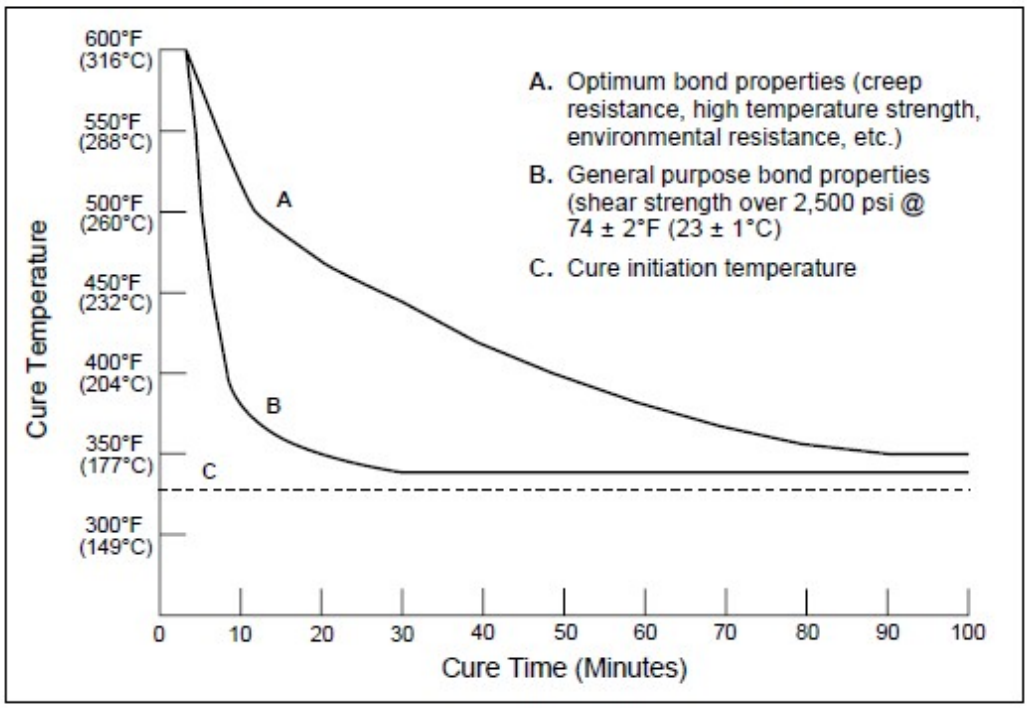
Cure Temperature
The cure temperature may be varied from 330 to 500°F (166 to 260°C) depending on the materials being bonded, equipment available and bond properties desired. Scotch-Weld 1386 will wet the surface to which it has been applied. Heating at temperatures above 325°F (163°C) will chemically convert the adhesive into a high strength solvent-resistant bond.
The following is a guide to the effect of bondline temperature during cure on 75°F (24°C) overlap shear strengths:

Bond Line Time at 75°F (24°C)
Temperature Shear Strength
350°F (177°C) 40-60 minutes 5500 psi
375°F (191°C) 20-30 minutes 5500 psi
400°F (204°C) 5-20 minutes 5300 psi
425°F (218°C) 10-15 minutes 4300 psi
450°F (232°C) 5-7 minutes 3500 psi

The time required to reach the specified bond line temperature is not included. Time lag for the parts to reach temperature will depend on relative mass and efficiency of the heat source. Temperature of the bond line should be determined experimentally by thermocouple measurements. Cure temperatures in excess of 400°F (204°C) yield useful, but lower than optimum strengths. At these temperatures the indicated time cycles should not be exceeded.

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. Figure 1 is a guide from which an approximate cure cycle can be taken for various cure times or temperatures.

Figure 1 – Curing Temperature vs Curing Time for 3M™ Scotch-Weld™ Epoxy Adhesive EC-1386



– Curing Temperature vs Curing Time for 3M™ Scotch-Weld™ Epoxy Adhesive 1386

Cure Cycle

The following press cure cycle is suggested to obtain dense glue lines and was used to obtain the strengths reported in the Test Results section:

1. Apply a pressure of 25 psi prior to reaching a bond line temperature of 150°F (66°C) and maintain throughout the press cure cycle. (Pressure was used to ensure flat test panels.
2. Raise the bond line temperature from ambient to 350°F (177°C) at a rate of 10 ± 2°F (-12 ± 1°C).
3. Cure for 60 ± 1 minutes at 350 ± 2°F (177 ± 1°C).
4. Cool to below 200°F (93°C) bond line temperature prior to release to pressure. (In 3M laboratory tests, panels have been removed at 350°F (177°C) with no adverse effects.)

Industry Specifications

UL 94 HB

Storage and Shelf Life

Store product at 0 to 4°C (32 to 40°F) in the original, unopened packaging. Allow product to reach room temperature prior to use. For best performance, use product within 12 months from the date of manufacture when stored at 4°C (40°F) and 18 months when stored at -20°C (0°F) or below in the original, unopened container.

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

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.

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ISO Statement

This product was manufactured under a 3M quality system registered to ISO 9001 standards.

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.

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