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.**

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

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**Typical Cured Properties**

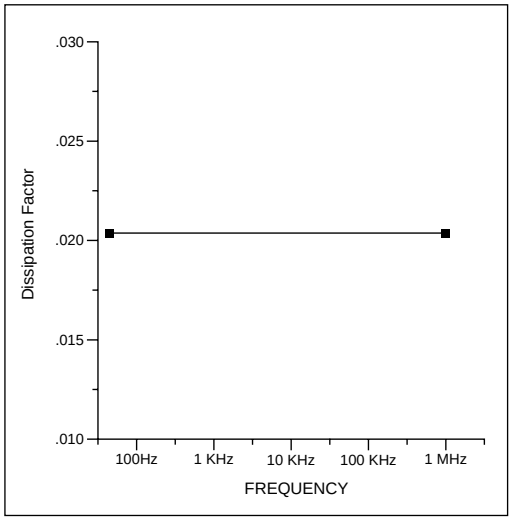
**Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.**

| | |
|---|---|
| **Physical:** | |
| 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) |
| **Thermal:** | |
| 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 | $80 \times 10^{-6}$ units/unit/°C<br>5-30°C range (10-86°F range) |
| Above Tg | $180 \times 10^{-6}$ 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 (@ 110°F on .250" samples) | |
| BTU - ft./ft.$^2$ - hr. - °F | .103 |
| Cal./sec. - cm - °C | $.426 \times 10^3$ |
| Watt/m - °C | .177 |
| Thermal Shock Resistance | |
| Potted Washer Olyphant Test<br>3M Test Method C-3174<br>+100°C (air) to -50°C (liquid) | Pass 5 Cycles without cracking |
| **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) | $4.1 \times 10^{14}$ ohm-cm |
| Insulation Resistance (.8 mm/.8 mm comb pattern on FR-4) 60°C/96% R.H./100 volts d.c.) | |
| Initial | $3 \times 10^{13}$ ohms |
| 1000 hrs. | $2 \times 10^{11}$ ohms |

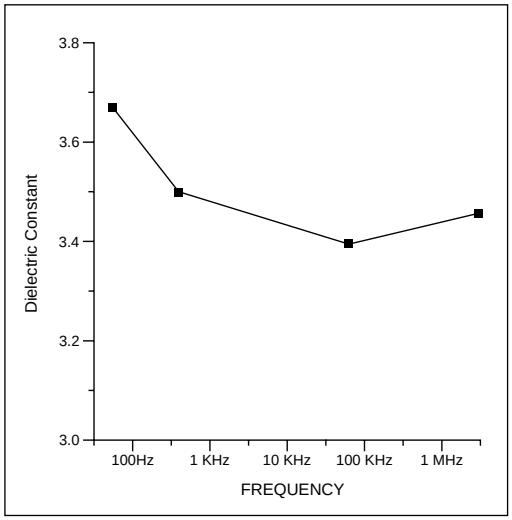
**Additional Electrical Properties**

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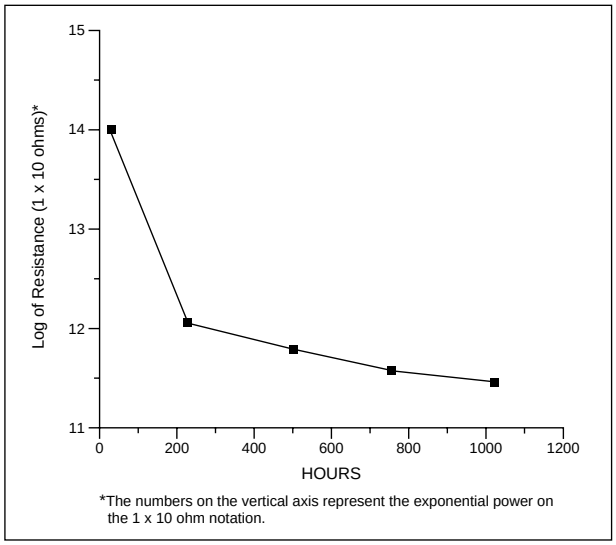
**Dissipation Factor Versus Frequency**




**Dielectric Constant Versus Frequency**




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



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**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 |
| (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)

| | 1 Hour | 1 Month |
|---|---|---|
| Acetone | **B** | **C** |
| Isopropyl Alcohol | **A** | **B** |
| Freon TF | **A** | **A** |
| Freon TMC | **B** | **C** |
| 1,1,1-Trichloroethane | **A** | **C** |
| RMA Flux | **A** | **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 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 |

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

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

| Adhesive* | 6mm Nozzle gms/minute | 10mm Nozzle 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 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.

**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.

**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.

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**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 two years for bulk containers and 15 months in duo-pak containers.

**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.

**Technical Information**

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.

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ISO 9001:2000

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