

# > FM<sup>®</sup> 300-2 FILM ADHESIVE

TECHNICAL DATA SHEET



## DESCRIPTION

FM<sup>®</sup> 300-2 film adhesive is a 250°F (121°C) cure version of Cytec Engineered Materials' widely used FM<sup>®</sup> 300 film adhesive. It delivers the same superior high temperature performance, toughness and stress/strain properties of FM 300 film adhesive without requiring a 350°F (177°C) cure cycle. In addition, FM 300-2 film adhesive's processing window includes temperatures up to 300°F (149°C) providing a unique level of flexibility from one adhesive product.

FM 300-2 adhesive was developed specifically for co-cure and secondary composite bonding applications. Through innovative curative technology, the required cure temperature is reduced allowing for secondary bonding of structure far below the composite's glass transition point. FM 300-2 film adhesive also offers optimum flow control desirable for co-cure composite bonding.

In metal bond applications, FM 300-2 film adhesive provides excellent moisture and corrosion resistance in high humidity environments with a minimal reduction in mechanical properties. To achieve consistent mechanical performance as well as maximum environmental resistance in bonding metallic details, the use of pre-cured BR<sup>®</sup> 127 corrosion inhibiting primer is recommended.

FM 300-2 adhesive is available as an unsupported or supported film employing both knit and random mat carriers. A low-flow version of FM 300-2 film adhesive for composite interleaving, designated FM 300-2 interleaf adhesive, is also available.

## FEATURES & BENEFITS

- 250°F (121°C) cure version of FM 300 film adhesive
- Offers service temperatures from 67°F to 300°F (-55°C to 149°C)
- Excellent moisture and corrosion resistance in high humidity environments with no significant reduction in mechanical properties
- Displays similar stress/strain properties to FM 300 film adhesive under both dry and wet conditions through 220°F (104°C)
- Ideal for co-cure and secondary composite bonding applications. Compatible with most thermoset and thermoplastic composite systems.

## SUGGESTED APPLICATIONS

- Co-cure and secondary composite bonding
- Vacuum-only processing common in repair applications

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### CHARACTERISTICS

Table 1 | Product description

Product Number	Nominal Weight, psf (gsm) <sup>1</sup>	Nominal Thickness, inches (mm)	Color
FM 300-2K film adhesive	0.100 (489)	0.016 (0.41)	Red
FM 300-2K film adhesive	0.080 (391)	0.013 (0.33)	Red
FM 300-2M film adhesive	0.050 (244)	0.008 (0.20)	Red
FM 300-2M film adhesive	0.060 (293)	0.010 (0.25)	Red
FM 300-2M film adhesive	0.030 (147)	0.005 (0.13)	Red
FM 300-2U film adhesive	0.030 (147)	0.005 (0.13)	Red

<sup>1</sup> Weight tolerance equals nominal weight  $\pm$  0.005 psf ( $\pm$  25 gsm)

Table 2 | Handling properties

Volatiles	1.0% maximum
Outgassing properties (after complete cure)	1.35% TWL and 0.08% CVCM (NASA reference publication 1124, Rev. 8/87)
Recommended storage	Store at or below 0°F (-18°C)
Shelf life	12 months from date of shipment at recommended storage conditions
Shop life	20 days at or below 75°F (24°C)

The following Cytec Engineered Materials products are recommended for use with FM 300-2 adhesive

- BR<sup>®</sup> 127 Corrosion Inhibiting Primer
- FM<sup>®</sup> 410-1 Foam Adhesive

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### PROPERTIES

Table 3 | Mechanical Performance<sup>1</sup>: FM 300-2 Film Adhesive with BR 127 Primer

Property and Test Condition	FM 300-2K 0.10 psf (489 gsm)	FM 300-2K 0.08 psf (391 gsm)	FM 300-2M 0.05 psf (244 gsm)	FM 300-2M 0.03 psf (147 gsm)
<b>Lap Shear Strength, psi (MPa) ASTM 1002</b>				
-67°F (-55°C)	4280 (29.5)	4580 (31.6)	4330 (29.8)	4000 (27.6)
75°F (24°C)	5410 (37.3)	5900 (40.7)	4850 (33.5)	-
180°F (82°C)	5200 (35.9)	5300 (36.6)	5150 (35.5)	-
250°F (121°C)	3750 (25.9)	3730 (25.7)	3800 (26.2)	4040 (27.9)
300°F (149°C)	-	2300 (15.8)	-	2955 (20.4)
<b>Metal-to-Metal Climbing Drum Peel, in-lb/in (Nm/m)</b>				
-67°F (-55°C)	17 (76)	18 (80)	20 (90)	23 (100)
75°F (24°C)	33 (150)	35 (160)	31 (140)	30 (130)
180°F (82°C)	39 (170)	40 (180)	35 (160)	33 (150)
250°F (121°C)	39 (170)	38 (170)	35 (160)	31 (140)
300°F (149°C)	-	40 (180)	-	33 (150)
<b>Honeycomb sandwich peel, in-lb/3 in (Nm/m)</b>				
-67°F (-55°C)	36 (53)	34 (50)	15 (22)	14 (21)
75°F (24°C)	50 (74)	45 (67)	21 (31)	17 (25)
250°F (121°C)	50 (74)	44 (65)	22 (33)	16 (24)
300°F (149°C)	-	33 (48)	-	13 (19)
<b>Flatwise tensile, psi (MPa)</b>				
-67°F (-55°C)	1230 (8.49)	1080 (7.45)	950 (6.56)	612 (4.22)
75°F (24°C)	1240 (8.56)	1120 (7.73)	892 (6.15)	592 (4.08)
180°F (82°C)	1000 (6.90)	961 (6.63)	760 (5.24)	496 (3.42)
250°F (121°C)	700 (4.83)	685 (4.73)	534 (3.68)	460 (3.17)
300°F (149°C)	-	325 (2.24)	-	160 (1.10)

<sup>1</sup> Primer: BR 127 corrosion inhibiting primer, 0.0002 inch (0.005 mm) thick, cured 60 minutes at 250°F (121°C)

Metal: 2024 T3, FPL etched

Honeycomb Core: 1/4 inch (6.25 mm) cell, 0.004 inch (0.10 mm) NP 5052 DURACORE<sup>®</sup> II honeycomb

Cure Cycle: 90 minutes at 250°F (121°C), 3°F (1.6°C)/minute ramp rate, 40 psi (0.28 MPa)

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**Table 4 | FM 300-2K Film Adhesive Baseline Comparison to FM 300K Film Adhesive<sup>1</sup>**

Property and Test Condition	FM 300-2K <sup>2</sup>	FM 300K <sup>3</sup>
<b>Lap Shear Strength, psi (MPa)</b>		
75°F (24°C)	5600 (38.6)	5500 (37.9)
250°F (121°C)	3900 (26.9)	4000 (27.6)
300°F (149°C)	2300 (15.9)	2700 (18.6)
<b>Floating Roller Peel, lbs/in (kN/m)</b>		
75°F (24°C)	36 (6.4)	35 (6.2)
<b>Honeycomb Sandwich Peel, in-lb/3 in (Nm/m)</b>		
75°F (24°C)	50 (74)	45 (67)
<b>Flatwise Tensile, psi (MPa)</b>		
75°F (24°C)	1100 (7.6)	1000 (6.9)
300°F (149°C)	400 (2.8)	460 (3.2)
<b>Flow, %</b>	450 – 550	450 – 550
<b>Tg, °C (TMA)</b>	144	148

<sup>1</sup> Primer: BR 127 corrosion inhibiting primer, 0.0002 inch (0.005 mm) thick, cured 60 minutes at 250°F (121°C)

Metal: 2024 T3, FPL etched

Adhesive Weight: 0.080 psf (391 gsm)

<sup>2</sup> Cured 90 minutes at 250°F (121°C)

<sup>3</sup> Cured 60 minutes at 350°F (149°C)

**Table 5 | Effect of Cure Cycle on Physical Properties of FM 300-2K Film Adhesive<sup>4</sup>**

Property and Test Condition	Cure Cycle 90 minutes 250°F (121°C)	Cure Cycle 60 minutes 300°F (149°C)	Cure Cycle 60 minutes 350°F (177°C)
<b>Lap Shear Strength, psi (MPa)</b>			
75°F (24°C)	6100 (42.0)	6460 (44.5)	6280 (43.2)
225°F (107°C)	4660 (32.1)	4680 (32.2)	4560 (31.4)
<b>Floating roller peel, lbs/in (kN/m)</b>			
75°F (24°C)	30 (5.3)	34 (6.0)	34 (6.0)
225°F (107°C)	43 (7.6)	45 (7.9)	49 (8.6)
<b>Honeycomb sandwich peel, in-lb/3 in. (Nm/m)</b>			
75°F (24°C)	48 (71)	52 (77)	50 (74)
225°F (107°C)	50 (74)	55 (81)	60 (89)
<b>Flow, %</b>	575	525	575
<b>Tg, °C (TMA)</b>	143	140	140

<sup>4</sup> Primer: BR 127 corrosion inhibiting primer, 0.0002 inch (0.005 mm) thick, cured 60 minutes at 250°F (121°C)

Metal: 2024 T3, FPL etched

Adhesive Weight: 0.080 psf (390 gsm)

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**Table 6 | Effect of Post-Bond Humidity on Peel Strength<sup>1</sup>**

Pre-Bond Film Exposure	Bonded Coupon Exposure	Floating Roller Peel, lbs/in (kN/m)	
		75°F (24°C)	250°F (121°C)
None	None	36 (6.3)	36 (6.3)
	30 days at 160°F (71°C), 100% RH	35 (6.2)	39 (6.9)
15 days at 75°F (24°C), 80% RH	None	40 (7.0)	37 (6.5)
	30 days at 160°F (71°C), 100% RH	35 (6.2)	39 (6.9)

<sup>1</sup> Primer: BR 127 corrosion inhibiting primer, 0.0002 inch (0.005 mm) thick, cured 60 minutes at 250°F (121°C)  
 Metal: 2024 T3, FPL etched  
 Adhesive Weight: 0.080 psf (391 gsm)  
 Cured 90 minutes at 250°F (121°C) with 40 psi (0.28 MPa)

**Table 7 | Wet Nomex<sup>®</sup> Bonding with FM 300-2K Film Adhesive**

Exposure	Bonded Coupon Exposure	Flatwise Tensile, psi (MPa)		
		75°F (24°C)	180°F (82°C)	250°F (121°C)
3 weeks at 75°F (24°C), 65% RH	None	780 (5.3) core failure	780 (5.3) core failure	630 (4.3) core failure
	30 days at 160°F (71°C), 100% RH	700 (4.8) core failure	570 (3.9) core failure	-
Immersed in water for 24 hours at 140°F (60°C), then bonded within two hours	None	720 (5.0) core failure	750 (5.1) core failure	620 (4.2) core failure
	30 days at 160°F (71°C), 100% RH	730 (5.0) core failure	545 (3.7) core failure	-

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**Table 8 | Composite Bonding of Precured Thermosetting Substrates with FM 300-2M Film Adhesive<sup>1</sup>**

Precured Composite Substrate	Bonded Specimen Exposure	Lap Shear Strength, psi (MPa)		
		75°F (24°C)	180°F (82°C)	200°F (93°C)
<b>CYCOM® 985 3K70P</b> graphite/epoxy prepreg, 350°F (177°C)	None	3440 (23.7)	4600 (31.7)	4430 (30.6)
	30 days at 160°F (71°C), 100% RH	3450 (23.8)	3300 (22.8)	3000 (20.7)
<b>CYCOM® 1827/6781</b> glass/epoxy prepreg, 350°F (177°C)	None	2320 (16.0)	2400 (16.6)	2350 (16.2)
	30 days at 160°F (71°C), 100% RH	2150 (14.8)	2000 (13.6)	1900 (13.1)
<b>CYCOM® 919/3K70P</b> graphite/epoxy prepreg, 250°F (121°C)	None	3530 (24.3)	-	-
	30 days at 160°F (71°C), 100% RH	4350 (30.0)	-	-

<sup>1</sup> Laminate Description: 10 plies, cured thickness 0.14 inches (3.56 mm)

Adhesive Weight: 0.050 psf (244 gsm)

Surface Preparation: Peel ply

Cure Cycle: 60 minutes to 250°F (121°C), 90 minutes at 250°F (121°C) with 40 psi (0.28 MPa)

**Table 9 | Secondary Bonding of Thermoplastic Composite Substrates<sup>2</sup>**

Adhesive System	Precured Composite Substrate	Lap Shear Strength, psi (MPa)			
		-67°F (-55°C)	75°F (24°C)	300°F (149°C)	180°F (82°C) wet <sup>3</sup>
<b>FM 300</b> Adhesive 0.080 psf (391 gsm)	PEEK (APC™-2)	3080 (21.2)	3660 (25.2)	1940 (13.4)	3220 (22.2)
<b>FM 300-2K</b> Adhesive 0.080 psf (391 gsm)	PEEK (APC™-2)	3100 (21.4)	3650 (25.2)	1820 (12.6)	3170 (21.8)

<sup>2</sup> Comparative data between FM 300-2 and FM 300 film adhesives

PEEK/graphite supplied by ICIP.L.C., United States, unidirectional fiber, 0.14 inch (3.56 mm) thick

Surface Preparation: Plasma etched

Cure temperatures:

FM 300-2K: 90 minutes at 250°F (121°C), 40 psi (0.28 MPa), heat up rate 3°F (1.7°C)/minute

FM 300: 60 minutes at 350°F (177°C), 40 psi (0.28 MPa), heat up rate 3°F (1.7°C)/minute

<sup>3</sup> Individual coupons exposed 30 days at 140°F (60°C) and 100% RH

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**Table 10 | Effect of Post-Bond Humidity Exposure<sup>1</sup>**

Bonded Specimen Exposure	Lap Shear Strength, psi (MPa)		
	75°F (24°C)	180°F (82°C)	250°F (121°C)
None	2420 (16.7) [70% C, 30% LF]	2570 (17.7) [60% C, 40% LF]	2340 (16.1) [85% A, 15% C]
30 days at 160°F (71°C), 100% RH	2600 (17.9) [100% LF]	2600 (17.9) [50% C, 50% LF]	1550 (10.7) [100% C]

<sup>1</sup> AVIMID<sup>®</sup> K/graphite laminate, unidirectional, 0.14 inch (3.56 mm) thick  
 Surface preparation: Sandblast, solvent wipe  
 Cure Cycle: FM 300-2K adhesive, 60 minutes to 250°F (121°C), 40 psi (0.28 MPa)  
 LF = Laminate Failure  
 C = Cohesive Failure  
 A = Adhesive Failure

**Table 11 | Composite Bonding Data<sup>2</sup>**

Adhesive System	Bonded Specimen Exposure	Wide Area Lap Shear Strength, psi (MPa)	
		75°F (24°C)	220°F (104°C)
FM 300-2M 0.030 psf (145 gsm)	None	2510 (17.3) [LF]	2180 (15.0) [LF]
	30 days at 140°F (60°C), 100% RH	3250 (22.4) [LF]	3140 (21.7) [LF]

<sup>2</sup> FM 300-2M adhesive co-cured with CYCOM<sup>®</sup> 985/AS-4 unidirectional prepreg system  
 Cured Laminate Thickness: 0.14 inch (3.56 mm)  
 Cure Cycle: FM 300-2M adhesive, 60 minutes at 240°F (116°C), 90 minutes at 250°F (121°C) with 40 psi (0.28 MPa)  
 LF = Laminate Failure

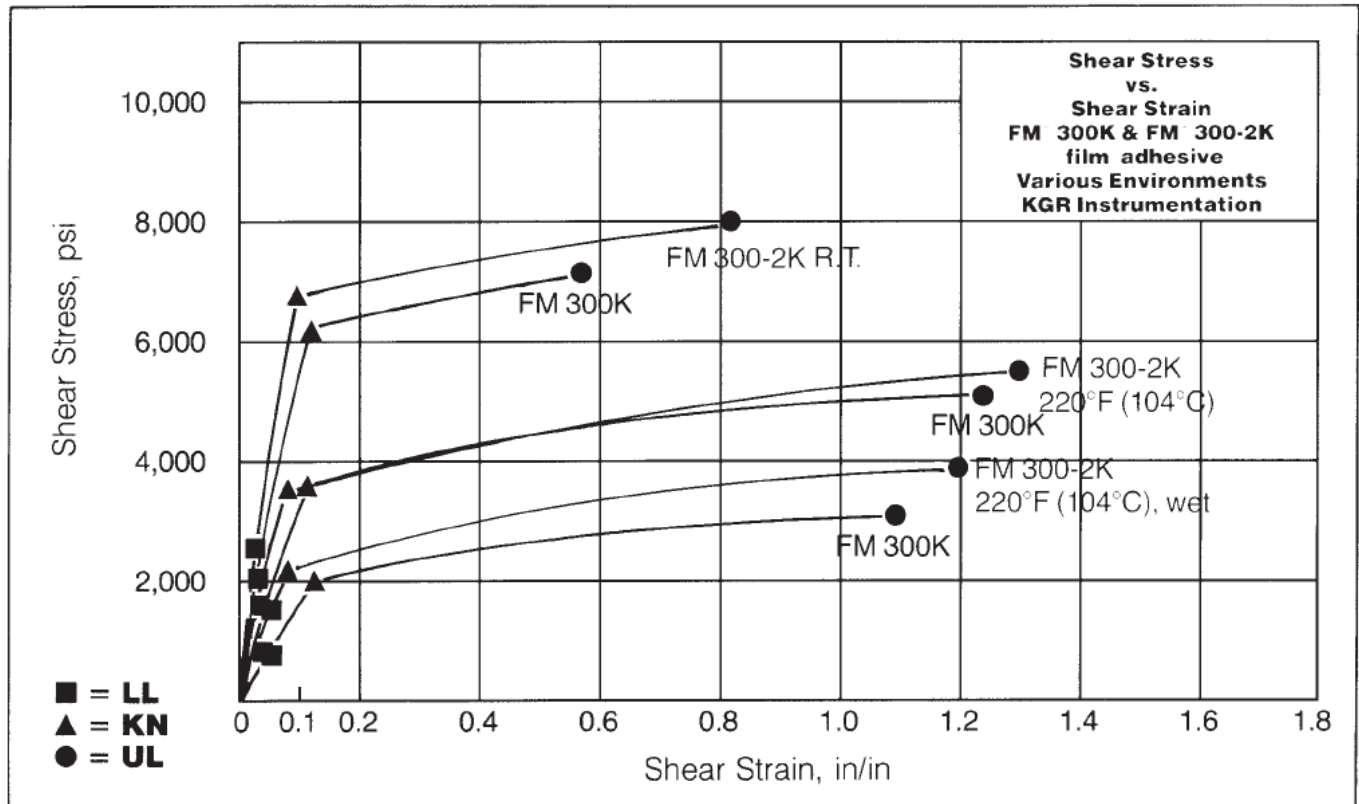
**Table 12 | KGR-1 Stress Strain Data for FM 300K Adhesive Film, 0.06 psf (293 gsm) with BR<sup>®</sup> 127 Primer**  
 [*f* = Shear Stress, psi (MPa), *γ* = Shear Strain, in/in, G = Shear Modulus, psi (Mpa)]

Test Temperature	Linear Limit (LL)			Knee (KN)		Ultimate Failure (UL)	
	<i>f</i>	<i>γ</i>	G	<i>f</i>	<i>γ</i>	<i>f</i>	<i>γ</i>
75°F (24°C)	2060 (14.2)	0.0156	131,500 (907.5)	6100 (42.1)	0.0932	7210 (49.8)	0.5446
220°F (104°C)	916 (6.32)	0.0150	64,700 (446.2)	3020 (20.8)	0.0835	5190 (35.8)	1.2073
220°F (104°C) <sup>3</sup>	745 (5.14)	0.0273	27,500 (189.8)	1880 (13.0)	0.1047	3100 (21.4)	1.0744

<sup>3</sup>Postbond exposure to 100% RH at 140°F (60°C) until saturated

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## APPLICATION NOTES

### Primer Application

Although not mandatory, BR<sup>®</sup> 127 corrosion inhibiting primer is recommended for use with FM 300-2 adhesive in the bonding of aluminum details. BR 127 primer offers superior durability and resistance to hostile environments within the bond line and also may be used as a protective coating outside the bonded areas. Apply BR 127 as follows:

1. Allow BR 127 material to warm to room temperature prior to opening container
2. Thoroughly mix before application and agitate during application
3. Spray or brush coat to a dry primer thickness of 0.0001 in (0.0025 mm) nominal with a 0.0003 inch (0.0075 mm) maximum thickness. For protective coating applications, increase primer thickness to 0.0004 to 0.0010 inch (0.0102 to 0.025 mm)
4. Air dry 30 minutes minimum prior to using
5. Oven dry 30 minutes at 250 ± 10°F (121 ± 6°C)



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### Bonding Procedure

FM 300-2 film adhesive can be bonded at pressures ranging from 15 – 100 psi (0.10 – 0.69 MPa) depending upon the application. The following cure cycle is recommended for FM 300-2 film adhesive:

- 30 minutes to 250°F ± 5°F (121°C ± 3°C)
- 90 minutes at 250°F ± 5°F (121°C ± 3°C)
- 40 ± 5 psi (0.28 ± 0.03 MPa)

### PRODUCT HANDLING AND SAFETY

Cytec Engineered Materials recommends wearing clean, impervious gloves when working with epoxy resin systems to reduce skin contact and to avoid contamination of the product.

Materials Safety Data Sheets (MSDS) and product labels are available upon request and can be obtained from any Cytec Engineered Materials Office.

### DISPOSAL OF SCRAP MATERIAL

Disposal of scrap material should be in accordance with local, state, and federal regulations.

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