3M Scotch-Weld™ Epoxy Adhesive DP-100 FR

Technical Data **March, 2003**

Product Description

3M™ Scotch-Weld™ Epoxy Adhesive DP-100 FR is a two-part flame retardant (self-extinguishing) version of Scotch-Weld DP-100. It meets the UL94 V-O Burn Test requirements and has a work life of 4-8 minutes after mixing. It is ideal for many applications requiring a self-extinguishing structural epoxy adhesive system.

Features

- Fast Cure
- Cream Color
- Easy Mixing
- Meets UL 94 V-O (File No. E61941)
- Passes 14 CFR 25.853 (60 Sec. Vertical Burn Test)[1]

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.

Viscosity[2] @ 23°C (73°F)	**Base (B)** **Accelerator (A)**	50,000 - 100,000 cps 40,000 - 120,000 cps
Base Resin		Epoxy
Color		Cream
Net Weight Lbs./Gallon	**Base (B)** **Accelerator (A)**	11.7 - 12.1 10.7 - 11.1
Mix Ratio (B:A)	**By Volume** **By Weight**	1 : 1 1 : 0.916
Worklife[3] @ 23°C (73°F)	**20 g mixed**	4-8 minutes

[1] As listed in code Federal Regulations, FAA, DOT Regulations 25.853 paragraph a.

[2] Brookfield RVF #7 spindle at 20 rpm.

[3] Approximate time during which a 20 gram quantity of mixed resin at 73°F (23°C) will adequately wet out on a substrate.

Typical Cured Properties

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

Physical

Color	Cream
Shore D Hardness[4]	87
Time to Handling Strength[5]	15-20 min. @ 73°F (23°C)
Cure Time[6]	24-48 hrs. @ 73°F (23°C)

Thermal

Glass Transition Temperature[7] (Tg)		111°F (44°C)
Coefficient of Thermal Expansion[8] (in./in./°C)	Below Tg Above Tg	60 x 10^{-6} (-58° to 86°F) (-50° to 30°C) 125 x 10^{-6} (176° to 212°F) (80° to 100°C)
Temperature of Weight Loss[9]	1% @ 5% @ 10% @ 20% @	316°F (158°C) 560°F (294°C) 581°F (305°C) 590°F (310°C)
Thermal Conductivity[10] (btu-ft./sq. ft.-hr. °F)		0.111 ± .011

Electrical

	Dielectric Constant[11]	**Dissipation Factor[11]**
@ 100 Hz	4.8	0.015
@ 500 Hz	4.7	0.015
@ 1 KHz	4.7	0.016
@ 10 KHz	4.6	0.024
@ 100 KHz	4.4	0.038
	Volume Resistivity[12] 1.7 x 10^{14} ohm-cm	Surface Resistivity[12] 2.3 x 10^{15} ohms/sq

[4] ASTM D 2240.

[5] Time to develop 50 psi overlap shear properties.

[6] Time to develop maximum overlap shear properties.

[7] Determined using DSC and heating rate of 68°F (20°C) per minute.

[8] Determined using TMA and heating rate of 41°F (5°C) per minute. First heat values given.

[9] By TGA in air at 50°F (10°C)/min. Perkin Elmer TGA-7.

[10] ASTM C 177 (0.209 inch sample thickness at 107°F (42°C).

[11] ASTM D 150 at 73°F (23°C).

[12] ASTM D 257 at 73°F (23°C).

Handling/Application Information

Directions for Use

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 necessary depends on the required bond strength and the environmental aging resistance desired by user. For specific surface preparations on some common substrates, see the section on surface preparation.

3M™ Scotch-Weld™ Epoxy Adhesive DP-100 FR is supplied in a dual syringe plastic duo-pak cartridge as part of the 3M™ EPX™ Applicator System. To use, simply insert the duo-pak cartridge into the EPX Applicator and start the plunger into the cylinders using light pressure on the trigger. Next, remove the duo-pak cartridge cap and expel a small amount of adhesive to be sure both sides of the duo-pak cartridge are flowing evenly and freely. If simultaneous mixing of Part A and Part B is desired, attach the EPX mixing nozzle to the duo-pak cartridge and begin dispensing the adhesive.

When mixing Part A and Part B manually, the components must be mixed in the ratio indicated in the Physical Uncured Properties section. Thorough mixing of the two components is required to obtain optimum properties.

Two-part mixing/proportioning/dispensing equipment is available for intermittent or production line use. These systems are ideal for line use because of their variable shot size and flow rate characteristics and are adaptable to most 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 necessary depends on the required bond strength and the environmental aging resistance desired by user.

The following cleaning methods are suggested for these common surfaces:

Steel:

1. Wipe free of dust with oil-free solvent such as acetone, isopropyl or alcohol solvents.*
2. Sandblast or abrade using clean fine grit abrasives.
3. Wipe again with solvent 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 1945 B/A is used, apply a thin coating (0.5 mils) 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, including pilot lights, and follow manufacturer’s precautions and directions for use.

Handling/Application Information *(continued)*

Surface Preparation *(continued)*

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 (88°C) ± 10°F (-13°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°F (66°C) ± 5°F (-15°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	

Note: Read and follow component suppliers environmental, health and safety recommendations prior to preparing this etch solution.

4. Rinse: Rinse panels in clean running tap water.
5. Dry: Air dry 15 minutes; force dry 10 minutes at 190°F (88°C) ± 10°F (5°C).
6. 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.
3. Wipe with isopropyl alcohol.*

Glass

1. Solvent wipe surface using acetone or methyl ethyl ketone (MEK).*
2. Apply a thin coating (0.0001 in. or less) of primer such as 3M™ Scotch-Weld™ Structural Adhesive Primer EC-3901 to the glass surfaces to be bonded and allow the primer to dry before bonding.

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

Typical Adhesive Performance Characteristics

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

The following product performance data were obtained in the 3M laboratory under the conditions specified. The following data show typical results obtained with the 3M™ Scotch-Weld™ Epoxy Adhesive DP-100 FR when applied to properly prepared substrates, cured, and tested according to the specifications indicated. This data was generated using the 3M™ EPX™ Applicator System equipped with an EPX static mixer, according to manufacturer's directions. Thorough manual mixing should afford comparable results.

Overlap Shear[13] at R.T.

Aluminum -Etched MEK/abrade/MEK	1400 psi 620 psi
Cold Rolled Steel-MEK/abrade/MEK	995 psi
Copper-MEK/abrade/MEK	1350 psi
Brass-MEK/abrade/MEK	1140 psi
Stainless Steel-MEK/abrade/MEK	870 psi
Galvanized Steel-MEK/abrade/MEK	1465 psi
ABS	175 psi
PVC	225 psi
Polycarbonate	215 psi
Polyacrylic	160 psi
FRP	260 psi
SBR/Steel	270 psi
Neoprene/Steel	130 psi
Nitrile/Steel	115 psi

Overlap Shear[13] After Environmental Exposure

Water Vapor (160°F / 100% RH / 3 days)	2350 psi
8 days @ 149°C (300°F)	2800 psi
Hydraulic Oil (30 days) 23°C (73°F)	2050 psi
Tap Water (30 days) 23°C (73°F)	2400 psi
Salt Spray (30 days) 23°C (73°F)	2200 psi
JP-4 Fuel (7 days) 23°C (73°F)	1000 psi
50% RH / 25°C (77°F) 30 days	1800 psi

Overlap Shear[13] at Various Temperatures

-67°F (-55°C)	850 psi
73°F (23°C)	1400 psi
180°F (82°C) (15 min.)*	450 psi

[13] Overlap Shear (ASTM D 1002-64)

Overlap shear (OLS) strengths were measured on 1" wide 1/2" overlap specimens. These bonds were made individually using 1" x 4" pieces of substrate except for aluminum. Two panels 0.063" thick, 4" x 7" of 2024 T-3 clad aluminum were bonded and cut into 1" wide samples after 24 hours. The thickness of the bond line was 0.005-0.008". All strengths were measured at 73°F (23°C) except where noted.

The separation rate of the testing jaws was 0.1" per minute for metals, 2" per minute for plastics and 20" per minute for rubbers. The thickness of the substrates were: steel, 0.060"; other metals. 0.05-0.064"; rubbers, 0.125"; plastics, 0.125".

*Time in test chamber oven before test.

Typical Adhesive Performance Characteristics ***(continued)***

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

90° T-Peel[14] Adhesive

Aluminum, etched 2024 T-3 (.032")	17-20 mil bond line	4 piw
Cold Rolled Steel (.032") (MEK/abrade/MEK)	17-20 mil bond line	5 piw

[14] T-peel (ASTM D 1876-61T)

T-Peel strengths were measured on 1" wide bonds at 73°F (23°C). The testing jaw separation rate was 10 inches per minute. The substrates were 0.032" thick.

With the exception of rate of strength build-up tests, all bonds were cured 7 days at 73°F (23°C)/50% relative humidity before testing or subjected to further conditioning or environmental aging.

Rate of Strength Build-Up

Aluminum, Overlap Shear (7 mil Bond line)
Bonds Tested at 73°F (23°C)

Time (substrate bonding to time tested)

10 minutes	6-8 psi
20 minutes	820 psi

Scotch-Weld™
Epoxy Adhesive
DP-100 FR

Storage

Store product at 60-80°F (16-27°C) for maximum storage life. Higher temperatures reduce normal storage life. Lower temperatures may cause increased viscosity of a temporary nature. Rotate stock on a “first in-first out” basis.

Shelf Life

When stored in the original, unopened container at the storage conditions suggested, this product has a shelf life of 15 months.

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 1-800-362-3550 or visit www.3M.com/adhesives. Address correspondence to: 3M Industrial Adhesives and Tapes Division, Building 21-1W-10, 900 Bush Avenue, St. Paul, MN 55144-1000. Our fax number is 651-778-4244. 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 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 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 Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9002 standards.

3M

Industrial Business
Industrial Adhesives and Tapes Division
3M Center, Building 21-1W-10, 900 Bush Avenue
St. Paul, MN 55144-1000

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

Printed in U.S.A.
 78-6900-9907-8 (3/03)