TECHNICAL DATASHEET

FM® 1515-3 Film Adhesive

Description:

FM® 1515-3 and 1515-3 MHT are 350°F (177°C) curing modified epoxy supported film adhesives. This material also can be cured at 250°F (121°C). Maximum continuous service temperature range up to 275° to 320°F (135° to 160°C).

FM® 1515-3 is available in medium- and high-tack (HT) versions which give the same mechanical and physical properties.

Applications for FM® 1515-3 are for metal-to-metal and composite bonding, for Boeing BMS 5-154, and for cosmetic surfacing, Boeing BMS 8-341.

For more information, contact:
Cytec Engineered Materials
Technical Service
Anaheim, California
714 630-9400

Features and benefits:

- **Industry standard for composite bonding and surfacing applications.**
- **Designed for co-cured, pre-cured and co-bonding of composite materials.**
- **Provides excellent surfacing character-istics. Good resistance to pre-cure humidity.**
- **Available in variety of weights and carriers.**
- **Bonds metal-to-metal, metal-to-core, composites.**
- **Co-cures with most 350°F (177°C) curing prepregs.**
- **Shelf life should not exceed 12 months at 0°F (-18°C), one month at 40°F (4°C).**
- **Shop life is 10 to 30 days at <80°F (27°C).**

This information is provided for informational purposes only and without legal responsibility.
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CREATING A MATERIAL ADVANTAGE

Physical properties

		1515-3
T_g °F (°C) (1)	338 (170)	Roll length yds. (m) 60 (55)
Cure temp range °F (°C)	250 to 350 (121 to 177)	weight lb./ft.²* (gm/m²) 0.03 - 0.10 (146 to 486)
Service temp range °F (°C)	-65 to 320 (-54 to 160)	Mat or Nylon Knit carrier
Shop life (days at RT)	15	Volatiles % Wt. 1% maximum
RT tack	Medium	Roll width in. (cm)** 36 to 48 (91 to 122)
Color	Blue	

Separator, release paper and polyethylene film.

(1) T_g °F (°C) G' knee by dynamic mechanical analysis.

* This range tailored to your specification - contact Cytec Fiberite Technical Services Department.

** Or slit to your requirement.

Mechanical properties • FM 1515-3M HT • BMS 5-154
Pre-exposed film 10 days at 90°F/50% RH

Property	Test temp 0°F/(0°C)	Grade 03	Grade 05	Grade 08
Double lap shear (psi)	-65 (-54)	4007	4111	3789
	75 (24)	4093	4512	4246
	160 (71)	4195	4161	3972
	270 (132)	2064	2336	2522
Sandwich beam shear (psi)	-65 (-54)	695	688	676
	75 (24)	596	667	613
	160 (71)	634	596	608
Honeycomb flatwise tensile (psi)	-65 (-54)	950	887	877
	75 (24)	838	883	904
	160 (71)	848	907	873

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Mechanical properties • FM 1515-3M HT • BMS 5-154

Property	Speciman exposure prior to test	Test temp 0°F/(0°C)	Grade 03
Double lap shear (psi)	1000 hrs at 160°F, 100% RH	75	4435
	14 days at 160°F 100% RH	160 (132)	4237
Honeycomb flatwise tensile (psi)	14 days at 160°F 100% RH	160 (71)	551

Mechanical properties • FM 1515-3M HT • BMS 5-154

Property	Speciman exposure prior to test	Test temp 0°F/(0°C)	Grade 05
Double lap shear (psi)	1000 hrs at 160°F, 100% RH	75	4823
	14 days at 160°F 100% RH	160 (132)	4272
Honeycomb flatwise tensile (psi)	14 days at 160°F 100% RH	160 (71)	677

Mechanical properties • FM 1515-3M HT • BMS 5-154

Property	Speciman exposure prior to test	Test temp 0°F/(0°C)	Grade 08
Double lap shear (psi)	1000 hrs at 160°F, 100% RH	75	4433
	14 days at 160°F 100% RH	160 (132)	4369
Honeycomb flatwise tensile (psi)	14 days at 160°F 100% RH	160 (71)	588

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Mechanical properties • Per BMS 8-245B

Property	Test temp 0°F/(0°C)	1515-3	Substrate
Adh Wt lb/ft² (gm/m²)		0.05 (242)	
Lap shear, psi (MPa), metal-to-metal	-65 (-54) RT 250 (121) 300 (149) 350 (177)	4600 (32) 4700 (32) 3800 (26) 3000 (21) 1800 (12)	2024 T3 Aluminum, no primer Tested at 270°F (132°C)
Double lap shear, psi (MPa), metal-to-metal	-65 (-54) RT 250 (121) 300 (149) 350 (177)	5900 (41) 5900 (41) 4700 (32) 3500 (24) 2500 (17)	2024 T3 aluminum, no primer
Double lap shear, psi (MPa), composite-to-composite	-65 (-54) RT 250 (121) 300 (149) 350 (177)	4900 (34) 5400 (37) 2600 (18) 1900 (13) 630 (4.3)	Carbon Epoxy composite per BMS 8-212
Bell Peel lbs./in. (KN/m) metal-to-metal	-65 (-54) RT 250 (121) 300 (149) 350 (177)	6 (1.0) 16 (2.8) 14 (2.4) 8 (1.4) 4 (0.7)	0.063 in./0.025 in. (1.60 mm/0.635mm) 2024 T3 aluminum no primer

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Mechanical properties • Per BMS 8-245B, cont.

Property psi = (MPa)	Test temp 0°F/(0°C)	1515-3	Specimen
Sandwich peel ipiw (Nm/m) metal-to-honeycomb	-65 (-54) RT 250 (121) 300 (149) 350 (177)	7.8 (34.7) 8.2 (36.5) 6.3 (28.0) 4.3 (19.1) 3.5 (15.6)	See footnote A
Flatwise tensile, psi (MPa), composite-to-honeycomb	-65 (-54) RT 160 (71)	980 (6.7) 1000 (6.9) 980 (6.7)	See footnote B
Flatwise tensile, psi (MPa), metal-to-honeycomb	-65 (-54) RT 250 (121) 300 (149) 350 (177)	1300 (9.0) 1100 (7.6) 670 (4.6) 430 (3.0) 230 (1.6)	See footnote C

(A) 1515-3: 0.020 in. (0.508mm) 2024 T3 aluminum. Skins, no primer on 5052 1/4 in. (6.35mm) cell. 7.9 density, 0.5 in. (12.7mm) thick core.
1515-1: 0.020 in. (0.508mm) 2024 T3 skin, no primer on 5052 3/16 in. (4.75mm) cell. 5.9 density, 0.5 in. (12.7mm) thick core.

(B) Carbon epoxy composite per BMS 8-212 co-cured on HRP 3/16 in. (4.75mm)cell. 8.0 density, 0.5 in. (12.7mm) thick core.

(C) 0.20 in. (.508mm) 2024 T3 aluminum skins, no primer on 5052 1/4 in. (6.35mm) cell. 7.9 density, 0.5 in. (12.7mm) thick core.

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General information

Cure cycle

Recommended standard autoclave cure cycle for 1515-3 is:

Pressure

Full vacuum 26 in. Hg (88 kPa) and 45 psi (310 kPa) clave pressure, vent to atmosphere at 20 psi (139 kPa).

Heatup

RT to 350°F (177°C) at 1 to 5°F (0.5° to 3°C)/minute.

Hold

350 +/- 10°F (177 +/- 5.5°C) for 120 minutes.

Cool down

Under pressure to <140°F (60°C).

For recommendations on other cure cycles and processes, contact Cytec Fiberite's Technical Services Department.

Surface preparation

Cured composite substrates

Most high performance composites employ a removable "peel ply" of Nylon or Dacron fabric. Good bonding can be achieved with no surface preparation. Remove the peel ply and bond immediately.

For surfaces without peel ply:

1. Lightly sand the surface to be bonded.
2. Use 240-280 grit sandpaper.
3. Clean the composite using clean cotton (lint free) cloth and MEK or acetone.
4. Dry thoroughly at room temperature.

Aluminum skins:

A clean, dry, grease-free surface is required for bonding. FM® 1515-3 is used with all standard cleaning techniques involving: solvent degreasing, alkaline cleaning, surface abrading, chemical deoxidizing, alodining, anodizing, and/or priming. General guidance can be found in ASTM D 2651.

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Surface preparation, cont.

Best results for aluminum are obtained by a five step procedure of: solvent degreasing, alkaline cleaning, chemical deoxidizing (etching), phosphoric acid anodizing*, and priming with BR® 6747-1, 6725-1 or BR® 127 primer.

*Boeing patent 4,085,012. April 1978. It is now being used by a large number of aircraft manufacturers due to the improved surface bond durability it provides.

Aluminum core

No cleaning is necessary unless the core has been contaminated by foreign matter. If contaminated, solvent clean or vapor degrease with MEK, acetone or trichlorethylene.

Other substrates

Information concerning the surface treatment of substrates other than aluminum is given in MIL-A-9067 and/or Cytec's Surface Treatment brochure. This will be supplied upon request.

Primer

The use of a primer is not a prerequisite for obtaining a structural bond. However, assemblies are commonly primed to improve production flow. Use BR® 6747-1, 6725-1 or BR® 127 primer. Consult the primer's data sheet for details.

Storage of primed surfaces

Primed details may be stored for extended periods, but must be protected from contamination by wrapping in non-waxes Kraft paper.

Prefitting of details

Faying surfaces shall have good contact over the entire surface area to be bonded and shall be free of burrs, waves and other imperfections. Where feasible, details should be prefitted prior to assembly bonding.

Layup procedure

1. When FM® 1515 is removed from refrigerated storage, the adhesive must be allowed to reach RT before the roll is unpackaged.
2. Remove either of the interliners and place the adhesive against the surface to be bonded. Care should be taken to prevent air entrapment between the film adhesive and substrates, especially in large area bonds.
3. If additional tack is desired, the adhesive may be heated to as high as 140°F (60°C) without altering the adhesive properties. Before heat tacking, be sure the film is in the proper position, removal will be difficult.
4. Complete the assembly after removing the other interliner.

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Health and safety information

Refer to Material Safety Data Sheets 8755 and 7178.

Important notice

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contact us

Cytec Engineered Materials Inc. North American Facilities

Anaheim, California
714 630-9400 • Fax 714 666-4345

Havre de Grace, Maryland
410 939-1910 • Fax 410 939-8100

Greenville, Texas
903 457-8500 • Fax 903 457-8598

Winona, Minnesota
507 454-3611 • Fax 507 452-8195

Orange, California
714 639-2050 • Fax 714 639-2033

D Aircraft Products, Inc.
Anaheim, California
714 632-8444 • Fax 714 632-7164

Cytec Carbon Fibers LLC
Piedmont, South Carolina
800 222-2448 • Fax 864 299-9333

GLOBAL HEADQUARTERS
Tempe, Arizona
480 730-2000 • Fax 480 730-2390

Cytec Engineered Materials, Ltd. United Kingdom

Wrexham, UK
+44 1978 665200
Fax +44 1978 665222

Cytec Engineered Materials (GmbH) Germany

Ostringen, Germany
+49 7523 912800
Fax +49 7523 912899

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