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Technical Data Sheet

3M™ Scotch-Weld™ Epoxy Adhesive DP420 Black

Additional Info

Regulatory Info/SDS

Product Description

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

Product Features

- Excellent shear strength
- Excellent peel strength
- Excellent environmental resistance in diesel, gasoline, salt water, and water.
- 20 minute open time

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	Temperature	Value
Mix Ratio by Volume (B:A)		2:1
Mix Ratio by Weight (B:A)		2:0.98
Accelerator Resin		Amine
Base Resin		Epoxy
Accelerator Color		Amber
Base Color		Black
Color		Black [1]
Accelerator Viscosity	23 °C (73 °F)	9,000 cP (9,000 mPa.s) [2]
Base Viscosity	23 °C (73 °F)	23,000 cP (23,000 mPa.s) [2]
Accelerator Density		1.10 g/cm³ (9.2 lb/gal)
Base Density		1.13 g/cm³ (9.4 lb/gal)

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

[2] 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]
Time to Handling Strength	23 °C (73 °F)	2.5 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	81

Typical Performance Characteristics

Overlap Shear Strength

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

Dwell Time	Substrate	Surface Prep	Value
7 d	ABS	IPA Wipe	3 MPa (430 lb/in²) [1]
7 d	Acrylic (PMMA)	IPA Wipe	1.7 MPa (250 lb/in²) [1]
7 d	Aluminum	Sandblasted	27.8 MPa (4030 lb/in²) [1]
24 h	Aluminum	Etched	30.2 mPa.s (4380 lb/in²) [1]
7 d	CRS	Acetone/Abrade/Acetone	19.6 MPa (2840 lb/in²) [1]
7 d	FRP (Epoxy)	Acetone/Abrade/Acetone	39.3 MPa (5700 lb/in²) [1]
7 d	FRP (Polyester)	Acetone/Abrade/Acetone	7.3 MPa (1060 lb/in²) [1]
7 d	Polycarbonate (PC)	IPA Wipe	4.2 MPa (610 lb/in²) [1]
7 d	Polyvinyl chloride (PVC)	IPA Wipe/Abrade/IPA Wipe	1.2 MPa (180 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
Surface Prep: MEK,Sandblast,MEK
Test Condition: Pendulum Impact

Attribute Name	Test Method	Value
Impact Shear Strength	ASTM D950	19 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	12.4 N/mm (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	Dwell Time	Temperature	Test Condition	Value
Elongation		23 °C (73 °F)	10 mm/min	3.7 % [1]

Attribute Name	Dwell Time	Temperature	Test Condition	Value
Modulus				1873 MPa (271710 lb/in²)
Tensile Strength	7 d	23 °C (73 °F)	10 mm/min	35.4 MPa [1]

[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	23.7 MPa (3440 lb/in²) (85%) [1]
49 °C (120 °F)	12.9 MPa (1870 lb/in²) (46%) [1]
82 °C (180 °F)	2.7 MPa (390 lb/in²) (10%) [1]
200 °C (392°F)	1.6 MPa (230 lb/in²) (6%) [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

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

Environmental Condition	Value
200°C / 30 minutes	34.3 MPa (4970 lb/in²) (123%) [1]
85 °C + 85 %RH: 500 hrs	27.0 MPa (3920 lb/in²) (97%) [1]
Diesel Fuel: 500 hrs	26.5 MPa (3850 lb/in²) (96%) [1]
Gasoline: 500 hrs	25.5 MPa (3700 lb/in²) (92%) [1]
Salt water (5% wt in water): 500 hrs	24.7 MPa (3580 lb/in²) (89%) [1]
Water: 500 hrs	26.9 MPa (3900 lb/in²) (97%) [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: PVC
Surface Prep: 50/50 IPA
Temperature: 23 °C (73 °F)
Dwell Time: 7 d
Environmental Condition: 49 °C + 80 %RH

Attribute Name	Test Method	Value
Overlap Shear Strength	ASTM D1002, ISO 4587	2 MPa (290 lb/in²) (161%) [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: Cold Rolled Steel
Surface Prep: Acetone/Abrade/Acetone
Temperature: 23 °C (73 °F)
Dwell Time: 7 d
Environmental Condition: 200°C / 30 minutes

Attribute Name	Test Method	Value
Overlap Shear Strength	ASTM D1002, ISO 4587	22.8 MPa (3300 lb/in²) (116%) [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
Glass Transition Temperature (Tg)			81 °C (179 °F) [1]
Thermal Conductivity	ASTM E1530	50 °C, 25 psi	0.22 W/m·K
Coefficient of Thermal Expansion		Above Tg	180.8 x 10^{-6} m/m/°C [2]
Coefficient of Thermal Expansion		Below Tg (5 ~ 20 °C)	90.6 x 10^{-6} m/m/°C [3]

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

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

[3] CTE determined using TMA Analyzer using 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

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. Optimized FPL Etch Solution (1 liter):

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 etch aluminum panels place them in FPL etch solution heated to 66 to 71°C (150 to 160°F). Panels should soak for 12 to 15 minutes.

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.

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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