

3M™ Scotch-Weld™ AF 3024

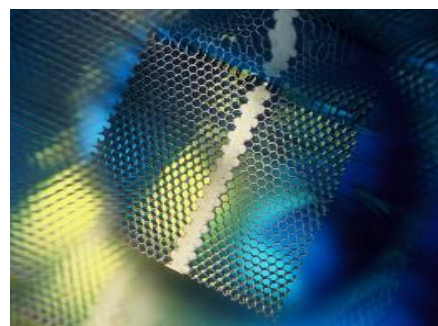
Core Splice Film

Product Description

3M™ Scotch-Weld™ AF 3024 is an epoxy based, heat curing, expandable adhesive film for filling mismatched areas, core splicing and reinforcing honeycomb core. It can be cured at temperatures from 121 °C to 176 °C and is therefore co-curable with structural adhesive films and composite prepregs. Within the 3M core splice film product family, Scotch-Weld™ AF 3024 has the highest expansion.

Key Features

- Low density, expandable adhesive film
- Excellent gap filling capability due to expansion up to 150 %
- Curable / co-curable between 121 °C and 176 °C
- 6 months shelf life at -18 °C, 10 days shop life
- Qualified to numerous OEM specifications



Product Characterization

All technical data and information in this data sheet should be considered representative or typical only and should not be used for specification purposes.

General properties	100 mil version	50 mil version	25 mil version
Form		Unsupported film	
Colour		Off-white	
Chemical base		Modified epoxy	
Volatiles content ^(a)	< 1 % < 1.5 %	(cured 90 min at 121 °C, heat-up rate 3 – 6 °C/min) (cured 60 min at 176 °C, heat-up rate 3 – 6 °C/min)	
Film thickness	2.54 ± 0.25 mm	1.27 ± 0.13 mm	0.64 ± 0.06 mm
Mass per unit area	2440 g/m ²	1220 g/m ²	610 g/m ²
Uncured density	0.96 g/cm ³	0.96 g/cm ³	0.96 g/cm ³
Available packaging sizes	Sheets (560 x 300 mm ²)	Sheets (560 x 300 mm ²) Roll (560 mm width)	Sheets (560 x 300 mm ²)

^(a) Weight loss during cure

Product Performance

The following product performance data were obtained with the three versions of Scotch-Weld™ AF 3024 using two different cure cycles.

Cure cycle A: 90 minutes at 121 °C, heat-up rate 2 – 3 °C/min

Cure cycle B: 60 minutes at 176 °C, heat-up rate 2 – 3 °C/min.

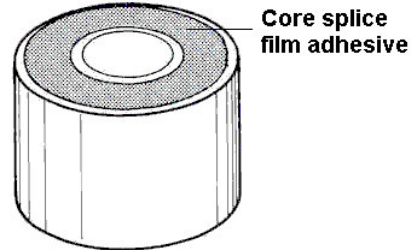
Properties of cured film	Cure cycle A	Cure cycle B	Comments
Expansion during cure	140 – 150 %	150 – 160 %	
Vertical flow during cure	6 mm	10 mm	25 x 50 mm ² of material (2.5 mm thick) on aluminium in vertical position; atmospheric pressure
Density	0.37 – 0.40 g/cm ³		

Tube shear strength

Specimens were prepared by placing 45 g ± 0.2 g of AF 3024 (50 mil version) between the walls of two 230 mm long tubes. After cure, the tubes were cut into 12.7 mm high specimens and tested by pushing out the inner tube. Tube shear resistance is calculated by the following formula:

$$\sigma [MPa] = \frac{F}{\pi d_{inner} h}$$

Test specimen



Outer and inner tubes: 230 mm long tubes, aluminium alloy 5052-0 bare. Outer tube: diameter 25.0 mm, thickness 1.25 mm. Inner tube: diameter 12.5 mm, thickness 1.25 mm.

	Test temperature	Cure cycle A	Cure cycle B
Tube shear strength	-55 °C	10.0 MPa	15.2 MPa
3M test method C-280	24 °C	9.9 MPa	14.3 MPa
Test speed 1.27 mm/min	82 °C	10.7 MPa	10.7 MPa
	121 °C	4.8 MPa	7.6 MPa
	176 °C	--	2.1 MPa

Ageing properties

	Test temperature	Exposure time	Medium	Results
Tube shear strength after ageing	24 °C	720 h	Jet fuel JP-4	11.0 MPa
Cure cycle B	24 °C	720 h	Skydrol® 500B/4	8.9 MPa
3M test method C-280	24 °C	720 h	Ethylene glycol	9.4 MPa
Test speed 1.27 mm/min	24 °C	720 h	Isopropyl alcohol	10.8 MPa
	24 °C	360 h	Methyl ethyl ketone	14.8 MPa
	24 °C	360 h	1,1,1-trichlorethylene	10.1 MPa
	24 °C	720 h	Salt water	9.4 MPa
	24 °C	0 h	Control (no immersion)	10.5 MPa
	121 °C	0 h	Control (no immersion)	9.4 MPa
	121 °C	24 h	Boiling water	6.1 MPa
As above, with primed tubes ^(a) and 60 min cure at 121 °C.	24 °C	30 days	Salt spray, 35 °C	7.3 MPa
	24 °C	3 days	Boiling water	9.4 MPa

^(a) Tubes primed with 3M™ Scotch-Weld™ Adhesive Primer EC 3960.

No drop in mechanical performance was obtained after ageing the uncured material 10 days at 32 °C prior to sample preparation, as the following data shows (50 mil version, cure cycle: 60 min at 121 °C, heat-up rate 2 – 3 °C/min):

	Test temperature	Exposure time	Medium	Results
Tube shear strength after ageing	24 °C	0 h	Control (no immersion)	10.3 MPa
Uncured film aged 10 days at 32 °C prior to sample preparation ^(a) .	24 °C	3 days	Salt spray, 35 °C	8.8 MPa
	24 °C	3 days	Boiling water	10.1 MPa

^(a) Tubes primed with 3M™ Scotch-Weld™ Adhesive Primer EC 3960.

Flatwise tensile strength

Metal to honeycomb flatwise tensile strength was measured on 25.4 x 25.4 mm² honeycomb core (5052 aluminium alloy, thickness 12.7 mm, 4.8 mm cell diameter, 0.05 mm foil), which was with Scotch-Weld™ AF 3024, 50 mil version, to a 25.4 x 25.4 x 38.1 mm³ tensile block (2024 T§ bare aluminium, FPL etched). The film was cured at 176 °C for 60 minutes under a pressure of 240 kPa and a heat-up rate of 6 °C/min.

	Test temperature	Results
Flatwise tensile strength	24 °C	6.5 MPa
MIL-A-25463	149 °C	0.8 MPa

Handling, Application, Storage

Precautionary Information

Refer to product label and Material Safety Data Sheet (MSDS) for health and safety information before using this product. For MSDS visit our website www.3M.com/msds.

Instructions for use

Process step	Instruction
Surface preparation	<p>A thoroughly cleaned, dry, grease-free surface is essential for maximum performance. Cleaning methods which will produce a continuous water film on a metal surface are generally satisfactory. However, the necessary amount of surface preparation depends on the user's required bond strength and environmental ageing resistance. The results given in this data sheet were determined using an optimized FPL etching process:</p> <ol style="list-style-type: none"> 1) Degrease with methyl ethyl ketone. 2) Immerse 10 to 20 minutes in alkaline degreasing 8 % Oakite 164 solution at 85 ± 5 °C. 3) Rinse in tap water. 4) Sulfochromic immersion (10 minutes) at 70 ± 2 °C: 27.5 wt.% of H₂SO₄; 7.5 wt.% of Na₂Cr₂O₇ · 2 H₂O; 65 wt.% of demineralised water; 0.5 g/l aluminium; 1.5 g/l CuSO₄ · 5 H₂O. 5) Rinse in tap water. 6) Dry 15 minutes at 23 ± 2 °C. 7) Dry 10 minutes minimum at 60 C maximum. <p>Caution: Use adequate respiratory, eye and skin protection when using etch solutions.</p>
Film application	<p>Care must be taken when handling AF 3024 at low temperatures because it can easily crack. Warm AF 3024 to ambient conditions in the sealed package to prevent moisture condensation on the adhesive surface.</p> <ol style="list-style-type: none"> 1) Cut portion of film to be used with protective liners in place. 2) Remove paper liner from one side of the film. 3) Place film on metal or edge of honeycomb core using the remaining liner as a protective cover. 4) On metal surfaces, roll film into position with a rubber roller to ensure that no air is entrapped between the film and the metal 5) Remove second protective liner. 6) Assemble parts and cure. <p>Note: if necessary, the tack of the adhesive film can be increased by heating it to 50 – 80 °C.</p>

Process step	Instruction
Suggested cure cycle	<p>The tack, flow, and cure initiation temperature of Scotch-Weld™ AF 3024 is a time-temperature relationship and depends upon the rate of heat input. Normally, AF 3024 will begin to cure when a temperature of 107 °C is reached. The rate of heat input affects the degree of expansion. Heat-up rates to cure temperature lower than 0.3 °C/min generally result in less expansion while rates above 6 °C/min result in higher expansion.</p> <p>For AF 3024 a minimum cure temperature of 110 °C is suggested to effect a useful cure in reasonable length of time (approximately 90 minutes).</p> <p>Full or partial vacuum applied during cure will cause excessive expansion of the product.</p>
Storage	<p>When stored at -18 °C or below, this product has a shelf life of 6 months from date of shipment. Our data indicates, that no loss in mechanical properties is obtained after ageing the uncured product 10 days at room temperature. Please note, that room temperature exposures are accumulative.</p>

Important notice: All statements, technical information and recommendations in this data sheet are based on tests 3M believes to be reliable, but the accuracy or completeness of those tests is not guaranteed. All technical data and information should be considered typical or representative only and should not be used for specification purposes. Given the variety of factors that affect the use and performance of a 3M product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product before use to determine the suitability of the 3M product for the intended use and method of application. All questions of liability relating to the 3M product are governed by the terms of the sale subject to, where applicable, the prevailing law.



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