

# 3M

## Scotch-Weld™

### Epoxy Potting Compound/Adhesive

#### DP270 Clear and Black

Technical Data

December, 2009

#### 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. 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.

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.

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

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

|                                     |                                                         |
|-------------------------------------|---------------------------------------------------------|
| <b>Color:</b>                       | Clear or Black                                          |
| <b>Base Resin:</b>                  | Epoxy/amine                                             |
| <b>Mix Ratio:</b>                   | 1:1 by volume (1:0.85 B:A by weight)                    |
| <b>Net Weight:<br/>Lbs./Gal.</b>    | Base 9.6 - 9.8<br>Accelerator 8.0 - 8.2                 |
| <b>Worklife:</b>                    | 60-70 minutes @ 23°C (73°F)                             |
| <b>Viscosity:<br/>@ 23°C (73°F)</b> | Base 7000 - 16,000 cps<br>Accelerator 6000 - 12,000 cps |

# 3M™ Scotch-Weld™

## Epoxy Potting Compound/Adhesive

### DP270 Clear and Black

#### Typical Cured Properties

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

|                                                                                              |                                                                     |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Physical:</b>                                                                             |                                                                     |
| Color                                                                                        | Clear or Black                                                      |
| Refractive Index @ 25°C (77°C)                                                               | 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)                                               |
| <b>Thermal:</b>                                                                              |                                                                     |
| Weight Loss by TGA (in air)                                                                  | 1% @ 122°C (252°F)<br>5% @ 175°C (347°F)<br>10% @ 210°C (410°F)     |
| Thermal Coefficient of Expansion by TMA                                                      |                                                                     |
| Below Tg                                                                                     | 80 x 10 <sup>-6</sup> units/unit/°C<br>5-30°C range (10-86°F range) |
| Above Tg                                                                                     | 180 x 10 <sup>-6</sup> units/unit/°C<br>60-125°C range (140-257°F)  |
| Glass Transition Temperature by DSC                                                          |                                                                     |
| Onset                                                                                        | 43°C (109°F)                                                        |
| Mid-Point                                                                                    | 49°C (120°F)                                                        |
| Thermal Conductivity<br>(@ 110°F on .250" samples)                                           |                                                                     |
| BTU - ft./ft. <sup>2</sup> - hr. - °F                                                        | .103                                                                |
| Cal./sec. - cm - °C                                                                          | .426 x 10 <sup>3</sup>                                              |
| 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)                                                               |                                                                     |
| <b>Electrical:</b>                                                                           |                                                                     |
| 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 10 <sup>14</sup> ohm-cm                                       |
| Insulation Resistance<br>(.8 mm/.8 mm comb pattern on FR-4)<br>60°C/96% R.H./100 volts d.c.) |                                                                     |
| Initial                                                                                      | 3 x 10 <sup>13</sup> ohms                                           |
| 1000 hrs.                                                                                    | 2 x 10 <sup>11</sup> ohms                                           |

# 3M™ Scotch-Weld™

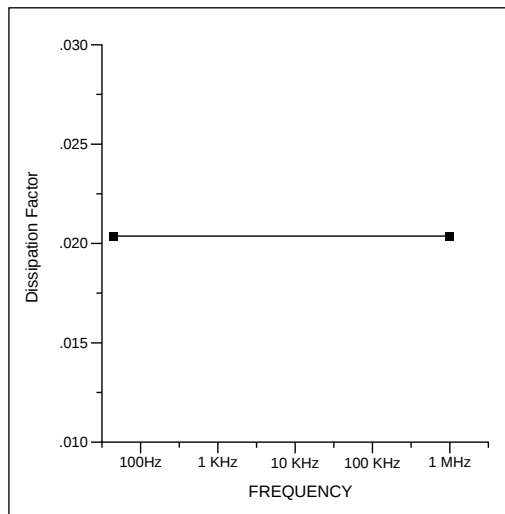
## Epoxy Potting Compound/Adhesive

### DP270 Clear and Black

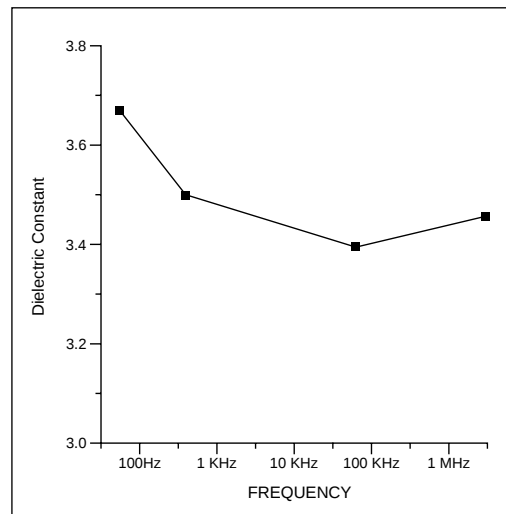
#### Additional Electrical Properties

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**

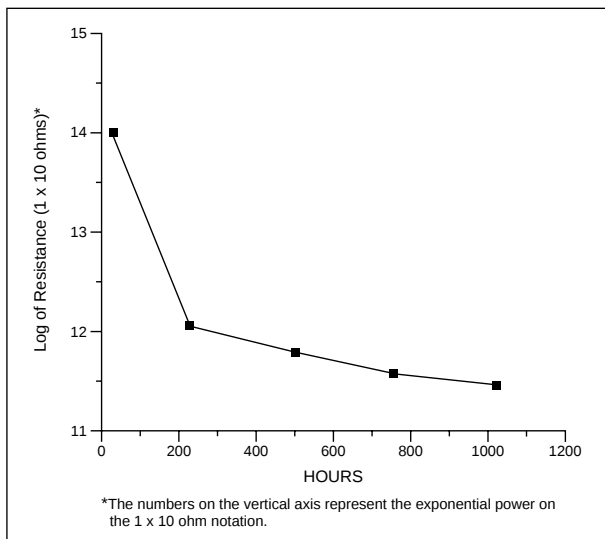


**Dielectric Constant Versus Frequency**



#### Insulation Resistance

.8 mm/.8 mm Comb Pattern  
60°C (140°F)/95% RH/100 V d.c.



# 3M™ Scotch-Weld™

## Epoxy Potting Compound/Adhesive

### DP270 Clear and Black

#### 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<br>(35°C/95°F/96% R.H./45V d.c./15 days)           | Pass - No copper corrosion                                    |
| Per 3M Test Method C-708<br>(45°C/113°F/96% R.H./250V d.c./5 days) | Pass - No copper corrosion                                    |
| (65°C/149°F/96% R.H./250V d.c./4 days)                             | Pass - No copper corrosion                                    |
| Per Mil S-46163<br>(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))

|                       | 1 Hour   | 1 Month  |
|-----------------------|----------|----------|
| Acetone               | <b>B</b> | <b>C</b> |
| Isopropyl Alcohol     | <b>A</b> | <b>B</b> |
| Freon TF              | <b>A</b> | <b>A</b> |
| Freon TMC             | <b>B</b> | <b>C</b> |
| 1,1,1-Trichloroethane | <b>A</b> | <b>C</b> |
| RMA Flux              | <b>A</b> | <b>B</b> |

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)

|                           | Curing Conditions<br>7 days/73°F (23°C)         |                                               |
|---------------------------|-------------------------------------------------|-----------------------------------------------|
| Alum./Alum. (etched)      | @-67°F (-55°C)<br>@73°F (23°C)<br>@180°F (82°C) | 1200-1250 psi<br>2450-2500 psi<br>300-350 psi |
| FR-4/FR-4 (MEK Wiped)     | @73°F (23°C)                                    | 1750-1800 psi                                 |
| Copper/Copper (MEK Wiped) | @73°F (23°C)                                    | 1700-1750 psi                                 |

#### 90° T-Peel Adhesion (ASTM D-1876-61T)

|                      |              |         |
|----------------------|--------------|---------|
| Alum./Alum. (etched) | @73°F (23°C) | < 2 piw |
|----------------------|--------------|---------|

#### Compression Strength (ASTM D-695-68T)

|                                                                   |              |          |
|-------------------------------------------------------------------|--------------|----------|
| Scotch-Weld epoxy potting compound/adhesive DP270 Clear and Black | @73°F (23°C) | 8100 psi |
|-------------------------------------------------------------------|--------------|----------|

# 3M™ Scotch-Weld™

## Epoxy Potting Compound/Adhesive

### DP270 Clear and Black

---

#### 3M™ EPX™ Pneumatic Applicator Delivery Rates

#### 200 ml Applicator – Maximum Pressure 58 psi

| Adhesive*                                                    | 6mm Nozzle<br>gms/minute | 10mm Nozzle<br>gms/minute |
|--------------------------------------------------------------|--------------------------|---------------------------|
| 3M™ Scotch-Weld™ Epoxy Potting Compound/Adhesive DP270 Black | 38.2                     | 148.8                     |

#### 50 ml Applicator – Maximum Pressure 50 psi

| Adhesive*                                                    | 1/4 in. Nozzle<br>gms/minute |
|--------------------------------------------------------------|------------------------------|
| 3M™ Scotch-Weld™ Epoxy Potting Compound/Adhesive DP270 Clear | 75.6                         |
| Scotch-Weld epoxy potting compound/adhesive DP270 Black      | 68.6                         |

\*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

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.

|               |            |
|---------------|------------|
| 23°C (73°F)   | 48 Hours   |
| 50°C (122°F)  | 4 Hours    |
| 80°C (176°F)  | 60 Minutes |
| 100°C (212°F) | 30 Minutes |
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.

# 3M™ Scotch-Weld™

## Epoxy Potting Compound/Adhesive

### DP270 Clear and Black

---

#### 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.

# 3M™ Scotch-Weld™

## Epoxy Potting Compound/Adhesive

### DP270 Clear and Black

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Storage</b>                                  | Store product at 60-80°F (16-27°C) for maximum storage life.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Shelf Life</b>                               | These products when stored in original, unopened container have a shelf life of two years for bulk containers and 15 months in duo-pak containers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Precautionary Information</b>                | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Technical Information</b>                    | The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Product Use</b>                              | Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.                                                                                                                                                                                                                                                                                |
| <b>Warranty, Limited Remedy, and Disclaimer</b> | Unless an additional warranty is specifically stated on the applicable 3M product packaging or product literature, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price. |
| <b>Limitation of Liability</b>                  | Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.                                                                                                                                                                                                                                                                                                                                                                                                                          |

**ISO 9001:2000**

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2000 standards.



#### Industrial Adhesives and Tapes Division

3M Center, Building 225-3S-06  
St. Paul, MN 55144-1000  
800-362-3550 • 877-369-2923 (Fax)  
www.3M.com/industrial



Recycled Paper  
40% pre-consumer  
10% post-consumer

3M, Scotch-Weld and EPX are  
trademarks of 3M Company.  
Printed in U.S.A.

©3M 2009 78-6900-9677-7 (12/09)