Scotch-Weld™
Epoxy Potting Compound/Adhesive
DP270 Clear and Black

Technical Data

Product Description
3M™ Scotch-Weld™ Epoxy Potting Compound/Adhesive DP270 (or 3M™ Scotch-Weld™ Epoxy Potting Compound/Adhesive 270 B/A) is a two-part, low viscosity epoxy resin system designed primarily for potting, sealing, and encapsulation of many electronic components and is available in clear or black. 3M™ Scotch-Weld™ epoxy potting compound/adhesive DP270 is noncorrosive to copper and offers good thermal shock resistance and excellent retention of electrical insulation properties under high humidity conditions.

3M™ Scotch-Weld™ epoxy potting compound/adhesive DP270 has a work life of approximately 70 minutes, a tack-free time of about 3 hours and is fully cured after 48 hours at 73°F (23°C). This product produces no exotherm in 5-10 gram masses and a very slight exotherm in larger masses.

3M™ Scotch-Weld™ epoxy potting compound/adhesive DP270 is ideal for the potting and encapsulation of many heat sensitive or delicate components such as glass diodes and sensors as well as for transformers, coils, chokes, relays, etc. It is available in the convenient 3M™ EPX Applicator System for multi-station usage and in bulk containers for larger volume applications.

Available in bulk containers as Scotch-Weld epoxy potting compound/adhesive 270 B/A.

Features
- Good Thermal Shock Resistance
- Meets UL 94 HB (File No. E61941)
- Long Worklife
- Excellent Electrical Properties
- Noncorrosive to Copper
- Negligible Exotherm

Typical Uncured Properties

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color:</td>
<td>Clear or Black</td>
</tr>
<tr>
<td>Base Resin:</td>
<td>Epoxy/amine</td>
</tr>
<tr>
<td>Mix Ratio:</td>
<td>1:1 by volume (1:0.85 B:A by weight)</td>
</tr>
<tr>
<td>Net Weight:</td>
<td>Base 9.6 - 9.7</td>
</tr>
<tr>
<td></td>
<td>Accelerator 8.0 - 8.2</td>
</tr>
<tr>
<td>Worklife:</td>
<td>60-70 minutes @ 23°C (73°F)</td>
</tr>
<tr>
<td>Viscosity: @ 23°C</td>
<td>Base 7000 - 16,000 cps</td>
</tr>
<tr>
<td></td>
<td>Accelerator 6000 - 12,000 cps</td>
</tr>
</tbody>
</table>

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

**Physical:**
- **Color:** Clear or Black
- **Refractive Index @ 25°C (77°F):** Clear 1.656
- **Cure Shrinkage:** .08%
- **Shore D Hardness (ASTM D-2240):** 83
- **Tack-free Time:** Approx. 3 hrs. @ 23°C (73°F)
- **UL Rating:** 94 HB (File No. E61941)
- **Cure Time:** 48 hrs. @ 23°C (73°F)

**Thermal:**
- **Weight Loss by TGA (in air):**
  - 1% @ 122°C (252°F)
  - 5% @ 175°C (347°F)
  - 10% @ 210°C (410°F)
- **Thermal Coefficient of Expansion by TMA:**
  - Below Tg: 80 x 10⁻⁶ units/unit/°C
  - Above Tg: 5-30°C range (10-86°F range)
  - 180 x 10⁻⁶ units/unit/°C
- **Glass Transition Temperature by DSC:**
  - Onset: 43°C (109°F)
  - Mid-Point: 49°C (120°F)
- **Thermal Conductivity:**
  - @ 110°F on .250” samples: .103 BTU - ft./ft² - hr. - °F
  - Cal./sec. - cm - °C: .426 x 10³
  - Watt/m - °C: .177
- **Thermal Shock Resistance:**
  - Potted Washer Olyphant Test: Pass 5 Cycles without cracking
  - 3M Test Method C-3174: +100°C (air) to -50°C (liquid)

**Electrical:**
- **Dielectric Constant (ASTM D-150):** 3.5 @ 1 KHz @ 23°C (73°F)
- **Dissipation Factor (ASTM D-150):** .018 @ 1 KHz @ 23°C (73°F)
- **Dielectric Strength (ASTM D-149):** 850 volts/mil
- **Volume Resistivity (ASTM D-257):** 4.1 x 10¹⁴ ohm-cm
- **Insulation Resistance:** (31 mm/30 mm comb pattern on FR-4)
  - Initial: 3 x 10¹³ ohms
  - 1000 hrs.: 2 x 10¹¹ ohms

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

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

**Dissipation Factor Versus Frequency**

**Dielectric Constant Versus Frequency**

**Insulation Resistance**

.8 mm/.8 mm Comb Pattern

60°C (140°F)/95% RH/100 V d.c.

*The numbers on the vertical axis represent the exponential power on the 1 x 10 ohm notation.*
Typical Cured Properties (continued)  
Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Corrosion:
- Per ASTM D-3482 (35°C/95°F/96% R.H./45V d.c./15 days) Pass - No copper corrosion
- Per 3M Test Method C-708 (45°C/113°F/96% R.H./250V d.c./5 days) Pass - No copper corrosion
- Per Mil S-46163 (65°C/149°F/96% R.H./250V d.c./4 days) Pass - No copper corrosion
- Per Mil S-46163 (10 days/50% R.H./23°C/73°F) Pass - No aluminum, brass or steel discoloration or corrosion

Solvent Resistance:
(Visual check after immersion in specified solvent at 23°C (73°F)

<table>
<thead>
<tr>
<th>Solvent</th>
<th>1 Hour</th>
<th>1 Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Freon TF</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Freon TMC</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>1,1,1-Trichloroethane</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>RMA Flux</td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

Key: A - Unaffected  
B - Slight Attack  
C - Moderate/Severe Attack

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.

Although 3M™ Scotch-Weld™ Epoxy Potting Compound/Adhesive DP270 and 270 B/A can be used for many potting and encapsulation applications, they can also be used as adhesives. The following shows typical shear and peel values determined on several common substrates:

Overlap Shear Adhesion (ASTM D-1002-72)

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Curing Conditions 7 days/73°F (23°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alum./Alum. (etched)</td>
<td>@-67°F (-55°C) @73°F (23°C) @180°F (82°C)</td>
</tr>
<tr>
<td>FR-4/FR-4 (MEK Wiped)</td>
<td>@73°F (23°C)</td>
</tr>
<tr>
<td>Copper/Copper (MEK Wiped)</td>
<td>@73°F (23°C)</td>
</tr>
</tbody>
</table>

90° T-Peel Adhesion (ASTM D-1876-61T)

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Curing Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alum./Alum. (etched)</td>
<td>@73°F (23°C)</td>
</tr>
</tbody>
</table>

Compression Strength (ASTM D-695-68T)

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Curing Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotch-Weld epoxy potting compound/adhesive DP270 Clear and Black</td>
<td>@73°F (23°C)</td>
</tr>
</tbody>
</table>
3M™ Scotch-Weld™
Epoxy Potting Compound/Adhesive
DP270 Clear and Black

3M™ EPX
Pneumatic Applicator
Delivery Rates

<table>
<thead>
<tr>
<th>Adhesive*</th>
<th>6mm Nozzle gms/minute</th>
<th>10mm Nozzle gms/minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M™ Scotch-Weld™ Epoxy Potting Compound/Adhesive DP270 Black</td>
<td>38.2</td>
<td>148.8</td>
</tr>
</tbody>
</table>

48.5/50 ml Applicator – Maximum Pressure 50 psi

<table>
<thead>
<tr>
<th>Adhesive*</th>
<th>1/4 in. Nozzle gms/minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M™ Scotch-Weld™ Epoxy Potting Compound/Adhesive DP270 Clear</td>
<td>75.6</td>
</tr>
<tr>
<td>Scotch-Weld epoxy potting compound/adhesive DP270 Black</td>
<td>68.6</td>
</tr>
</tbody>
</table>

*Tests were run at a temperature of 70°F ± 2°F (21°C ± 1°C) and at maximum applicator pressure.

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. However, the amount of surface preparation directly depends on the required bond strength and the environmental aging resistance desired by user. For specific surface preparations on common substrates, see the section on surface preparation.

2. These products consist of two parts.

Mixing

For Duo-Pak Cartridges

3M™ Scotch-Weld™ epoxy potting compound/adhesive DP270 Clear and Black are supplied in a dual syringe plastic duo-pak cartridge as part of the 3M™ EPX Applicator systems. 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 mixing of Part A and Part B is desired, attach the EPX applicator mixing nozzle to the duo-pak cartridge and begin dispensing the adhesive. For hand mixing, expel the desired amount of material and mix thoroughly to obtain a uniform color.

For Bulk Containers

Mix thoroughly by weight or volume in the proportions specified in the typical uncured properties section to obtain a uniform color.
3M™ Scotch-Weld™
Epoxy Potting Compound/Adhesive
DP270 Clear and Black

Handling/Curing Information (continued)

3. For maximum bond strength apply product evenly to both surfaces to be joined.

4. Application to the substrates should be made within 70 minutes. 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 firm. Heat up to 200°F (93°C) will speed curing.

6. The following times and temperatures will result in a full cure of these products.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Cure Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>23°C (73°F)</td>
<td>48 Hours</td>
</tr>
<tr>
<td>50°C (122°F)</td>
<td>4 Hours</td>
</tr>
<tr>
<td>80°C (176°F)</td>
<td>60 Minutes</td>
</tr>
<tr>
<td>100°C (212°F)</td>
<td>30 Minutes</td>
</tr>
</tbody>
</table>

7. Keep parts from moving during cure. Contact pressure necessary. Maximum shear strength is obtained with a 3-5 mil bond line.

8. Excess uncured adhesive can be cleaned up with ketone type solvents*.

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

Adhesion Coverage: A 0.005 in. thick bondline will yield a coverage of 320 sq. ft./gallon

Application and Equipment Suggestions

These products may be applied by spatula, trowel or flow equipment.

Two part mixing/proportioning/dispensing equipment is available for intermittent or production line use. These systems are ideal because of their variable shot size and flow rate characteristics and are adaptable to most applications.
**Surface Preparation**

For high strength structural bonds, paint, oxide films, oils, dust, mold release agents and all other surface contaminants must be completely removed. However, the amount of surface preparation directly depends on the required bond strength and the environmental aging resistance desired by user.

The following cleaning methods are suggested for common surfaces:

**Steel**

1. Wipe free of dust with oil-free solvent such as acetone, isopropyl or 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.

**Aluminum**

1. 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.
2. 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 - 41.5 oz./gallon
   2024-T3 aluminum (dissolved) 0.2 oz./gallon minimum
   
   Tap water as needed to balance
3. Rinse: Rinse panels in clear running tap water.
4. Dry: Air dry 15 minutes; force dry 10 minutes at 150°F ± 10°F (66°C ± 5°C).
5. 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.*

**Glass**

1. Solvent wipe surface using acetone or MEK.*
2. Apply a thin coating (0.0001 in. or less) of 3M™ Scotch-Weld™ Metal Primer EC3901 to the glass surfaces to be bonded and allow the primer to dry 60 minutes before bonding.

*Note: When using solvents, extinguish all ignition sources, including pilot lights, and follow the manufacturer’s precautions and directions for use.
Storage
Store product at 60-80°F (16-27°C) for maximum storage life.

Shelf Life
These products when stored in original, unopened container have a shelf life of 18 months from date of manufacture.

Precautionary Information
Refer to Product Label and Material Safety Data Sheet for health and safety information before using this product. For additional health and safety information, call 1-800-364-3577 or (651) 737-6501.

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3M Scotch-Weld™
Epoxy Potting Compound/Adhesive
DP270 Clear and Black

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