



Technical Data Sheet

3M™ Scotch-Weld™ Epoxy Adhesive DP405 Black



[Product Details](#)



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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 ¹
Mix Ratio by Weight (B:A)	2.1:1
Mix Ratio by Volume (B:A)	2:1

¹ 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	22 °C (72 °F)	11,000 cP ¹
Accelerator Viscosity	22 °C (72 °F)	6,500 cP ¹

¹ Brookfield RVF #7 spindle at 20 rpm.

Typical Mixed Physical Properties

Rate of Strength Buildup

Substrate: Etched Aluminum

Temperature: 22 °C (72 °F)

Test Method: ASTM D1002, ISO 4587

Dwell Time	Value
15 min	43 lb/in ² ¹
30 min	110 lb/in ² ¹
1 h	240 lb/in ² ¹
2 h	630 lb/in ² ¹

Dwell Time	Value
3 h	1,630 lb/in ² ¹
6 h	4,410 lb/in ² ¹
24 h	4,790 lb/in ² ¹

¹ 1 in wide 1/2 in overlap specimens with 1 in x 4 in substrates. 0.005-0.008in bondline.
 Jaw separation 0.1 in/min.
 Substrate thickness 0.05-0.064 in
 Cohesive (CF), Adhesive (AF), Substrate (SF) Failure

Attribute Name	Temperature	Value
Applied Open Time		3 min ¹
Open Time		4 min ²
Worklife	22 °C (72 °F)	4 min ³
Set Time (min)	22 °C (72 °F)	8 – 10 min ⁴
Time to Full Cure	22 °C (72 °F)	15 h ⁵

¹ Approximate time after application of adhesive that bonds can be made without adversely affecting wetting out of adhesive and ultimate performance levels.
² 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 1/8" bead of molten adhesive on a non-metallic surface.
³ 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.
⁴ Minimum time required to achieve 50 psi of overlap shear strength. Cure times are approximate and depend on adhesive temperature.
⁵ 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: 22 °C (72 °F)

Attribute Name	Test Method	Value
Shore D Hardness	ASTM D2240	77 ¹

¹ Tensile and Elongation. Samples were 51 mm (2") dumbbells with 3 mm (0.125") neck and 0.8 mm (0.03" sample thickness. Separation rate was 51 mm/min (2"/min)

Typical Performance Characteristics

Temperature: 22 °C (72 °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: 22 °C (72 °F)

Dwell Time: 7 d

Test Method: ASTM D1002, ISO 4587

Substrate	Value
Aluminum	2,580 lb/in ² ¹
Cold Rolled Steel	2,260 lb/in ² ¹
Galvanized Steel	2,050 lb/in ² ²

Substrate	Value
Copper	2,300 lb/in ² ²
Brass	2,830 lb/in ² ²

¹ 25 mm (1") wide, 12.7 mm (1/2") overlap samples, 25 mm (1") x 102 mm (4") substrates, 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. Cohesive Failure (CF), Adhesive Failure (AF), Mixed Failure (MF), Substrate Failure (SF)

² 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 ¹
22 °C (72 °F)	40 lb/in width ¹
82 °C (180 °F)	8 lb/in width ¹

¹ 1/2 in. wide bonds. Jaw separation 6in/min. 0.025in thick substrate. 0.064in bondline

Electrical and Thermal Properties

Coefficient of Thermal Expansion

Test Condition	Value
20°C ~ 70°C	180 x 10 ⁻⁶ ¹
20°C ~ 100°C	105 x 10 ⁻⁶ ¹

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

Temperature: 22 °C (72 °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 ¹⁵ 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

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ISO Statement

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

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