

3M

Scotch-Weld™

Structural Plastic Adhesive

DP-8010 • DP-8010NS

Technical Data

February, 2006

Product Description

3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010 and DP-8010NS is a two-part acrylic-based adhesive (10:1 ratio by volume) that can bond many low surface energy plastics, including many grades of Polypropylene, Polyethylene, and TPO's *without special surface preparation.*

Scotch-Weld Adhesive DP-8010 and DP-8010NS can replace screws, rivets, plastic welding, and two-step processes which include chemical etchants, priming or surface treatments in many applications.

Scotch-Weld Adhesive DP-8010NS is a non-sag product designed to be used in applications where a high viscosity product is needed such as a vertical surface.

Features

- Ability to Bond Dissimilar Substrates
(Priming to Metal Surfaces May be Necessary)
- Ability to Structurally Bond Polyolefins
- Room Temperature Cure
- Excellent Water and Humidity Resistance
- Very Good Chemical Resistance
- Scotch-Weld Adhesive DP-8010NS Has High Viscosity for Sag Resistance.
- One Step Process - No Pre-Treatment of the Polyolefin Substrates Needed
- Solvent-free Adhesive System
- Convenient Hand-Held Applicator System
- Available in Bulk

3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010 • DP-8010NS

Typical Uncured Properties

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

Product		3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010	3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010NS
Color	Base (B) Accelerator (A)	Pink/Amber White	Pink/Amber White
Lbs./gal.	Base (B) Accelerator (A)	8.4 8.5	8.4 8.5
Viscosity (cps) ⁽¹⁾	Base (B) Accelerator (A)	18,000 27,000	70,000 27,000
Base Resin	Base (B) Accelerator (A)	Methacrylate Amine	Methacrylate Amine
Mix Ratio	(Volume) (Weight)	10:1 9.8:1	10:1 9.8:1
Time to Handling Strength (minimum of 50 psi of shear at 73°F/23°C)		1.5 - 2 hrs.	1.5 - 2 hrs.
Full Cure 73°F (23°C)		8 - 24 hrs.	8 - 24 hrs.
Worklife 73°F (23°C)		10 - 12 min.	10 - 12 min.

(1) Viscosity obtained by Brookfield, DV-II, #7 Spindle, 20 rpm at 75°F (24°C).

Typical Cured Properties

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Product		Scotch-Weld Adhesive DP-8010	Scotch-Weld Adhesive DP-8010NS
Color		Yellow	Yellow
Tg onset (°C) ⁽²⁾		34	34
Coefficient of Thermal Expansion (ppm/°C) ⁽²⁾			
	Below Tg	133	132
	Above Tg	171	207
Mechanical Properties ⁽³⁾			
	Strain at Break	3%	—
	Stress at Break (psi)	1,900	—
	Modulus @ 1% Strain (psi)	70,000	—

(2) Tg and CTE determined by TMA -40°F to 249°F (-40°C to 120°C) at 10°F (5°C)/min. (after 2 heat cycles).

(3) Mechanical properties obtained using a Sintech 5GL Mechanical Tester. Approximate dimensions of the test specimen was 1.5" x 0.5" x 0.3". Elongation was determined by crosshead displacement. The crosshead velocity was 0.5"/min.

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Typical 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 Strength⁽⁴⁾, tested @ 73°F (23°C)

Product	3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010	3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010NS
Substrate	OLS (psi)	OLS (psi)
UHMWPE	750 SF	775 SF
LDPE	400 SF	400 SF
HDPE	1100 SF	1100 SF
PE	1225 SF	950 SF
PP	1500 CF	1150 SF
ABS	1450 SF	1475 SF
Lexan	1250 CF	1050 MM
Plexiglass (PMMA)	1075 SF	1150 SF
PVC	2200 SF	2050 SF
HIPS	575 SF	575 SF
PTFE	550 AF	475 AF
Green FRP	2425 MM	2525 MM
Polystyrene	775 SF	750 SF
Glass (3/16" thick)	600 SF	600 SF
Gel Coat (3/16" thick)	1550 SF	1450 SF
Copper (1/16" thick)	2375 MM	1875 MM
Aluminum (1/16" thick)	2200 CF	1950 AF
Cold-Rolled Steel (1/32" thick)	1525 AF	2050 AF
304 Stainless Steel (1/32" thick)	900 AF	1200 AF
Acetal	200 AF	150 AF
CRS/HDPE (non-abraded CRS)	825 AF to CRS	850 AF to CRS
Aluminum/HDPE (non-abraded aluminum)	425 AF to Al	125 AF to Al
ED-5000 E-Coated CRS/HDPE	1225 AF	1025 AF
EC 3924 Primed CRS (non-abraded CRS)	1575 CF	1375 MM
EC 3924 Primed Al/HDPE (non-abraded Al)	1450 CF	1500 CF
DCT 5002X Top Coat CRS/HDPE**	1200 Top Coat Failure	950 AF/Top Coat
RK8010A Top Coat CRS/HDPE**	125 AF	600 AF

** (non-abraded CRS)

SF = Substrate Failure/Break/Yield

CF = Cohesive Failure

AF = Adhesive Failure

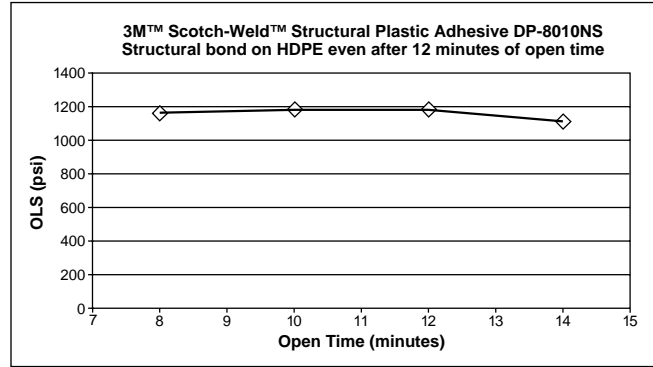
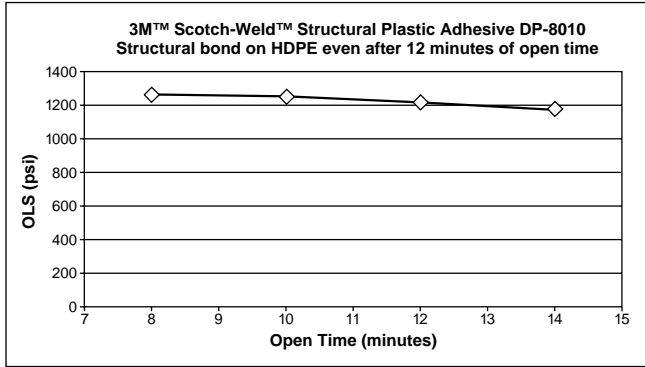
MM = Mixed (Mode of AF and CF)

(4) Overlap Shear Test Method: Overlap shear test for adhesion determined in accordance to ASTM D1002. Sample dimensions were 1" x 4" x 1/8" (unless other thicknesses indicated) with an overlap area of 1" x 1/2". Plastics and glass substrates were cleansed with isopropyl alcohol (IPA) wipes; metal substrates were abraded with 150-grit sandpaper and cleansed with methyl ethyl ketone (MEK) wipes. All bonds were allowed to cure for a minimum of 48 hours at 73°F (23°C) before tested. Data were collected using a Sintech 5GL Mechanical Tester with the 2000-lb or 5000-lb load cells. Test rate was 2"/min. for plastic bonds, and 0.1"/min. for metal and glass bonds at 73°F (23°C).

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Typical 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.



T-Peel Strength (piw)⁽⁵⁾, tested @ 73°F (23°C)

Substrate	Scotch-Weld Adhesive DP-8010	Scotch-Weld Adhesive DP-8010NS
HDPE	35 piw SF	30 piw SF

(5) Peel tests on 0.02" thick HDPE, 0.017" bondline thickness, 8" x 1" in T-peel mode at a rate of 2.0"/min.

Environmental Resistance

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

Environmental & Chemical Exposure Test on HDPE⁽⁶⁾

All Exposure Times 14 Days Unless Otherwise Noted

All Temperatures are Room Temperature Unless Otherwise Noted

Product	Scotch-Weld Adhesive DP-8010	Scotch-Weld Adhesive DP-8010NS
Condition	Overlap Shear (psi)	Overlap Shear (psi)
Control - no chemical exposure	1100 SF	1100 SF
160°F (71°C)/100% RH	1000 MM	900 MM
160°F (71°C) Water Soak	1175 CF	1175 CF
Room Temperature Salt Water Soak (5% by wt.)	1000 SF	975 SF
160°F (71°C)/100% RH Salt Water Soak (5% by wt.)	925 CF	975 CF
NaOH (10% by wt.)	975 SF	950 SF
HCl (16% by vol.)	975 SF	875 SF
Isopropyl Alcohol	975 SF	875 SF
Antifreeze Coolant	1000 SF	975 SF
Gasoline	550 CF	575 CF
Diesel Fuel	925 SF	925 SF
Toluene	50 CF	50 CF
Acetone	250 CF	275 CF

SF = Substrate Failure/Break/Yield

CF = Cohesive Failure

AF = Adhesive Failure

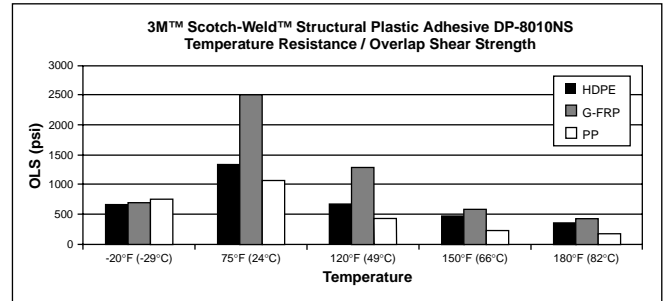
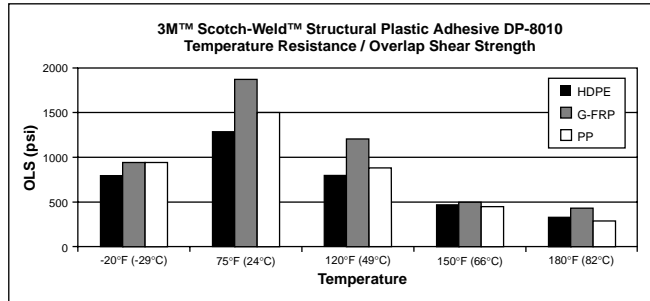
MM = Mixed (Mode of AF and CF)

(6) Environmental tests were conducted by immersing bonded coupons of HDPE and subsequent testing in accordance with footnote 4.

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Temperature Resistance⁽⁷⁾

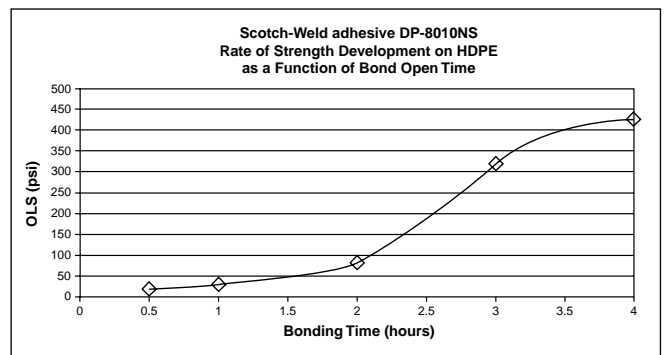
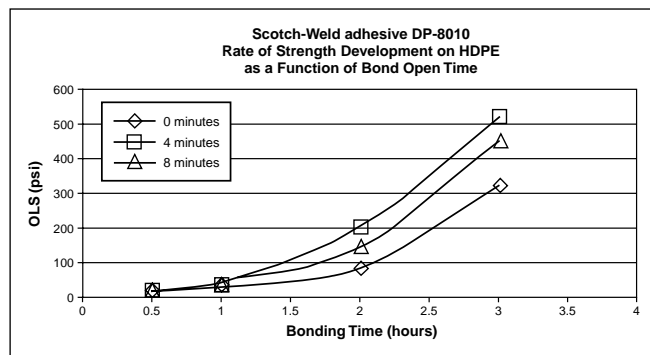
Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.



(7) Temperature resistance tests were conducted at specified temperature in accordance with footnote 4.

Typical Rate of Strength Build-Up⁽⁸⁾

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



(8) Rate of strength testing done using overlap shear test described in footnote 4.

Suggested Substrates

Note: The following suggestions are based on laboratory tests on typical grades of the listed substrates. Because of the many combinations of process aids and additives that are used with plastic substrates, the user is responsible for determining whether 3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010 and DP-8010NS are appropriate for a given application.

Potential Primary Surfaces	Polypropylene (PP) Polyethylene (PE, HDPE, LDPE) TPO
Potential Secondary Surfaces	Fiber Reinforced Plastic (FRP) Primed metals Polycarbonate Wood Glass TPE PVC ABS PMMA Polystyrene Concrete
Not Recommended Surfaces	Silicone Surfaces Surfaces Containing Mold Release Polyimide Nylons

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Handling/Curing Information

Directions for Use:

Important: Use only the specified 3M™ EPX™ Plus II Applicator system or appropriate meter mix equipment to ensure the proper 10:1 mix ratio and mix. Hand mixing is not recommended and may result in unpredictable results.

- 1) Apply adhesive to clean, dry substrates, which are free of paint, oxide films, oils, dust, mold release agents and all other surface contaminants. See the Surface Preparation section for specific substrate preparation methods.

35 ml Cartridge:

Place duo-pak cartridge in EPX applicator. Remove cap. Dispense and discard a small amount of adhesive to assure even ratio and free flow. Clear orifice if necessary. Use only orange 10:1 mixing nozzle by: (a) aligning nozzle notch with cartridge recess, and (b) twisting into place. Dispense and discard a small amount of adhesive through nozzle until the adhesive is mixed.

250 ml Cartridge:

While holding duo-pak cartridge in an upright position, remove and discard the insert from the cartridge by unscrewing the plastic nut and removing the metal washer. Place cartridge in a 10:1, 250 ml EPX applicator.

Clean orifice if clogged, dispense and discard a small amount of adhesive to even pistons. Attach orange 10:1 EPX mixing nozzle by:

- (a) sliding the nozzle over the cartridge orifice until the nozzle notch aligns and seats against the tab on the neck of the cartridge and;
- (b) screwing the plastic nut back onto the cartridge to secure the nozzle. Check the small orifice for debris. Dispense and discard a small amount of adhesive until the mixed adhesive has a milky white appearance. If adhesive is clear, check the small orifice for debris or flow.

Meter-Mix Equipment:

Follow manufacturer's precautions, directions for use, and recommendations.

- 2) After the adhesive is applied, substrates must be mated within the worklife of the adhesive, 10 minutes or sooner for one-sided applications. Adhesive thickness less than .005" will yield unpredictable results. The joint design of the substrates should facilitate a .005" to .008" adhesive thickness at the bondline. Adhesive contains .008" micropheres for this purpose.
- 3) The bonded surfaces should be fixtured, or clamped, for at least 2 hours. The clamping pressure should be sufficient to keep the surfaces in contact during cure (typically 4-8 psi). Plastic parts can be designed to be self-fixturing, negating the need for external fixturing.

Note: Heating the bondline to 150-175°F (66-80°C) for 30 minutes will speed up curing. Assembled parts must remain at room temperature for 10 minutes prior to heating to allow more adhesive penetration into the substrates before heat-accelerated cure.

- 4) Cured adhesive appearance: the adhesive will yellow with time, a rippling effect in the adhesive as it cures is normal and indicates that the adhesive is mixed properly and curing normally.

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Handling/Curing Information (*continued*)

Approximate Coverage – By Size of Container (does not include nozzle waste)

Bead Size	Linear ft per 35 ml	Linear ft per 250 ml	Linear ft per mixed gallon
1/2"	1.8	12.9	196
3/8"	3	23	350
1/4"	7	51.8	785
1/8"	28.9	206.7	3,130
1/16"	114.8	820	12,240

Coverage in square feet – (.008" bond line)

Square ft per 35 ml	Square ft per 250 ml	Square ft per mixed gallon
2	13	200

Surface Preparation

3M™ Scotch-Weld™ Structural Plastic Adhesive DP-8010 and DP-8010NS can bond polypropylene, polyethylene and other thermoplastic polyolefins without special surface preparation. However, all substrates should be clean, dry and free of loose paint, oxide films, oils, dust, mold release agents and other surface contaminants. The amount of surface preparation directly depends on the bond strength and environmental resistance desired by the user.

The following cleaning methods are suggested for common surfaces.

Steel and Aluminum (priming necessary)

- 1) Wipe free of dust with oil-free solvent such as acetone or isopropyl alcohol.*
- 2) Sandblast or abrade using clean fine grit abrasives (150 grit or finer).
- 3) Wipe again with solvent to remove loose particles.
- 4) A suggested primer is 3M™ Scotch-Weld™ Structural Adhesive Primer EC-3924B or EC-3901. Follow the instructions in the Scotch-Weld Primer EC-3924B or EC-3901 data sheets for application technique and curing conditions.

Note: Aluminum may also be acid etched. Follow the manufacturer's precautions and directions for this procedure.

Thermoplastic Polyolefin (TPO)

- 1) Wipe with isopropyl alcohol.*
- 2) Allow solvent to evaporate before use.

Plastic/Rubber

- 1) Wipe with isopropyl alcohol.*
- 2) Abrade using fine grit abrasives (150 grit or finer).
- 3) Remove residue by wiping again with isopropyl alcohol.*
- 4) Allow solvent to evaporate before use.

Glass

- 1) Solvent wipe surface using acetone or isopropyl alcohol.*
- 2) Allow solvent to evaporate before use.

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

