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Technical Data Sheet

3M™ Scotch-Weld™ Epoxy Adhesive DP420 Black

Product Description

3M™ Scotch-Weld™ Epoxy Adhesives are high performance, two-part epoxy adhesives offering outstanding shear and peel adhesion, and very high levels of durability.

Product Features

- High shear strength
- High peel strength
- Outstanding environmental performance
- Easy mixing
- 20 minute worklife

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 Volume (B:A)	2:1
Mix Ratio by Weight (B:A)	2:0.97

[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		Amber
Base Resin		Epoxy
Accelerator Resin		Amine
Base Net Weight		9.3 – 9.7 lb/gal
Accelerator Net Weight		9.0 – 9.4 lb/gal
Base Viscosity	22 °C (72 °F)	20000 – 50000 cP [1]
Accelerator Viscosity	22 °C (72 °F)	8000 – 14000 cP [1]

[1] Viscosity measured using cone-and-plate viscometer; reported viscosity at 4 sec^{-1} shear rate.

Typical Mixed Physical Properties

Attribute Name	Temperature	Value
Open Time		20 min [1]
Worklife, 5g mixed	22 °C (72 °F)	30 min
Worklife, 10g mixed	22 °C (72 °F)	20 min
Worklife, 20g mixed	22 °C (72 °F)	15 min

[1] 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.

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 (85) [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

Overlap Shear Strength

Temperature: 22 °C (72 °F)
Dwell Time: 7 d
Test Method: ASTM D1002, ISO 4587

Substrate	Surface Prep	Value
Aluminum	MEK/Abrade/MEK	2,500 lb/in² [1]
Cold Rolled Steel	MEK/Abrade/MEK	2,200 lb/in² [1]
Stainless Steel	MEK/Abrade/MEK	1,800 lb/in² [2]
Copper	MEK/Abrade/MEK	5,000 lb/in² [2]
Brass	MEK/Abrade/MEK	2,800 lb/in² [2]
ABS	IPA Wipe/Abrade/IPA Wipe	550 lb/in² [2]
Polycarbonate (PC)	IPA Wipe/Abrade/IPA Wipe	450 lb/in² [2]
Acrylic (PMMA)	IPA Wipe/Abrade/IPA Wipe	450 lb/in² [2]
Fiber-Reinforced Plastic	IPA Wipe/Abrade/IPA Wipe	1100 lb/in² (SF) [2]
Polyvinyl chloride (PVC)	IPA Wipe/Abrade/IPA Wipe	400 lb/in² (SF) [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
Test Method: ASTM D3167

Temperature	Value
-55 °C (-67 °F)	20 lb/in width [1]
22 °C (72 °F)	82 lb/in width [1]
82 °C (180 °F)	18 lb/in width [1]

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

Typical Curing Characteristics (OLS)

Substrate: Aluminum
Test Method: ASTM D1002, ISO 4587

Dwell Time	Temperature	Value
2 h	22 °C (72 °F)	300 lb/in² [1]
3 h	22 °C (72 °F)	800 lb/in² [1]
5 h	22 °C (72 °F)	3,000 lb/in² [1]
6 h	22 °C (72 °F)	3,700 lb/in² [1]
24 h	22 °C (72 °F)	4,500 lb/in² [1]
30 min	49 °C (120 °F)	2,300 lb/in² [1]
60 min	49 °C (120 °F)	4,700 lb/in² [1]
15 min	60 °C (140 °F)	3,200 lb/in² [1]
60 min	60 °C (140 °F)	4,700 lb/in² [1]

[1] Generated using 3M™ EPX™ Applicator System with an EPX static mixer according to mfr directions. Thorough hand-mixing will give comparable results. 7mil bondline
*Avg bondline temperature during cure time is lower than oven temp.

T-Peel Adhesion

Test Method: ASTM D1876

Temperature	Substrate	Surface Prep	Value
-55 °C (-67 °F)	Aluminum		9.3 lb/in width [1]
22 °C (72 °F)	Aluminum		50 lb/in width [1]
22 °C (72 °F)	Cold Rolled Steel	Oakite degrease	40 lb/in width [1]
22 °C (72 °F)	Cold Rolled Steel	MEK/Abrade/MEK	25 lb/in width [1]
22 °C (72 °F)	Etched Aluminum		60 lb/in width [2]
22 °C (72 °F)	Etched Aluminum		50 lb/in width [3]
82 °C (180 °F)	Aluminum		20 lb/in width [1]

[1] T-peel strengths were measured on 1 in. wide bonds. The testing jaw separation rate was 20 inches per minute.

[2] T-peel strengths were measured on 1 in. wide bonds. The testing jaw separation rate was 20 inches per minute. 0.032in thick substrate; 17 - 20 mil bondline

[3] T-peel strengths were measured on 1 in. wide bonds. The testing jaw separation rate was 20 inches per minute. 0.032in thick substrate; 5 - 8 mil bondline

Electrical and Thermal Properties

Coefficient of Thermal Expansion

Test Condition	Value
Below Tg	80 x 10^{-6} m/m/°C
Above Tg	194 x 10^{6} m/m/°C

Temperature: 22 °C (72 °F)

Attribute Name	Test Method	Value
Volume Resistivity	ASTM D257	1.6 x 10^{15} Ω-cm

3M™ EPX™ Pneumatic Applicator Delivery Rates

Pneumatic Applicator Delivery Rates

Test Condition	Value
200 ml Applicator - Maximum Pressure 58 psi. 6mm Nozzle	29.6 lb/in² [1]
200 ml Applicator - Maximum Pressure 58 psi. 10mm Nozzle	113 lb/in² [1]

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

Handling/Application Information

Directions for Use

3M™ Scotch-Weld™ Epoxy Adhesive DP420 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 24 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

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.

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ISO Statement

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

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