



## Technical Data Sheet

3M™ Scotch-Weld™ Epoxy Adhesive DP405  
Black



[Product Details](#)



[Regulatory Info/SDS](#)

### Product Description

3M™ Scotch-Weld™ Epoxy Adhesive DP405 Black is a two-part, 2:1 mix ratio, toughened epoxy structural adhesive which has a 5 minute work life and accelerated cure. It exhibits excellent shear and peel strengths along with good impact resistance and durability. It bonds extremely well to many metal and composite surfaces. It also has lower odor when compared to traditional fast cure epoxies and acrylic adhesives.

### Product Features

- Excellent shear and peel strengths
- 5-minute work life
- Easy mixing
- Low odor

### Technical Information Note

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

### Typical Uncured Physical Properties

| Attribute Name            | Value              |
|---------------------------|--------------------|
| Color                     | Black <sup>1</sup> |
| Mix Ratio by Weight (B:A) | 2.1:1              |
| Mix Ratio by Volume (B:A) | 2:1                |

<sup>1</sup> Colors may vary from nearly white to yellow/amber. Adhesive performance is not affected by color variation.

| Attribute Name         | Temperature   | Value                  |
|------------------------|---------------|------------------------|
| Base Color             |               | Black                  |
| Accelerator Color      |               | Clear                  |
| Base Resin             |               | Epoxy                  |
| Base Net Weight        |               | Approx. 10 lb/gal      |
| Accelerator Net Weight |               | Approx. 9.2 lb/gal     |
| Base Viscosity         | 23 °C (73 °F) | 11,000 cP <sup>1</sup> |
| Accelerator Viscosity  | 23 °C (73 °F) | 6,500 cP <sup>1</sup>  |

<sup>1</sup> Brookfield RVF #7 spindle at 20 rpm.

### Typical Mixed Physical Properties

#### Rate of Strength Buildup

Substrate: Etched Aluminum

Temperature: 23 °C (73 °F)

Test Method: ASTM D1002, ISO 4587

| Dwell Time | Value                               |
|------------|-------------------------------------|
| 15 min     | 43 lb/in <sup>2</sup> <sup>1</sup>  |
| 30 min     | 110 lb/in <sup>2</sup> <sup>1</sup> |
| 1 h        | 240 lb/in <sup>2</sup> <sup>1</sup> |
| 2 h        | 630 lb/in <sup>2</sup> <sup>1</sup> |

| Dwell Time | Value                                 |
|------------|---------------------------------------|
| 3 h        | 1,630 lb/in <sup>2</sup> <sup>1</sup> |
| 6 h        | 4,410 lb/in <sup>2</sup> <sup>1</sup> |
| 24 h       | 4,790 lb/in <sup>2</sup> <sup>1</sup> |

<sup>1</sup> 25 mm (1 in) wide 12.7 mm (0.5 in) overlap specimens with 25 mm x 102 mm (1 in x 4 in) substrates. 13 - 20 µm (0.005-0.008 in) bondline.

Jaw separation 2.5 mm/min (0.1 in/min)

Substrate thickness 1.3 - 1.6 mm (0.05-0.064 in)

Cohesive (CF), Adhesive (AF), Substrate (SF) Failure

| Attribute Name    | Temperature   | Value                   |
|-------------------|---------------|-------------------------|
| Applied Open Time |               | 3 min <sup>1</sup>      |
| Open Time         |               | 4 min <sup>2</sup>      |
| Worklife          | 23 °C (73 °F) | 4 min <sup>3</sup>      |
| Set Time (min)    | 23 °C (73 °F) | 8 — 10 min <sup>4</sup> |
| Time to Full Cure | 23 °C (73 °F) | 15 h <sup>5</sup>       |

<sup>1</sup> Approximate time after application of adhesive that bonds can be made without adversely affecting wetting out of adhesive and ultimate performance levels.

<sup>2</sup> Max time allowed after applying adhesive to a substrate before bond must be closed and fixed. Cure times approximate and depend on adhesive temperature. Hotmelts: The approx. bonding range of a 3.2 mm (1/8 in) bead of molten adhesive on a non-metallic surface.

<sup>3</sup> Maximum time that adhesive can remain in a static mixing nozzle and still be expelled without undue force on the applicator. Cure times are approximate and depend on adhesive temperature.

<sup>4</sup> Minimum time required to achieve 0.3 MPa (50 psi) of overlap shear strength. Cure times are approximate and depend on adhesive temperature.

<sup>5</sup> The cure time is defined as that time required for the adhesive to achieve a minimum of 80% of the ultimate strength as measured by aluminum-aluminum OLS.

## Typical Physical Properties

| Attribute Name | Value |
|----------------|-------|
| Cured Color    | Black |

## Typical Cured Characteristics

Temperature: 23 °C (73 °F)

| Attribute Name   | Test Method | Value |
|------------------|-------------|-------|
| Shore D Hardness | ASTM D2240  | 77    |

## Typical Performance Characteristics

Temperature: 23 °C (73 °F)

Substrate: Cushioned Sleeve A

| Attribute Name    | Test Method | Value      |
|-------------------|-------------|------------|
| 90° Peel Adhesion | ASTM D3330  | 2,860 N/cm |

## Overlap Shear Strength

Surface Prep: MEK/Abrade/MEK

Temperature: 23 °C (73 °F)

Dwell Time: 7 d

Test Method: ASTM D1002, ISO 4587

| Substrate         | Value                                 |
|-------------------|---------------------------------------|
| Aluminum          | 2,580 lb/in <sup>2</sup> <sup>1</sup> |
| Cold Rolled Steel | 2,260 lb/in <sup>2</sup> <sup>1</sup> |
| Galvanized Steel  | 2,050 lb/in <sup>2</sup> <sup>1</sup> |

| Substrate | Value                                 |
|-----------|---------------------------------------|
| Copper    | 2,300 lb/in <sup>2</sup> <sup>1</sup> |
| Brass     | 2,830 lb/in <sup>2</sup> <sup>1</sup> |

<sup>1</sup> 25 mm (1") wide, 12.7 mm (1/2") overlap samples, 25 mm (1") x 102 mm (4") substrates, bondline thickness: 0.13-0.20 mm (5-8 mil)  
Separation rate 2.5 mm/min (0.1 in/min) metal, 51 mm/min (2 in/min) plastic, 510 mm/min (20 in/min) rubber.  
Substrate thickness: steel 1.5 mm (60 mil), other metal 1.3-1.6 mm (50-64 mil), rubber and plastic 3.2 mm (125 mil)  
Cohesive Failure (CF), Adhesive Failure (AF), Mixed Failure (MF), Substrate Failure (SF)

## Bell Peel

Substrate: Aluminum  
Dwell Time: 7 d  
Test Method: ASTM D3167

| Temperature     | Value                       |
|-----------------|-----------------------------|
| -55 °C (-67 °F) | 18 lb/in width <sup>1</sup> |
| 23 °C (73 °F)   | 40 lb/in width <sup>1</sup> |
| 82 °C (180 °F)  | 8 lb/in width <sup>1</sup>  |

<sup>1</sup> 12.7 mm (0.5 in) wide bonds. Jaw separation 15 cm/min (6 in/min). 0.64 mm (0.025 in) thick substrate. 1.6 mm (0.064 in) bondline

## Electrical and Thermal Properties

### Coefficient of Thermal Expansion

| Test Condition | Value                               |
|----------------|-------------------------------------|
| 20 ~ 70 °C     | 180 x 10 <sup>-6</sup> <sup>1</sup> |
| 20 ~ 100 °C    | 105 x 10 <sup>-6</sup> <sup>1</sup> |

<sup>1</sup> Determined using Thermal Mechanical Analysis (TMA) and heating rate of 9°F (5°C) per minute. First heat values given.

Temperature: 23 °C (73 °F)

| Attribute Name      | Test Method | Test Condition | Value                       |
|---------------------|-------------|----------------|-----------------------------|
| Dielectric Constant | ASTM D150   | 1 KHz          | 4.1                         |
| Dissipation Factor  | ASTM D150   | 1 KHz          | 0.016                       |
| Volume Resistivity  | ASTM D257   |                | 4.4 x 10 <sup>15</sup> Ω-cm |

## Handling/Application Information

### Directions for Use

3M™ Scotch-Weld™ Epoxy Adhesive DP405 Black is supplied in dual syringe plastic duo- pak cartridges as part of the 3M™ EPX™ Applicator System. The duo-pak cartridges are supplied in 50 ml, 200 ml and 400 ml configurations. To use the EPX cartridge system simply insert the duo-pak cartridge into the EPX applicator. 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 simultaneous mixing of Part A and Part B is desired, attach the EPX mixing nozzle to the duo-pak cartridge and begin dispensing the adhesive.

When mixing Part A and Part B manually the components must be mixed in the ratio indicated in the typical uncured properties section of this data sheet. Complete mixing of the two components is required to obtain optimum properties. Two-part mixing/proportioning/dispensing equipment is available for intermittent or production line use. These systems are ideal for line uses because of their variable shot size and flow rate characteristics and are adaptable to most applications.

Apply adhesive to clean, dry surfaces, joint parts and secure until adhesive sets (see rate of strength build up).

## Surface Preparation

The following surface preparations were used for substrates described in this Technical Data Sheet.

### A. Aluminum Etch

Optimized FPL Etch - 3M (test method C-2803)

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 (3M test method C-2802).
2. Optimized FPL Etch Solution (1 liter):

#### Material Amount

Distilled Water 700 ml plus balance of liter (see below)

Sodium Dichromate 28 to 67.3 grams

Sulfuric Acid 287.9 to 310.0 grams

Aluminum Chips 1.5 grams/liter of mixed solution

To prepare 1 liter of this solution, dissolve sodium dichromate in 700 ml of distilled water. Add sulfuric acid and mix well. Add additional distilled water to fill to 1 liter. Heat mixed solution to 66 to 71°C (150 to 160°F). Dissolve 1.5 grams of 2024 bare aluminum chips per liter of mixed solution. Gentle agitation will help aluminum dissolve in about 24 hours.

To FPL etch panels, place them in the above solution at 150 to 160°F (66 to 71°C) for 12 to 15 minutes.

**Note:** Review and follow precautionary information provided by chemical suppliers prior to preparation of this etch solution.

3. Rinse immediately in large quantities of clear running tap water.

4. Dry – air dry approximately 15 minutes followed by force dry at 140°F (60°C) maximum for 10 minutes (minimum).

5. Both surface structure and chemistry play a significant role in determining the strength and permanence of bonded structures. It is therefore advisable to bond or prime freshly primed clean surfaces as soon as possible after surface preparation in order to avoid contamination and/or mechanical damage. Please contact your 3M sales representative for primer recommendations.

### B. Oakite Degrease

Oakite 164 solutions (9-11 oz./gallon of water) at 190°F ± 10°F (88°C ± 5°C) for 2 minutes. Rinse immediately in large quantities of cold running water.

### C. MEK/Abrade/MEK

Wipe surface with a methyl ethyl ketone (MEK) soaked swab, abrade and wipe with a MEK soaked swab.\* Allow solvent to evaporate before applying adhesive.

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

### D. Isopropyl Alcohol Wipe Only Surface Preparation

Wipe surface with an isopropyl alcohol soaked swab.\* Allow solvent to evaporate before applying adhesive.

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

### E. Isopropyl Alcohol/Abrade/Isopropyl Alcohol Surface Preparation

Wipe surface with an isopropyl alcohol soaked swab, abrade using clean fine grit abrasives, and wipe with an isopropyl alcohol soaked swab.\* Then allow solvent to evaporate before applying adhesive.

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

## Storage and Shelf Life

Store under normal conditions of 16° to 27°C (60° to 80°F) and 40 to 60% relative humidity in the original packaging, out of direct sunlight. For best performance, use this product within 18 months from date of manufacture.

## Automotive Disclaimer

### Select Automotive Applications:

This product is an industrial product and has not been designed or tested for use in certain automotive applications, such as automotive electric powertrain battery or high voltage applications, which may require the product to be manufactured in a IATF certified facility, meet a Ppk of 1.33 for all properties, undergo an automotive production part approval process (PPAP), or fully adhere to automotive design or quality system requirements (e.g., IATF 16949 or VDA 6.3). Customer assumes all responsibility and risk if customer chooses to use this product in these applications.

## Information

**Technical Information:** The technical information, guidance, and other statements contained in this document or otherwise provided by 3M are based upon records, tests, or experience that 3M believes to be reliable, but the accuracy, completeness, and representative nature of such information is not guaranteed. Such information is intended for people with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license under any 3M or third party intellectual property rights is granted or implied with this information.

**Product Selection and Use:** 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. As a result, customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment and reviewing all applicable regulations and standards (e.g., OSHA, ANSI, etc.). Failure to properly evaluate, select, and use a 3M product and appropriate safety products, or to meet all applicable safety regulations, may result in injury, sickness, death, and/or harm to property.

**Warranty, Limited Remedy, and Disclaimer:** Unless a different warranty is specifically stated on the applicable 3M product packaging or product literature (in which case such warranty governs), 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, FITNESS FOR A PARTICULAR PURPOSE, OR ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. If a 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. Warranty claims must be made within one (1) year from the date of 3M's shipment.

**Limitation of Liability:** Except for the limited remedy stated above, and except to the extent prohibited by law, 3M will not be liable for any loss or damage arising from or related to the 3M product, whether direct, indirect, special, incidental, or consequential (including, but not limited to, lost profits or business opportunity), regardless of the legal or equitable theory asserted, including, but not limited to, warranty, contract, negligence, or strict liability.

**Disclaimer:** 3M industrial and occupational products are intended, labeled, and packaged for sale to trained industrial and occupational customers for workplace use. Unless specifically stated otherwise on the applicable product packaging or literature, these products are not intended, labeled, or packaged for sale to or use by consumers (e.g., for home, personal, primary or secondary school, recreational/sporting, or other uses not described in the applicable product packaging or literature), and must be selected and used in compliance with applicable health and safety regulations and standards (e.g., U.S. OSHA, ANSI), as well as all product literature, user instructions, warnings, and limitations, and the user must take any action required under any recall, field action or other product use notice. Misuse of 3M industrial and occupational products may result in injury, sickness, or death. For help with product selection and use, consult your on-site safety professional, industrial hygienist, or other subject matter expert. For additional product information, visit [www.3M.com](http://www.3M.com).

## **ISO Statement**

This product was manufactured under a 3M quality system registered to ISO 9001 standards.

3M™ Industrial Adhesives and Tapes Division  
3M Center, St. Paul, MN 55144-1000  
[3M.com/iatd](http://3M.com/iatd)

3M, Scotch-Weld and EPX are trademarks of 3M Company.  
©3M 2024 (9/24)