

3M

Scotch-Weld™

Acrylic Adhesives

DP-805 • DP-820

Technical Data

January, 2001

(Supersedes August, 1998)

Product Description

3M™ Scotch-Weld™ Acrylic Adhesives DP-805 and DP-820 are two-part, 1:1 mix ratio, toughened acrylic structural adhesives. They exhibit excellent shear and peel strength along with good impact and durability. Scotch-Weld DP-805 and DP-820 adhesives bond well to many metals, ceramics, wood and most plastics.

Features

- Excellent shear and peel strength
- 5 minute worklife (DP-805 Adhesive)
20 minute worklife (DP-820 Adhesive)
- Minimal surface preparation
- Easy mixing
- Non-sag
- 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-805	DP-820
Color	Base (B) Accelerator (A)	Off-White Yellow	Off-White Yellow
Net Weight (Lbs./Gallon)	Base (B) Accelerator (A)	8.4 8.1	8.6 8.1
Viscosity ¹ @ 73°F (23°C)	Base (B) Accelerator (A)	75,000 cps 150,000 cps	70,000 cps 45,000 cps
Base Resin		Acrylic	Acrylic
Mix Ratio (B:A)	By Volume By Weight	1:1 1:1	1:1 1:1
Worklife ² @ 73°F (23°C)	Nozzle mixed	3-4 minutes	15-20 minutes
Applied Open Time ³		3 minutes	15 minutes
Time to Handling Strength ⁴		7-10 minutes	35-45 minutes

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Typical Cured Properties

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Physical

Product	DP-805	DP-820
Color	Pale Yellow	Pale Yellow
Shore D Hardness ⁵	79	75
Full Cure Time ⁶	24 hrs. @ 73°F (23°C)	48 hrs. @ 73°F (23°C)
Elongation ⁷	30%	50-75%
Tensile Strength ⁷	3200 psi	—

Thermal

Product	DP-805	DP-820
Glass Transition Temperature ⁸ (Tg)	140°F (60°C)	136°F (58°C)
Coefficient of Thermal Expansion ⁹ (units/units/°C)	105 x 10 ⁻⁶ 60-212°F (20-100°C)	180 x 10 ⁻⁶ 68-158°F (20-70°C)
Weight Loss at Temperature ¹⁰ by Thermal Gravimetric Analysis (TGA)	1% @ 275°F (135°C) 5% @ 451°F (233°C)	1% @ 266°F (130°C) 5% @ 446°F (230°C)

Electrical

Product	DP-805	DP-820
Dielectric Constant ¹¹	3.6 @ 500 Hz 3.6 @ 1 KHz 3.5 @ 10 KHz 3.4 @ 100 KHz	3.1 @ 500 Hz 3.0 @ 1 KHz 2.8 @ 10 KHz 2.8 @ 100 KHz
Dissipation Factor ¹¹	0.046 @ 500 Hz 0.037 @ 1 KHz 0.023 @ 10 KHz 0.018 @ 100 KHz	0.083 @ 500 Hz 0.065 @ 1 KHz 0.032 @ 10 KHz 0.022 @ 100 KHz
Volume Resistivity ¹²	1.1 x 10 ¹⁴ ohm-cm	2.2 x 10 ¹² ohm-cm
Dielectric Strength ¹³	—	3500 volts/mil
Surface Resistivity ¹²	2.1 x 10 ¹⁵ ohms	1.6 x 10 ¹⁴ ohms

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**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.

Overlap Shear (OLS)¹⁴ to Various Substrates (psi)

Product	DP-805	DP-820
Aluminum - etched	3500	3200
Aluminum - (etched/oily)	3500	2900
Aluminum - (120 grit sandpaper)	3200	3100
Aluminum - (solvent cleaned only)	900	300
Cold Rolled Steel (CRS)	2800	2500
CRS (oily)	2700	2400
Copper	900	—
Galvanized Steel	1300	1200
FR-4 Glass Epoxy	2500	2000
Fiberglass Reinforced Plastic	600	700
ABS	1000	1000
PVC	1750	1750
Polycarbonate	950	1150
Acrylic	1200	1250
Fir Wood	800	1200

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

Product	DP-805	DP-820
Control (no immersion)	2800	2500
Toluene	2650	NR
Machine Oil	2850	1950
IPA (isopropyl alcohol)	2650	1350
Gasoline	2750	1500
1,1,1-Trichloroethane	2550	NR*
10% HCL	800	NR*
MEK (methyl ethyl ketone)	<10	NR*
Acetone	<10	NR*

*Not Recommended (NR)

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

Product	DP-805	DP-820
Control (RT Aging)	2500	2000
248°F (120°C)/2 wks	2700	3300
194°F (90°C)/90% RH/2 wks	2600	1600
Tap Water 1 wk/RT	2200	1500

RT = Room Temperature RH = Relative Humidity

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

Product	DP-805	DP-820
Control (RT Aging)	2800	2500
248°F (120°C)/2 wks	500	300
194°F (90°C)/90% RH/2 wks	2200	850
Tap Water 1 wk/RT	2500	850

RT = Room Temperature RH = Relative Humidity

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**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.

Overlap Shear¹⁴ (Etched Alum./Etched Alum.) Tested at Various Temperatures (psi)

Product	DP-805	DP-820
-67°F (-55°C)	2500	3100
73°F (23°C)	3500	3150
180°F (83°C)	2200	1900
200°F (93°C)	—	1450

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

Product	DP-805	DP-820
Etched Alum (Oily) 120°F (49°C)/100% RH/4 wks	3500	1650
Etched Alum 200°F (93°C)/100% RH/2 wks	3300	1000
CRS (Oily) 120°F (49°C)/100% RH/2 wks	2600	1150

180° T-Peel Adhesion^{15, 16} (piw)

Substrate	Test Temperature	Peel Adhesion	
		DP-805	DP-820
Etched Al/Etched Al	-67°F (-55°C)	20	19
Etched Al/Etched Al	73°F (23°C)	35	22
Etched Al/Etched Al	100°F (38°C)	35	22
Etched Al/Etched Al	130°F (54°C)	36	22
Etched Al/Etched Al	150°F (65°C)	35	22
Etched Al/Etched Al	180°F (83°C)	34	22
Neoprene/CRS	73°F (23°C)	16 ¹⁷	11
Nitrile/CRS	73°F (23°C)	4	22
Red SBR/CRS	73°F (23°C)	17 ¹⁷	—
Black SBR/CRS	73°F (23°C)	3	9

Rate of Strength Build-up OLS¹⁴ (psi)

Etched Al/Etched Al Time Bonding to Testing	OLS Bond Strength	
	DP-805	DP-820
7 minutes	125	—
15 minutes	1000	—
30 minutes	2000	40
1 hour	2600	900
2 hours	2800	1700
4 hours	3200	2750
1 day	3500	3400
2 days	3500	3450
7 days	3500	3450

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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 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-805 and DP-820 are 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 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 2 minutes for Scotch-Weld DP-805 or 15 minutes for Scotch-Weld DP-820. Larger quantities and/or higher temperatures will reduce this working time.
5. Join the adhesive coated surfaces and allow to cure at 60°F (16°C) or above until completely firm. Heat up to 200°F (93°C) will speed curing. Scotch-Weld DP-805 will fully cure in 24 hours @ 75°F (24°C) and Scotch-Weld DP-820 will fully cure in 48 hours @ 75°F (24°C).
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 Scotch-Weld DP-805 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 one minute Scotch-Weld DP-805 may begin to form a very thin "skin" over the exposed surface. If left exposed long enough (2-3 minutes), a thick enough "skin" may form which will inhibit the proper wetting needed 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. Scotch-Weld DP-820 does not exhibit this skinning characteristic.

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Handling/Curing Information (*continued*)

Adhesive Coverage: A 0.005 in. thick bondline will yield a coverage of 320 sq. ft./gallon (typical).

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

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 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 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.

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 ± 10°F (88°C ± 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°F ± 5°F (66°C ± 2°C).

Sodium Dichromate	4.1 - 4.9 oz./gallon
Sulfuric Acid, 66°Be	38.5 o 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 190°F ± 10°F (88°C ± 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.*

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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 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 and follow the manufacturer's precautions and directions for use.

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) strength when cured at (73°F) 23°C.
5. ASTM D-2240.
6. Time to develop 80% of maximum overlap shear values.
7. Tensile and Elongation. Used procedure in 3M AdhD™ (3M Adhesives Division, Test Method) C-3094/ASTM D-882. Samples were 2 in. dumbbells with 0.125 in. neck and .030 in. sample thickness. Separation rate was 2 inches per minute.
8. Determined using DSC and heating rate of 68°F (20°C) per minute.
9. Determined using Thermal Mechanical Analysis (TMA) and heating rate of 41°F (5°C) per minute. First heat values given.
10. By TGA in air at 50°F (10°C)/min. Perkin Elmer TGA-7.
11. ASTM D-150 at 73°F (23°C).
12. ASTM D-257 at 73°F (23°C).
13. ASTM D-149 at 73°F (23°C). Sample thickness 14 mils.
14. Overlap Shear (ASTM D-1002-64) (3M™ C-236) strengths were measured on 1 in. wide 1/2 in. overlap specimens. These bonds were made individually using 1 in. x 4 in. pieces of substrate. The thickness of the bond line was 0.005 - 0.008 in. All strengths were measured at 73°F (23°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.; rubbers, 0.125 in.; plastics, 0.125 in.
15. Metal/metal bonds tested per 3M AdhD™ C-439 @ 20 in./min. at 73°F (23°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 60°F (16°C). Refrigerated storage is recommended.

Shelf Life: Scotch-Weld DP-805 and DP-820 have a shelf life of 6 months in unopened original containers.

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

For Additional Information To request additional product information or to arrange for sales assistance, call toll free 1-800-362-3550. Address correspondence to: 3M Adhesives Division, 3M Center, Building 220-8E-05, St. Paul, MN 55144-1000. Our fax number is 651-733-9175. In Canada, phone: 1-800-364-3577. In Puerto Rico, phone: 1-787-750-3000. In Mexico, phone: 52-70-04-00.

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This Adhesives Division product was manufactured under a 3M quality system registered to ISO 9002 standards.

For Additional Product Safety and Health Information, See Material Safety Data Sheet, or call:



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