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Technical Data Sheet

3M™ Scotch-Weld™ Epoxy Adhesive DP420 Black

Product Details

Regulatory Info/SDS

Product Description

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

Product Features

• Excellent shear strength • Excellent peel strength • Excellent environmental performance • 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	Test Method	Temperature	Value
Base Resin			Epoxy
Accelerator Resin			Amine
Base Color			Black
Base Net Weight			1.11 — 1.16 g/cm³ (9.3 — 9.7 lb/gal)
Accelerator Color			Amber
Accelerator Net Weight			1.08 — 1.13 g/cm³ (9.0 — 9.4 lb/gal)
Base Viscosity		27 °C (80 °F)	15000 - 50000 cP [1]
Accelerator Viscosity	3M C1d	27 °C (80 °F)	6000 - 14000 cP [2]

[1] Viscosity measured using Brookfield RTV, spindle #7, 20 RPM

[2] Procedure involves Brookfield RVF, #6 spindle, 20 rpm. Measurement taken after 1 minute.

Attribute Name	Value
Color	Black [1]
Mix Ratio by Weight (B:A)	2:0.97
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.

Typical Mixed Physical Properties

Attribute Name	Temperature	Value
Open Time		20 min [1]
Time to Handling Strength	23 °C (73 °F)	2 h

[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 3.2 mm (1/8 in) bead of molten adhesive on a non-metallic surface.

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	80

Typical Performance Characteristics

Overlap Shear Strength

Temperature: 23 °C (73 °F)
Test Method: ASTM D1002, ISO 4587

Dwell Time	Substrate	Surface Prep	Value
24 h	Aluminum	Etched	4,387 lb/in² [1]
7 d	Acrylic (PMMA)	IPA Wipe	259 (AF) lb/in² [1]
7 d	FRP (Epoxy)	Acetone/Abrade/Acetone	5706 (AF/SF) lb/in² [1]
7 d	CRS	Acetone/Abrade/Acetone	2850 (MM) lb/in² [1]
7 d	FRP (Polyester)	Acetone/Abrade/Acetone	1062 (MM/SF) lb/in² [1]
7 d	ABS	IPA Wipe	432 (AF) lb/in² [1]
7 d	Polycarbonate (PC)	IPA Wipe	613 (MM) lb/in² [1]
7 d	Polyvinyl chloride (PVC)	IPA Wipe/Abrade/IPA Wipe	185 (AF) lb/in² [1]

[1] 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)

Substrate: Aluminum
Test Condition: Pendulum Impact

Attribute Name	Test Method	Value
Impact Shear Strength	ASTM D950	19.4 J [1]

[1] 21.7J Hammer

Substrate: Aluminum
Surface Prep: Etched
Temperature: 23 °C (73 °F)
Test Condition: 23 °C

Attribute Name	Test Method	Value
Bell Peel	ASTM D3167	71 lb/in width [1]

[1] Floating roller peel; adhesives allowed to cure for 24 hours @RT; 25 mm (1 in) wide samples;
Samples pulled at 15 mm/min (6 in/min)
Cohesive (CF), Adesive (AF) and Substrate (SF) Failure

Test Method: ASTM D638, ISO 527

Attribute Name	Temperature	Test Condition	Value
Elongation	23 °C (73 °F)	10 mm/min	8 % [1]
Modulus			271,710 lb/in²

[1] Type IV dogbone

Overlap Shear Strength

Substrate: Aluminum
Surface Prep: Sandblasted
Temperature: 23 °C (73 °F)
Dwell Time: 7 d
Test Method: ASTM D1002, ISO 4587

Test Condition	Value
-40 °F	3445 (MM) lb/in² [1]
49 °C (120 °F)	1879 (MM) lb/in² [1]
82 °C (180 °F)	393 (MM) lb/in² [1]
200 °C (392°F)	234 (MM) lb/in² [1]

[1] Overlap shear (OLS) strengths were measured on 25 mm wide x 13 mm overlap (1 x 0.5 in) specimens on 25 x 102 x 1.5 mm (1 x 4 x 0.06 in) substrates.
Jaw separation 2.5 mm/min (0.1 in/min). 0.25 mm (10 mil) bondline.

Typical Environmental Performance

Overlap Shear Strength

Temperature: 23 °C (73 °F)
Dwell Time: 7 d
Test Method: ASTM D1002, ISO 4587

Environmental Condition	Substrate	Surface Prep	Value
49 °C + 80 %RH	PVC	50/50 IPA	295 lb/in² [1]
200°C / 30 minutes	Cold Rolled Steel	Acetone/Abrade/Acetone	3,302 lb/in² [1]
Water: 500 hrs	Aluminum	MEK,Sandblast,MEK	3,901 lb/in² [1]
Diesel Fuel: 500 hrs	Aluminum	MEK,Sandblast,MEK	3,858 lb/in² [1]
85 °C + 85 %RH: 500 hrs	Aluminum	MEK,Sandblast,MEK	3,924 lb/in² [1]
200°C / 30 minutes	Aluminum	MEK,Sandblast,MEK	4,971 lb/in² [1]
Gasoline: 500 hrs	Aluminum	MEK,Sandblast,MEK	3,704 lb/in² [1]
Salt water (5% wt in water): 500 hrs	Aluminum	MEK,Sandblast,MEK	3,589 lb/in² [1]

[1] 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)

Electrical and Thermal Properties

Attribute Name	Test Method	Test Condition	Value
Thermal Conductivity	ASTM E1530	50 °C, 25 psi	0.22
Coefficient of Thermal Expansion		Above Tg	181.2 x 10^{-6} m/m/°C [1]
Glass Transition Temperature (Tg)			77 °C [2]

[1] CTE determined using TMA Analyzer using a heating rate of 3 °C per minute. Second heat values given.

[2] Glass Transition Temperature (Tg) determined using DSC Analyzer with a heating rate of 10 °C per minute. Second heat values given.

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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