

Scotch-Weld™

Structural Plastic Adhesive

DP-8005

Technical Data

September, 1999

Product Description Scotch-Weld DP8005 Structural Plastic Adhesive 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 thermoplastics Elastomers (TPE's), such as Santoprene® rubber without special surface preparation.

Scotch-Weld DP-8005 Structural Plastic Adhesive can replace screws, rivets, plastic welding, and two step processes which include chemical etchants, priming or surface treatments in many applications.

Features	- Ability to bond Dissimilar Substrates	- One Step Process - No Pre-Treatment of
	- Ability to Structurally Bond Polyolefins	of the Substrates Needed
	- Room Temperature Cure	- Solvent-Free adhesive System
	- Excellent Water and Humidity	- Convenient Hand-Held Applicator
		System
	- Very Good Chemical Resistance	- Available in Bulk

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.

Property	Accelerator (Part A)	Base (Part B)
Color	White	White/Translucent
Density (kg/l)	1.05-1.09	0.95-1
Viscosity mPas	35000 - 55000	17000 - 30000
Base Resin	Amine	Methyl Methacrylate
Mix Ratio (Volume)	1	10
Mix Ratio (Weight)	1	9.16
Time to Handling Strength (0.35MPa at 23°C)	2-3hrs	
Full Cure time (at 23°C)	8-24hrs	
Worklife at 23°C	2.5 - 3 min	

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Typical Cured Physical Properties

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

Color	Yellow
Tg (°C) onset point DSC 10°C/min⁽²⁾	34-38°C
Shore D Hardness (ASTM D-2240)	55
Coefficient of Thermal Expansion⁽³⁾ Below Tg (Between -40°C and 30°C)	6.6*10 ⁻⁶
Mechanical Properties⁽⁴⁾ :	
Strain at peak load	5.3%
Stress at peak load (MPa)	13
Modulus at 1% Strain (MPa)	0.6

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 Strength⁽⁵⁾

Substrate	Temp	OLS (MPa)	Failure mode
Extrudated PE	24°C	6.9	Substrate
Extrudated PP	24°C	7.2	Substrate
UHMW PE	24°C	5.3	Substrate
LDPE	24°C	2.3	Substrate
ABS	24°C	6.7	Substrate
Polycarbonate	24°C	5.9	Substrate
PMMA (acrylic)	24°C	5.6	Substrate
Rigid PVC	24°C	10.6	Substrate
Polystyrene	24°C	3.8	Substrate
Nylon-6,6 30% Glass filled	24°C	5.7	Cohesive
FRP	24°C	16.3	Cohesive
Galvanized/PE	24°C	6.8	Substrate
Galvanealed/PE	24°C	6.7	Substrate
Cold Rolled Steel/PE	24°C	6.7	Substrate
2024 Aluminium	24°C	14.8	Cohesive
Oily Steel (Galvanised)	24°C	14.8	Cohesive

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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.

Environmental Exposure Tests⁽⁶⁾
Overlap Shear Strength of HDPE bonds

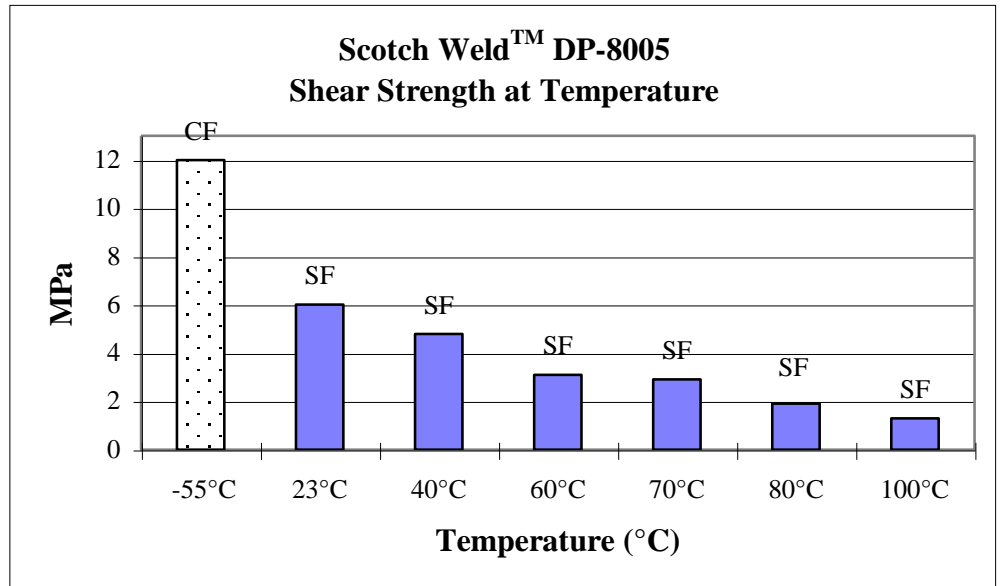
Condition	Time	Temp	OLS (MPa)	Failure mode
Control	-	24°C	6.9	Substrate PE
71°C/100%HR	14 days	71°C	5.7	Substrate PE
71°C/100%HR	30 days	71°C	5.6	Substrate PE
10% NaOH	14 days	24°C	6.7	Substrate PE
16% HCl	14 days	24°C	6.8	Substrate PE
20% Bleach	14 days	24°C	6.9	Substrate PE
IPA	14 days	24°C	6.6	Substrate PE
Pump Oil	14 days	24°C	7.1	Substrate PE
50% Antifreeze	14 days	24°C	6.7	Substrate PE
Gasoline	14 days	24°C	1.1	Cohesive
Diesel Fuel	14 days	24°C	5.9	Cohesive
Toluene	14 days	24°C	0.1	Cohesive

180° Peel Strength

Substrate	Temp	Strength (N/cm)	Failure mode
HDPE	24°C	28	Cohesive
Santoprene Rubber	24°C	32	Substrate

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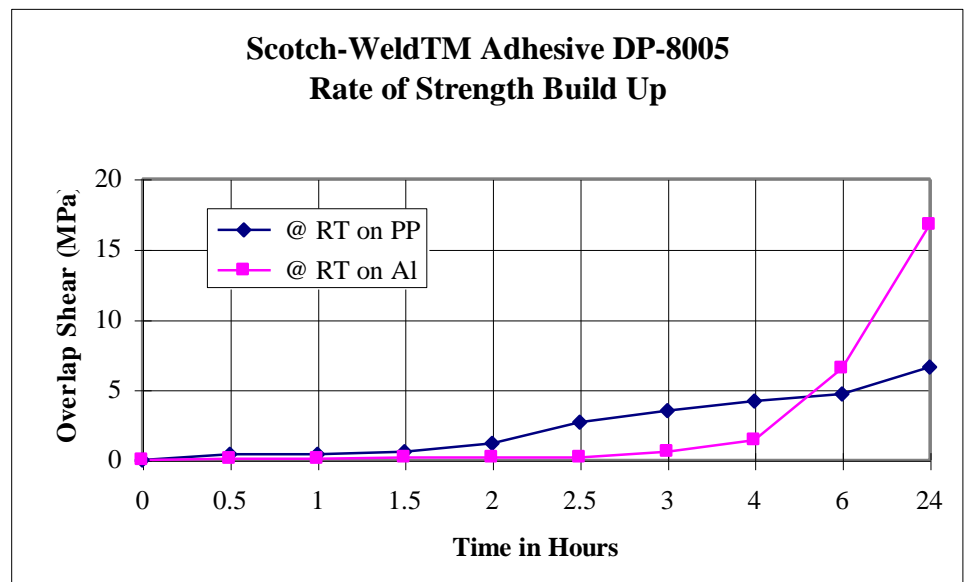
Figure 1



SF : Substrate Failure, CF : Cohesive failure

The above overlap shear tests data was collected on 5mm*100mm*25mm PP specimens overlapped 12.5mm, allowed to cure at 24°C for 7 days and then tested at a rate of 10mm/mn in overlap shear mode , at the temperature shown.

Figure 2



The above rate of strength build up was collected on 25mm*100mm Aluminium and PP samples overlapped 12.5mm allowed to cure at 24°C and tested at a rate of 10mm/mn in overlap shear mode at 24°C.

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Test Methods and Footnotes

- 1) Viscosity obtained by Brookfield, DV-II, Spindle 7, 20rpm at 24°C.
- 2) Tg determined by differential scanning calorimetry, TA Instruments 2920, Scanning rate (-50°C) to (130°C) at 10°C/min reported data is for Tg onset.
- 3) Coefficient of thermal expansion (CTE) obtained by use of TA Instruments 2940, sample was heated from -50°C to 150°C at 5°C/min. 0.03N static force was applied. Reported CTE represent value below Tg.
- 4) Mechanical properties obtained by use of Sintech 5 GL Mechanical Tester with a 500# load cell. Test specimen with approximate dimensions of 1.5”*0.5”*0.03”. Elongation was determined by crosshead displacement, pull rate was 0.5”/min.
- 5) Overlap shear test method : overlap shear test for adhesion determined in accordance to ASTM D1002, sample dimensions were 1”*4”*1/8”, with a ½ square inch of area of overlap, bonded to themselves unless otherwise noted, allowed to cure for at least 16 hours at 24°C before testing. Data were collected using a Sintech 5GL Mechanical Tester with a 2000 or 5000# load cell. Test rate was 0.5”/min. Strength at 24°C unless otherwise noted.
- 6) Environmental tests were conducted by immersing bonded coupons of extruded PP to extruded HDPE prepared in accordance to description in footnote 5.
- 7) Peel tests on 0.020” HDPE and .063” Santoprene® Rubber, 0.017” bondline thickness 8”*1” in T-Peel mode, peel rate 2”/min.

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 plastics substrates, the user is responsible for determining whether Scotch-Weld Structural Plastics Adhesive DP 8005 is appropriate for a given application.

Potential Primary Surfaces	Polypropylene (PP) Polyethylene (PE, HDPE, LDPE) Thermoplastic Elastomers (Santoprene® Rubber)
Potential Secondary Surfaces	Fiber Reinforced Plastics Rigid PVC Polycarbonate (PC) ABS Wood Acrylic (PMMA) Aluminium Polystyrene Glass Concrete
Not Recommended Surfaces Inconsistent results have been exhibited with substrate that contain oils and antistats.	PTFE (Teflon®) Silicones surfaces Mold-release Agents Polyimide

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Handling/Curing Information

Directions for Use :

Important : Use only the specified 3M™ EPX™ 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 cartridges :

Place Duo Pack cartridge of EPX applicator. Remove cap. Remove rubber plug. 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 : 1) aligning nozzle notch with cartridge recess, and 2) twisting into place. Dispense and discard a small amount of adhesive through nozzle until the adhesive is mixed.

250ml cartridge :

While holding Duo-Pack cartridge in an upright position, remove and discard the insert from the cartridge by unscrewing plastic nut and removing metal washer. Place cartridge in a 10:1, 250ml 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. Dispense and discard a small amount of adhesive until the adhesive has milky white appearance, if adhesive is clear check and small orifice for debris.

Meter Mix Equipment :

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

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- 2) After the adhesive is applied, substrates must be mated within the worklife of the adhesive, 2-2.5minutes for one-sided applications. Adhesive thickness less than 130µm will yield unpredictable results. The joint design of the substrates should facilitate a 130 to 200µm adhesive thickness at the bondline. Adhesive contains 200µm microspheres for this purpose.
 - 3) The bonded surfaces should be fixtured , or clamped for at least 2hrs. The clamping pressure should be sufficient to keep the surface in contact during cure (typically 0.028 -0.055MPa). Plastic parts can be designed to be self fixturing, negating the need for external fixturing (Note : Heating the bondline to 66 - 80°C for 30 minutes will speed curing)
 - 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

Bead Size	Linear m per 35ml	Linear m per 250ml	Linear m per mixed gallon
12.7mm	0.5	3.9	60
9.5mm	0.9	7	107
6.3mm	2.1	15.8	240
3.1mm	8.8	63	954
1.6mm	35	250	3730

Coverage in square meter - (200µm bondline)

m ² per 35ml	m ² per 250 ml	m ² per mixed gallon
0.2	1.2	18.6

Surface preparation

Scotch-Weld Structural Plastic Adhesive DP-8005 can bond Polypropylene, Polyethylene and PTFE without surface preparation. However, all substrates should be clean, dry and free of paint, oxide films, oils, dusts, 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 Aluminium

- 1) Wipe free of dust with oil-free solvent such as acetone or isopropyl alcohol.
- 2) Sandblast or abrade using clean grit abrasives (180grit or finer).
- 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™ Structural Adhesive Primer 1945 B/A is used, apply a thin coating (10µm) on the metal surface to be bonded, air dry at 24°C for 1hr, then cure for 30minutes at 82°C, 5 minutes at 122°C or 3 hours at 24°C (Note : Aluminium may also be acid etched. Follow the manufacturer's precautions and directions for this procedure).

Plastic/Rubber

- 1) Wipe with isopropyl alcohol*.
- 2) Abrade using fine grit abrasive (180 grit or finer)
- 3) Remove residue by wiping again with isopropyl alcohol*.

Glass

- 1) Solvent wipe surface using acetone.*

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

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Storage and Shelf Life **Storage :** For maximum shelf life, store Duo Pack cartridges and bulk containers at 4°c or below.

Shelf life : When stored at the recommended temperature in the original unopened containers, this product has a shelf life of six months from date of shipment.