FM® 123-5

Adhesive Film

FM 123-5 adhesive film is a modified nitrile epoxy adhesive supplied as a supported film on a knitted monofilament nylon carrier. Designed for structural bonding of both sandwich and all-metal constructions, it is serviceable over a temperature range from −67 to 250 °F (−55 ° to 120 °C). Because FM 123-5 adhesive film retains substantial strength at 250 °F (120 °C), problems normally encountered in multi-stage bonding are minimized.

Although not mandatory, BR® 127 corrosion inhibiting primer is recommended for use with FM 123-5 adhesive film in bonding aluminum details. Excellent corrosion inhibition, with no reduction in mechanical properties, is obtainable with this primer.

Cure cycles for bonding FM 123-5 adhesive film may be varied over an extremely broad range, allowing great flexibility in processing. Complete cures may be obtained in 90 minutes at 200 °F (95 °C), 45 minutes at 225 °F (105 °C), and 15 minutes at 250 °F (120 °C). Cure temperatures as low as 180 °F (82 °C) and as high as 350 °F (175 °C) have also been used. The minimum pressures which assure contact of the components to be bonded are adequate. The nylon carrier also permits use of relatively high pressure without starving the glueline. FM 123-5 adhesive film may be bonded with 10 to 12 psi (.07 to .08 MPa) vacuum pressure.

Product Description

FM 123-5 Adhesive Film

Form	Supported, moderate tack, film.
Volatiles	Less than 1.25%.
Shop life	10 days at 90 °F (32 °C).
Shelf life	Six months from date of shipment at recommended storage.
Storage	Store at or below 0 °F (−18 °C)

Weight	Nominal Thickness in (mm)
0.045 ± 0.005 psf (.22 ± 025 kg/m²)	.008" (.20 mm)
0.060 ± 0.005 psf (.30 ± .025 kg/m²)	.011" (.28 mm)
0.085 ± 0.005 psf (.042 ± .025 kg/m²)	.014" (.355 mm)

BR 127 Primer

Color	Yellow
Solids	10% ± 1% sprayable
Weight	7.3 lb/gal (875 g/liter)
Shop life	5 days at 90 °F (32 °C)
Shelf life	Six months from date of shipment at recommended storage
Storage	Store at or below 0 °F (−18 °C)

Metal Surface Preparation (Aluminum)

A clean, dry, grease-free surface is required for optimum performance.

A recommended procedure for cleaning aluminum skins prior to priming or bonding is as follows:

1. Vapor degrease, alkaline clean, rinse and check for water break.
2. Immerse in sodium dichromate-sulfuric acid solution at 155 ° ± 5 °F (68 °C ± 3 °C).
   Clad — 10 minutes; Bare — 5 minutes.
   This solution is made up as follows:

Sodium dichromate (Fed-O-S-595A)	34 grams
Sulfuric acid (Fed-O-A-115, Class A, Grade 2)	304 grams
Water	To make 1 liter

   Dissolve 1.5 grams of 2024 clad per liter.
3. Spray rinse with water at or below 75 °F(24 °C).
4. Immerse in cold water and repeat spray rinse.
5. Check for water break and dry in vented oven below 150 °F (66 °C).

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TYPICAL MECHANICAL PROPERTIES

Table I

FM 123-5 Adhesive Film with BR 127 Primer

Tested in Conformance with Federal Specification MMM-A-132, Type I, Class 2

Test No.	Property and Test Condition	Specification Average Requirement	Average Results with Nominal Film Weights	
			.060 psf (.30 kg/m²)	.085 psf (.42 kg/m²)
	Tensile shear, psi (MPa)			
1	75° ± 5°F (24° ± 3°C)	2500 (17.25)	5755 (39.71)	6360 (43.88)
2	10 minutes at 180° ± 5°F (82° ± 3°C)	1250 (8.62)	4025 (27.77)	3920 (27.05)
†	10 minutes at 250° ± 5°F (120° ± 3°C)	None	1430 (9.87)	1500 (10.35)
7	10 minutes at −67° ± 5° (−55° ± 3°C)	2500 (17.25)	6050 (41.75)	6380 (44.02)
	Fatigue strength, psi (MPa), 10^6 cycles			
8	75° ± 5°F (24° ± 3°C)	750 (5.17)	No failure	No failure
	Creep rupture, inch (mm) 1600 psi (11.04 MPa) 192 hours			
9	75° ± 5°F (24° ± 3°C)	0.015 max (.38) deformation	00060 (.0152)	00061 (.0155)
	Creep rupture, inch (mm) 800 psi (5.52 MPa) 192 hours			
10	180° ± 5°F (82° ± 3°C)	0.015 max. (.38) deformation	0007 (.0178)	002 (.051)
	Tensile shear, psi (MPa)			
13	75° ± 5°F (24° ± 3°C) After 30 days salt water spray	2250 (15.52)	5750 (39.68)	6250 (44.95)
14	75° ± 5°F (24° ± 3°C) After 30 days at 127° ± 5°F (48° ± 3°C) with 95% to 100% R.H.	2250 (15.52)	5655 (39.02)	6175 (42.61)
15	75° ± 5°F (24° ± 3°C) After 7 days JP-4 fuel (MIL-J-5624)	2250 (15.52)	6160 (42.50)	6315 (43.57)
	After 7 days anti-icing fluid (MIL-F-5566)	2250 (15.52)	6260 (43.19)	6750 (46.58)
	After 7 days in hydraulic oil (MIL-H-5606)	2250 (15.52)	6315 (43.57)	6505 (44.85)
	After 7 days in hydrocarbon (TT-S-735)	2250 (15.52)	6220 (42.92)	6540 (43.13)
	After 30 days immersion in tap water	2250 (15.52)	6160 (42.50)	6315 (43.54)
†	After 30 days immersion in Skydrol†† 500 at 120° ± 5°F (49° ± 3°C)	None	5465 (37.68)	———
	Blister detection tensile shear, psi (MPa)			
17	75° ± 5°F (24° ± 3°C)	2250 (15.52)	4650 (32.06)	4445 (30.74)
†	10 minutes at 180° ± 5°F (82° ± 3°C)	None	3210 (22.13)	———
†	10 minutes at −67° ± 5°F (−55° ± 3°C)	None	5080 (35.05)	———
	Metal-to-metal climbing drum, in lbs/in width (N/m)			
	.020" (.51 mm) to .25" (6.35 mm) 2024-T3 Alclad			
†	75° ± 5°F (24° ± 3°C)	None	85 (378)	———
	T-peel, lb/in (kN/m)			
16	75° ± 5°F (24° ± 3°C)	15 (2.63)	40 (7.00)	45 (7.88)

BR 127 primer, 10% solids; primer cured 30 minutes at 250°F (120°C).
Primer thickness .0001 to .0002 inches (.0025 to .005 mm)

†Data in addition to requirements of MMM-A-132

††Product of Monsanto Industrial Chemicals Company

TYPICAL MECHANICAL PROPERTIES
Table II
FM® 123-5 Adhesive Film with BR 127 Primer
Tested in Conformance with MIL-25463 A, Type I, Class 2

Test No.	Property and Test Condition	Specification Average Requirement	Average Results with Nominal Film Weights		
			.045 psf (.21 kg/m²)	.060 psf (.30 kg/m²)	.085 psf (.42 kg/m²)
	Sandwich peel in/lb 3 in. (Nm/m)				
1	75° ± 5°F (24° ± 3°C)	25.5 (37.81)	47 (69.69)	67 (99.34)	114 (169.03)
2	10 minutes at 180° ± 2°F (82° ± 1°C)	15 (22.24)	35 (51.89)	51 (75.62)	88 (130.48)
3	10 minutes at −67° ± 2°F (−55° ± 1°C)	6 (8.90)	53 (78.58)	65 (96.38)	69 (102.31)
†	75° ± 5°F (24° ± 3°C) After 30 days salt water spray	None	———	67 (99.34)	———
†	After 30 days at 120° ± 5°F (50° ± 3°C) 95% to 100% R.H.	None	———	68 (100.82)	———
	Flatwise tensile strength, psi (MPa)				
4	75° ± 5°F (24° ± 3°C)	450 (3.10)	960 (6.62)	1095 (7.56)	1340 (9.25)
5	10 minutes at 180° ± 2°F (82° ± 1°C)	270 (1.86)	570 (3.93)	600 (4.14)	688 (4.75)
6	10 minutes at −67° ± 2°F (−55° ± 1°C	350 (2.41)	1330 (9.18)	1395 (9.63)	1495 (10.32)
	Flexural strength, lb (N) (total load)				
7	75° ± 5°F (24° ± 3°C)	1750 (7785)	2260 (10 053)	2400 (10 676)	2400 (10 676)
8	10 minutes at 180° ± 2°F (82° ± 1°C)	1200 (5338)	1585 (7051)	1925 (8563)	2345 (10 431)
9	10 minutes at −67° ± 2°F (−55° ± 1°C)	1750 (7785)	2385 (10 609)	2590 (11 521)	2530 (11 254)
10	After 192 hours exposure at 180° ± 2°F) (82° ± 1°C)	1000 (4448)	1825 (8118)	2010 (8941)	2480 (11 032)
	Creep deflection in flexure when loaded for maximum of 192 hours, inch (mm)				
11	75° ± 5°F (24° ± 3°C) Under 1,000 lb (4448 N) load	0.025 max. (.635) deflection	0.00163 (.0414)	0.0020 (.0508)	0.00246 (.0625)
12	10 minutes at 180° ± 2°F (82° ± 1°C) Under 800 lb (3559 N) load	0.050 max. (1.27) deflection	0.0180 (.4572)	0.0147 (.3734)	0.0150 (.381)

BR 127 primer, 10% solids
Primer cured 60 minutes at 250°F (120°C)
Cured primer thickness 0.0002" to 0.0005" (.005 to .013 mm)

FM 123-5 adhesive cure cycle:
30 minutes to 225°F (105°C)
45 minutes at 225°F (105°C)
40 psi (.28 MPa)

†Data in addition to requirements of MIL-A-25463 A

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BR 127 Primer Application

1. Allow material to warm to room temperature prior to opening container. Thoroughly mix before and agitate during application.
2. Spray or brush coat to a dry primer thickness of 0.0001 inch (.0025 mm) nominal with a 0.0002 inch (.0050 mm) maximum thickness. For protective coating applications, primer thicknesses of 0.0004 to 0.0010 inch (.0102 to .025 mm) are generally recommended.
3. Air dry 30 minutes minimum prior to use.
4. Oven dry 30 minutes at 250° ± 10°F (120° ± 6°C).

Bonding Procedure

Metal must be properly prepared before application of the adhesive. For further detailed information on methods of surface preparation of metals, refer to Section 1.1.3 of our HANDBOOK OF ADHESIVES.

Primer assemblies, which have been properly dried and wrapped with a protective covering such as kraft paper, may be stored at 75°F (24°C) for several months without fear of degradation of the final bond.

Before bonding, detail parts and adhesive film must be properly assembled. Patterns of FM 123-5 film should be cut as required before removal of the protective covering which is easily stripped from the film at room temperature. Apply the adhesive film smoothly to the parts. For additional tack, use heat gun tack at 110°F (43°C).

After assembly of details, apply pressure and cure to one of these recommended Bloomingdale cycles (15 to 30 minutes heat up rate for all cure temperatures):

15 minutes at 250°F (120°C)
45 minutes at 225°F (105°C)
90 minutes at 220°F (95°C)
with 25 to 50 psi (.17 to .34 MPa)

Warning

Contains an epoxy resin. May cause allergic skin reaction. Avoid prolonged or repeated contact with skin. Wash thoroughly after handling.

First Aid

In case of contact, immediately wash skin with soap and plenty of water.

Ventilation Required

Use mechanical exhaust ventilation when heat curing resin system.

Detailed Handling Instructions

Refer to Material Safety Data Sheets and product labels.

Important Notice

The information and statements herein are believed to be reliable but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE. Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.

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ENGINEERED MATERIALS

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