

3M

Scotch-Weld

Acrylic Adhesive

DP-818

Temporary Technical Data

Dec.1996

Product Description 3M Scotch-Weld DP-818 Acrylic Adhesives is two part, 1:1 mix ratio, toughened acrylic structural adhesive. It exhibit excellent shear and peel strength along with good impact and durability. DP-818 adhesive bond well to many metals, ceramics, wood and most plastics.

Features	* Excellent shear and peel strength	* Easy mixing
	* 20 minute worklife	* Non-sag
	* Minimal surface preparation	* 1:1 mix ratio

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.

Product		DP-818
Color	Part A	light green
	Part B	light red
Density (gram/ml)	Part A	0.97
	Part B	1.02
Viscosity ¹ 23 deg.C	Part A	10,000cps
	Part B	8,000cps
Base Resin		Acrylic resin
Mix Ratio (A:B)	By volume	1:1
	By weight	1:1
Worklife ² 23 deg.C	Nozzle	15-20 minutes
	mixed	
Applied Open Time ³		15 minutes
Time to Handling Strength ⁴		30-35 minutes

For footnotes, see Test Procedures section on Page 7.

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Typical Cured Properties

Physical

Product	DP-818
Color	Cream white
Shore D Hardness ⁵	74
Full Cure Time ⁶	48 hrs.@23 deg.C
Elongation ⁷	approx. 50%
Tensile Strength ⁷	-

Thermal

Product	DP-818
Glass Transition Temp.(Tg) ⁸	59 deg. C
Coefficient of thermal Expansion (unit/unit/deg.C) ⁹	180x10 ⁻⁶ (20-70 deg.C)
Weight Loss at Temp. ¹⁰ By Thermal Gravimetric Analysis (TGA)	1% @ 130 deg.C 5% @ 230 deg.C

Electrical

Product	DP-818
Dielectric Constant ¹¹	3.1@500Hz 3.0@1000Hz 2.8@10KHz 2.8@100KHz
Dissipation Factor ¹²	0.083@500Hz 0.065@1KHz 0.032@10KHz 0.022@100KHz
Volume Resistivity ¹²	2.2 x 10 ¹² ohm-cm
Dielectric Strength ¹³	3500 volts/mil
Surface Resistivity ¹²	1.6x10 ¹⁴ ohms

For footnotes, see Test Procedures section on Page 7.

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Typical Adhesive Performance Characteristics Overlap Shear (OLS)¹⁴ to Various Substrate (psi)

Product	DP-818
Aluminum-etched	3200
Aluminum-(etched/oily)	2900
Aluminum-(sandpaper)	3100
Aluminum-(solvent cleaned)	2800
Cold Rolled Steel (CRS)	2700
CRS(oily)	2650
Copper	-
Galvanized Steel	1100
FR-4 Glass Epoxy	1000
Fiberglass reinforced plastic	1000
ABS	1100
PVC	700
Polycarbonate	1100
Acrylic	1200
Fir Wood	1200

Overlap Shear¹⁴ CRS/CRS Tested After 7 Days Immersion in the Following

Product	DP-818
Control (no immersion)	2500
Toluene	NR
Machine Oil	1950
IPA (isopropyl alcohol)	1350
Gasoline	1500
1.1,1-Trichloroethane	NR*
10% HCL	NR*
MEK (methyl ethyl ketone)	NR*
Acetone	NR*

* NR--Not Recommended

Overlap Shear¹⁴ (FR-4/FR-4) Tested After environmental Exposure (psi)

Product	DP-818
Control (RT aging)	2000
120 deg.C/2 weeks	3300
90 deg.C/90%RH/2 weeks	1600
Tap Water 1 week/RT	1500

Overlap Shear¹⁴ (CRS/CRS) Tested After Environmental exposure (psi)

Product	DP-818
Control (RT Aging)	2500
120 deg.C/2 weeks	300
90 deg.C/90%RH/2 weeks	850
Tap Water 1 week/RT	850

For footnotes, see Test Procedures section on Page 7.

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Typical Adhesive Performance Characteristics (continued)

Overlap Shear¹⁴ (Etched Al/Etched Al) Tested at Various Temp. (psi)

Product	DP-818
-55 deg.C	3100
23 deg.C	3150
83 deg.C	1900
93 deg.C	1450

Overlap Shear¹⁴ of Heat/Temp. Aged Oil Surfaces (psi)

Product	DP-818
Etched Al. (Oily) 49 deg.C/100%RH/4 weeks	1650
Etched Al. 93 deg.C/100%RH/2 weeks	1000
CRS(Oily) 49 deg.C/100%RH/2 weeks	1150

180 degree T-Peel Adhesion^{15,16} (piw)

Substrate	Test Temp. deg.C	Peel adhesion, DP-818
Etched Al/Etched Al	-55	19
Etched Al/Etched Al	23	22
Etched Al/Etched Al	38	22
Etched Al/Etched Al	54	22
Etched Al/Etched Al	65	22
Etched Al/Etched Al	83	22
Neoprene/CRS	23	11 ¹⁷
Nitrile/CRS	23	22
Red SBR/CRS	23	-
Black SBR/CRS	23	9

Rate of Strength Build-up OLS¹⁴ (psi)

Etched Al/Etched Al Time bonding to testing	OLS Bond Strength DP-818
7 minutes	-
15 minutes	-
30 minutes	40
1 hour	900
2 hours	1700
4 hours	2750
1 day	3400
2 days	3450
7 dars	3450

For footnotes, see test Procedures section on Page 7.

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Note: The data in this technical data sheet were generated using the 3M Scotch-Weld EPX Applicator System equipped with an EPX static mixer nozzle, according to manufacturer's directions. Thorough hand mixing should offer comparable results.

Handling/Curing Information	Directions for Use 1: For high strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. The amount of surface preparation directly depends on the required bond strength, environmental aging resistance desired by user. For suggested surface preparations on common substrates, see the following section on Surface Preparation. 2: Mixing For Duo-Pak Cartridges Scotch-Weld DP-818 Acrylic Adhesive are supplied in a dual syringe plastic Duo-Pak cartridge as part of the Scotch-Weld 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 automatic mixing of Part A and Part B is desired, attach the EPX mixing nozzle to the Duo-Pak cartridge and begin dispensing the adhesive. For hand mixing, expel the desired amount of adhesive and mix thoroughly. Mix approximately 15 seconds after uniform color is obtained. For Bulk Containers Mix thoroughly by weight or volume in the proportions specified on the product label or in the Typical Uncured Properties section. Mix approximately 15 seconds after uniform color is obtained. 3: For maximum bond strength apply adhesive evenly to both surfaces to be joined. 4: Application to the substrates should be made within 15 minutes for DP-818 adhesive. Larger quantities and/or higher temperatures will reduce this working time. 5: Join the adhesive coated surfaces and allow to cure at 16 deg.C or above until completely firm. Heat up to 93 deg.C will speed curing. Adhesive will fully cured in 24 hours. 6: Keep parts from moving during cure. Contact pressure is necessary. Maximum shear strength is obtained with a 3-5 mil bond line. 7: Excess uncured adhesive can be cleaned up with ketone type solvents. 8: Once DP-818 Acrylic Adhesive has been applied to a surface, it is best to join the two mating surfaces together as soon as possible. The reason for this is that after approximately two minutes DP-818 Acrylic Adhesive may begin to form a very thin "skin" over the exposed surface. If left exposed long enough (3-4 minutes), a thick enough "skin" may form which will inhibit the proper wetting needed
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Handling/Curing Information (continued)

to achieve maximum performance. In instances where an extended exposed open time is required it is still possible to achieve excellent bonds by coating both substrates to be joined and making the bond in such a manner as to rupture the "skin" surface.

Adhesive Coverage: A 0.005 in. thick bondline will yield a coverage of 32 sq.ft./gallon (typical).

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

Surface Preparation

For high strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. The amount of surface preparation directly depends on the required bond strength, environmental aging resistance desired by the user. The following cleaning methods are suggested for common surfaces:

Steel:

- 1: Wipe free of dust with oil-free solvent such as acetone or isopropyl 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 Scotch-Weld 1945 B/A two-part primer is used, apply a thin coating (0.5mils) on the metal surfaces to be bonded, air dry for 10 minutes, then cure for 30 minutes at 82 deg.C prior to bonding.

Aluminum:

- 1: Vapor Degrease: Perchlorethylene condensing vapors for 5-10 minutes.
- 2: Alkaline Degrease: Oakite 164 solution (9-11 oz./gallon water) at 88±5 deg.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 66±2 deg.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	Balance of volume
- 4: Rinse: Rinse panels in clear running tap water.
- 5: Dry: Air dry 15 minutes; force dry 10 minutes at 88 ± 5 deg.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.

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Surface Preparation (continued)

Glass:

- 1: Solvent wipe surface using acetone or MEK.
- 2: Apply a thin coating (0.0001 in. or less) of Scotch-Weld EC-3901 Primer to the glass surfaces to be bonded and allow the primer to dry before bonding.

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

Test Procedures:

- 1: Brookfield RVF #7 spindle at 20 rpm.
- 2: Approximate time during which material can remain in a mixer nozzle and still be expelled without undue force on the applicator.
- 3: Approximate time after application of adhesive that bonds can be made without adversely affecting wetting out of adhesive and ultimate performance levels.
- 4: Time to achieve approx. 50 psi Overlap Shear Strength (OLS) when cured at 23 deg.C.
- 5: ASTM D-2240.
- 6: Time to develop 80% of maximum overlap shear values.
- 7: Tensile and Elongation. Used procedure in 3M ITSD TM (3M Industrial Tape and Specialties Division, Test Method) C-3094/ASTM D0882. Samples were 2 in. dumbbells with 0.125 in. neck and 0.030 in. sample thickness. Separation rate was 2 in./minute.
- 8: Determined using DSC and heating rate of 20 deg.C per minute.
- 9: Determined using Thermal Mechanical Analysis (TMA) and heating rate of 5 deg.C per minute. First heat value given.
- 10: By TGA in air at 10 deg.C/min. Perkin Elmer TGA-7.
- 11: ASTM D-150 at 23 deg.C
- 12: ASTM D-257 at 23 deg.C
- 13: ASTM D-149 at 23 deg.C. Sample thickness 14 mils.
- 14: Overlap Shear (ASTM D-1002-64)(3M TM C-236) strengths were measured on 1 in. wide 1/2 in. overlap specimens. These bonds were made individually using 11 in. X 4 in. pieces of substrate. The thickness of the bond line was 0.005 - 0.008 in. All strengths were measured at 23 deg.C except when noted. The separation rate of the testing jaws was 0.1 in. per minute for metals, 2 in. per minute for plastics and 20 in. per minute for rubbers. The thickness of the substrates were: steel 0.035 in.; other metals 0.05-0.064 in.; rubber 0.125 in.; plastics 0.125 in.
- 15: Metal/metal bonds tested per 3M ITSD TM C-439 @ 20 in./min. at 23 deg.C substrate 0.020 in. thick. Metal/rubber bonds pulled at 10 in./min.
- 16: Rubber/metal bonds. Rubber sanded with 120 grit sandpaper then MEK wiped.
- 17: Rubber delamination/tear.

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Storage and Shelf Life

Storage: Store product in cool, dry area where temperature will not exceed 16 deg.C. Refrigerated storage is recommended.
Shelf Life: Scotch-Weld DP-818 acrylic adhesive in bulk containers have a shelf life of 6 months in unopened original containers and 6 months in Duo-Pak cartridges.

Precautionary Information

Refer to Product Label and Material Safety Data Sheet for Health and Safety Information before using the product.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-742-5933. Address correspondence to : 3M Industrial Tape and Specialties Division, 3M Center, Building 200-8E-04, P.O. Box 33220, St.Paul, MN 55133-3220. Our fax number is 612-736-4776. In Canada, phone: 1-519-451-2500. In Puerto Rico, phone: 1-809-750-3000. In Mexico, phone: 1-915-6-26-04-00.

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 method of application. Please remember that many factors can affect the use and performance of a 3M ITSD 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 ITSD product. Given the variety of factors that can affect the use and performance of a 3M ITSD product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M ITSD 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 negligence, warranty, or strict liability.

ISO 9002

This Industrial Tape and Specialties Division product was manufactured under 3M quality system registered to ISO 9002 standards.

For Additional Product Safety and Health Information, see Material Safety Data Sheet, or call:
3M, Adhesive Systems, Industrial Tape and Specialties Division
3M Center, Building 20-7E-01, St.Paul, MN 55144-1000
Phone: 612/733-1110, Operator No. 55

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