Scotch-Weld™ Structural Plastic Adhesive DP-8005

Product Data Sheet

Updated: April 2000
Supersedes: October 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 and Polyethylene, 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.

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.

<table>
<thead>
<tr>
<th>Property</th>
<th>Accelerator (Part A)</th>
<th>Base (Part B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>White</td>
<td>White/Translucent</td>
</tr>
<tr>
<td>Density (kg/l)</td>
<td>1.05-1.09</td>
<td>0.95-1</td>
</tr>
<tr>
<td>Viscosity mPas</td>
<td>35000 - 55000</td>
<td>17000 - 30000</td>
</tr>
<tr>
<td>Base Resin</td>
<td>Amine</td>
<td>Methyl acrylate</td>
</tr>
<tr>
<td>Mix Ratio (Volume)</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Mix Ratio (Weight)</td>
<td>1</td>
<td>9.16</td>
</tr>
<tr>
<td>Time to Handling Strength (0.35MPa at 23°C)</td>
<td>2-3hrs (Al)</td>
<td>20 mins (PP)</td>
</tr>
<tr>
<td>Full Cure time (at 23°C)</td>
<td>8-24hrs</td>
<td></td>
</tr>
<tr>
<td>Worklife at 23°C</td>
<td>2.5 - 3 min</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Property</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Yellow</td>
</tr>
<tr>
<td>Tg (°C) onset point (2)</td>
<td>34-38°C</td>
</tr>
<tr>
<td>DSC 10°C/min</td>
<td></td>
</tr>
<tr>
<td>Shore D Hardness (ASTM D-2240)</td>
<td>55</td>
</tr>
<tr>
<td>Coefficient of Thermal Expansion (3)</td>
<td>6.6*10^-9</td>
</tr>
<tr>
<td>Below Tg (Between -40°C and 30°C)</td>
<td></td>
</tr>
</tbody>
</table>

Mechanical Properties (4):

| Strain at peak load | 5.3%  |
| Stress at peak load (MPa) | 13    |
| Modulus at 1% Strain (MPa) | 0.6   |
### Overlap Shear Strength

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

### Environmental Exposure Tests

<table>
<thead>
<tr>
<th>Condition</th>
<th>Time</th>
<th>Temp</th>
<th>OLS (MPa)</th>
<th>Failure mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>-</td>
<td>24°C</td>
<td>6.9</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>71°C/100%HR</td>
<td>14 days</td>
<td>71°C</td>
<td>7.2</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>71°C/100%HR</td>
<td>30 days</td>
<td>71°C</td>
<td>5.3</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>10% NaOH</td>
<td>14 days</td>
<td>24°C</td>
<td>2.3</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>16% HCl</td>
<td>14 days</td>
<td>24°C</td>
<td>6.7</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>20% Bleach</td>
<td>14 days</td>
<td>24°C</td>
<td>5.9</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>IPA</td>
<td>14 days</td>
<td>24°C</td>
<td>5.6</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>Pump Oil</td>
<td>14 days</td>
<td>24°C</td>
<td>10.6</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>50% antifreeze</td>
<td>14 days</td>
<td>24°C</td>
<td>3.8</td>
<td>Substrate PE</td>
</tr>
<tr>
<td>Gasoline</td>
<td>14 days</td>
<td>24°C</td>
<td>5.7</td>
<td>Cohesive</td>
</tr>
<tr>
<td>Diesel Fuel</td>
<td>14 days</td>
<td>24°C</td>
<td>16.3</td>
<td>Cohesive</td>
</tr>
<tr>
<td>Toluene</td>
<td>14 days</td>
<td>24°C</td>
<td>6.8</td>
<td>Cohesive</td>
</tr>
</tbody>
</table>
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.

180° Peel Strength (Continued)

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Temp</th>
<th>Strength (N/cm)</th>
<th>Failure mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDPE</td>
<td>24°C</td>
<td>28</td>
<td>Cohesive</td>
</tr>
<tr>
<td>Santoprene Rubber</td>
<td>24°C</td>
<td>32</td>
<td>Substrate</td>
</tr>
</tbody>
</table>

Figure 1

Scotch Weld™ DP-8005 Shear Strength at Temperature

Temperature (°C)

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

Scotch-Weld™ Adhesive DP-8005 Rate of Strength Build Up

Time in Hours

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.
## 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)
- PETG
- PVDF

### Potential Secondary Surfaces
- Fiber Reinforced Plastics
- Polycarbonate (PC)
- Wood
- Aluminium
- Glass
- Rigid PVC
- ABS
- Rigid PVC
- ABS
- Acrylic (PMMA)
- Polystyrene
- Concrete

### Not Recommended Surfaces
- Inconsistent results have been exhibited with substrate that contain oils and antistats.
- PTFE (Teflon®)
- Silicones surfaces
- Mold-release Agents
- Polymide
<table>
<thead>
<tr>
<th>Handling/Curing Information</th>
<th>Directions for Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Important:</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

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:

**38ml cartridges:**
Place Duo Pack cartridge of 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: 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.

**265ml cartridge:**
While holding Duo-Pack cartridge in an upright position, remove and discard the insert from the cartridge by unscrewing plastics nut and removing metal washer. Place cartridge in a 10:1, 265ml 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.

1. After the adhesive is applied, substrates must be mated within the worklife of the adhesive, 2-2.5 minutes 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.
2. 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)
3. 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
<table>
<thead>
<tr>
<th>Handling/Curing Information (continued)</th>
<th>Approximate Coverage - By Size of Container</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linear m per 35ml</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>12.7 mm</td>
<td>0.5</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>0.9</td>
</tr>
<tr>
<td>6.3 mm</td>
<td>2.1</td>
</tr>
<tr>
<td>3.1 mm</td>
<td>8.8</td>
</tr>
<tr>
<td>1.6 mm</td>
<td>35</td>
</tr>
</tbody>
</table>

Coverage in square meter - (200µm bondline)

<table>
<thead>
<tr>
<th></th>
<th>m² per 35ml</th>
<th>m² per 250 ml</th>
<th>m² per mixed gallon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.2</td>
<td>1.2</td>
<td>18.6</td>
</tr>
</tbody>
</table>

Surface preparation

Scotch-Weld Structural Plastic Adhesive DP-8005 can bond Polypropylene and Polyethylene 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 (180 grit or finer).
3. Wipe again with solvent to remove loose particles.

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 30 minutes 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.

Storage and Shelf Life

<table>
<thead>
<tr>
<th>Storage and Shelf Life</th>
<th>Storage</th>
<th>Shelf life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage :</td>
<td>For maximum shelf life, store Duo Pack cartridges and bulk containers at 4°C or below.</td>
<td>When stored at the recommended temperature in the original unopened containers, this product has a shelf life of six months from date of shipment.</td>
</tr>
</tbody>
</table>
Features

- Ability to bond dissimilar substrates
- One Step Process – No Pre-Treatment of the substrates needed
- Ability to Structurally Bond Polyolefins
- Room Temperature Cure
- Solvent Free Adhesive System
- Excellent Water & Humidity System
- Convenient Hand-Held Applicator
- Very Good Chemical Resistance
- Available in Bulk

Values presented have been determined by standard test methods and are average values not to be used for specification purposes. Our recommendations on the use of our products are based on tests believed to be reliable but we would ask that you conduct your own tests to determine their suitability for your applications. This is because 3M cannot accept any responsibility or liability direct or consequential for loss or damage caused as a result of our recommendations.

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