



Toray Composite Materials America, Inc.



## 2511 PREPREG SYSTEM

This semi-toughened epoxy prepreg system was specifically formulated for better oven cure processing than the #2510 general aviation (AGATE) prepreg system. #2511 provides excellent all-around structural properties with a high wet and dry TG while offering a flexible cure temperature (250°F to 350°F, 121°C to 177°C) with a very low void content. This prepreg system also can be used in industrial and recreational applications.



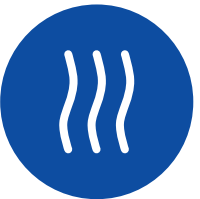
### Industry Material Specification

Material procurable to CMA specification TCSPF-T-2511 or Aerospace Material Specification (AMS) 3962.



### Industry Database

Select products listed in CMH-17 Vol 2. Contact us for more information.



### High Heat Tolerance

High Tg is suitable for structures exposed to elevated service temperatures.



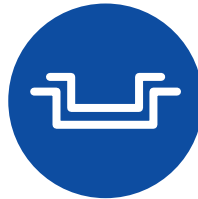
### Easy Layup

Product allows complex part layup with minimal cuts or ridge lines. It maintains a comparable class A finish through post-cure, minimizing sanding and finishing times.



### Readily Available

AMS products, marked with this icon, are kept in stock and ready to ship.



### Flexible Cure Methods

Curing methods include autoclave or oven cure. Product can be cured with or without using a dwell.

**AVAILABLE PRODUCT FORMATS**

2511 resin is available with numerous types of unidirectional carbon fibers and woven and glass fabrics with Fiber Areal Weight (FAW) ranging from 70 g/m<sup>2</sup> to 300 g/m<sup>2</sup> and Resin Content, (RC%) by weight percent, ranging from 24% to 44%. The table below lists commonly available product formats. Unidirectional products can be slit to widths between 1/8" and 60", and fabric products to widths above 6". Common product formats include: 1/4", 1/2", 1", and 1.5" AFP spools (UD only); 6", 500mm, 9", and 12" ATL rolls; and 24" to full width rolls for hand layup.

PART NUMBER	FIBER FORMAT	FIBER TYPE/STYLE	FAW (GSM)	RC % WEIGHT	ROLL WIDTH (IN)
P711AG-15	Unidirectional	T700GC-12K-31E	150	35	39
F6273C-11M (AMS 3962)	Plain Weave	T700SC-12K-50C	190	42	38
P211AS-200	Unidirectional	T800SC-24K-10E	200	35	60
FM6673G-11M	Plain Weave	T830HB-6K-41B	196	42	60
P6111-200	Unidirectional	M46JB-12K-50C	200	38	39
F4289-11M	Plain Weave	M46JB-6K-50C	202	42	39
FGF108-11M	Plain Weave	Style 108 E-Glass	48	42	38

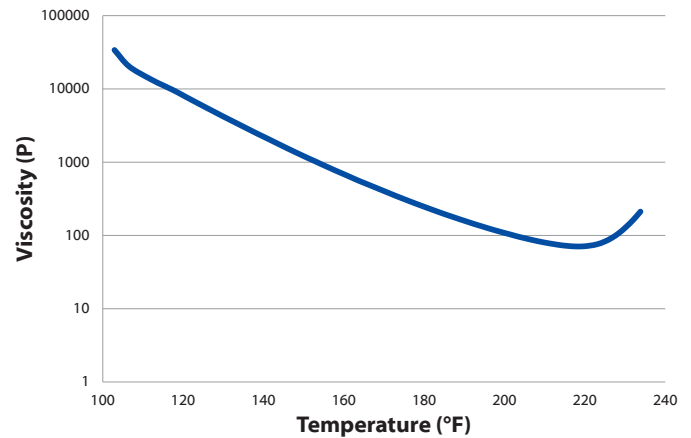
**NEAT RESIN PHYSICAL PROPERTIES**

PROPERTY	METHOD	UNITS	VALUE
Density	ASTM D792	g/cc	1.267
Tg (Dry)	ASTM D7028	°F (°C)	324 (162)
Tg (Wet)	ASTM D7028	°F (°C)	244 (118)
K <sub>IC</sub>	ASTM D5045	ksi*in <sup>0.5</sup>	0.75
Minimum Viscosity	ASTM D4440	Poise °F (°C)	70.8 218 (103)

**STORAGE LIFE**

Out Life	28 days @ 75 °F (24 °C)
Freezer Life	24 months @ <10 °F (-12 °C)

**RESIN VISCOSITY CURVE**



**Notes:**

CTA: -65°F (-54°C), Ambient  
 RTA: 72°F (22°C), Ambient  
 ETW: 180°F (82°C), conditioned at 160°F/85% RH until equilibrium  
 Tension and compression values are normalized to the indicated CPT values

**For more information or purchasing inquiries:**  
 AerospaceSales@toraycma.com | www.toraycma.com | 253-846-1777

**LAMINA/LAMINATE MECHANICAL PROPERTIES: F6273C-11M (T700S-12K PW)**


PROPERTY	SYMBOL	METHOD	UNITS	CTA	RTA	ETW
0° Tensile Strength	$F_{1t}$	ASTM D3039	Ksi (MPa)	145 (1000)	158 (1089)	158 (1089)
90° Tensile Strength	$F_{2t}$	ASTM D3039	Ksi (MPa)	141 (972)	144 (993)	131 (903)
0° Tensile Modulus	$E_{1t}$	ASTM D3039	Msi (GPa)	8.49 (58.5)	8.58 (59.2)	9.12 (62.9)
90° Tensile Modulus	$E_{2t}$	ASTM D3039	Msi (GPa)	8.25 (56.9)	8.23 (56.7)	8.59 (59.2)
0° Compressive Strength	$F_{1c}$	ASTM D6641	Ksi (MPa)	106 (731)	97.7 (674)	74.6 (514)
90° Compressive Strength	$F_{2c}$	ASTM D6641	Ksi (MPa)	104 (717)	92.6 (638)	65.5 (452)
0° Compressive Modulus	$E_{1c}$	ASTM D6641	Msi (GPa)	7.15 (49.3)	7.73 (53.3)	8.4 (57.9)
90° Compressive Modulus	$E_{2c}$	ASTM D6641	Msi (GPa)	7.22 (49.8)	7.04 (48.5)	8.18 (56.4)
In-Plane Shear Strength @ 5%	$F_{12}$	ASTM D5379	Ksi (MPa)	17.2 (119)	12.5 (86.2)	6.92 (47.7)
In-Plane Shear Modulus	$G_{12}$	ASTM D5379	Msi (GPa)	0.695 (4.79)	0.582 (4.01)	0.429 (2.96)
Short Beam Shear Strength	SBS	ASTM D2344	Ksi (MPa)	10.1 (69.6)	9.83 (67.8)	4.63 (31.9)
Poisson's Ratio	$\nu_{12}$	ASTM D3039	-	0.057	0.054	0.024
Open Hole Compression Strength (QI: 25/50/25)	OHC	ASTM D6484	Ksi (MPa)	49.1 (339)	39.5 (272)	30.4 (210)
Compression After Impact @ 1500 in-lb/in (QI: 25/50/25)	CAI	ASTM D7137	Ksi (MPa)	28.3 (195)	25.9 (179)	19.9 (137)
Laminate Density	$\rho$	ASTM D792	g/cc		1.51	
Fiber Volume Fraction	$V_f$	ASTM D3171	%		48.2	
Cured Ply Thickness	CPT	-	Inches (mm)		0.0086 (0.218)	

**LAMINA/LAMINATE MECHANICAL PROPERTIES: P711AG-15 (T700G-12K UD)**

PROPERTY	SYMBOL	METHOD	UNITS	CTA	RTA	ETW
0° Tensile Strength	$F_{1t}$	ASTM D3039	Ksi (MPa)	272 (1847)	321 (2212)	272 (1874)
0° Tensile Modulus	$E_{1t}$	ASTM D3039	Msi (GPa)	17.8 (123)	17.6 (121)	17.8 (123)
0° Compressive Strength	$F_{1c}$	SACMA SRM 1	Ksi (MPa)	235 (1619)	231 (1592)	166 (1144)
In-Plane Shear Strength @ Ultimate	$F_{12}$	ASTM D3518	Ksi (MPa)	-	25.0 (172)	-
Short Beam Shear Strength	SBS	ASTM D2344	Ksi (MPa)	-	15.4 (106)	-
Open Hole Compression Strength (QI: 25/50/25)	OHC	ASTM D6484	Ksi (MPa)	-	42.8 (295)	34.2 (236)
Compression After Impact (QI: 25/50/25)	CAI	ASTM D7137	Ksi (MPa)	-	26.2 (181)	-
Fiber Volume Fraction	$V_f$	ASTM D3171	%	-	54.7	-
Cured Ply Thickness	CPT	-	Inches (mm)	-	0.0058 (0.148)	-

**For more information or purchasing inquiries:**  
 AerospaceSales@toraycma.com | www.toraycma.com | 253-846-1777

### LAMINA/LAMINATE MECHANICAL PROPERTIES: P211AS-200 (T800S-24K UD)

PROPERTY	SYMBOL	METHOD	UNITS	RTA	ETW
0° Tensile Strength	$F_{1t}$	ASTM D3039	Ksi (MPa)	405 (2792)	-
90° Tensile Strength	$F_{2t}$	ASTM D3039	Ksi (MPa)	7.4 (51)	2.7 (18.6)
0° Tensile Modulus	$E_{1t}$	ASTM D3039	Msi (GPa)	21.1 (145)	-
90° Tensile Modulus	$E_{2t}$	ASTM D3039	Msi (GPa)	1.3 (9)	-
0° Compressive Strength	$F_{1c}$	ASTM D6641	Ksi (MPa)	180 (1241)	-
90° Compressive Strength	$F_{2c}$	ASTM D6641	Ksi (MPa)	32 (221)	17.6 (121)
0° Compressive Modulus	$E_{1c}$	ASTM D6641	Msi (GPa)	18 (124)	-
90° Compressive Modulus	$E_{2c}$	ASTM D6641	Msi (GPa)	1.3 (9)	1.2 (8.3)
In-Plane Shear Strength @ 5%	$F_{12}$	ASTM D5379	Ksi (MPa)	13.1 (90.3)	7.6 (52.4)
In-Plane Shear Modulus	$G_{12}$	ASTM D5379	Msi (GPa)	0.55 (3.79)	0.49 (3.38)
Short Beam Shear Strength	SBS	ASTM D2344	Ksi (MPa)	13.3 (91.7)	-
Open Hole Compression Strength (QI: 25/50/25)	OHC	ASTM D6484	Ksi (MPa)	43 (296)	33.7 (232)
Laminate Density	$\rho$	ASTM D792	g/cc		
Fiber Volume Fraction	$V_f$	ASTM D3171	%		
Cured Ply Thickness	CPT	-	Inches (mm)		

### LAMINA/LAMINATE MECHANICAL PROPERTIES: FM6673G-11M (T830H-6K PW)

PROPERTY	SYMBOL	METHOD	UNITS	RTA	ETW
90° Tensile Strength	$F_{2t}$	ASTM D3039	Ksi (MPa)	123 (848)	
90° Tensile Modulus	$E_{2t}$	ASTM D3039	Msi (GPa)	9.89 (68.2)	
90° Compressive Strength	$F_{2c}$	ASTM D6641	Ksi (MPa)	96.1 (6.63)	
90° Compressive Modulus	$E_{2c}$	ASTM D6641	Msi (GPa)	8.82 (60.8)	
In-Plane Shear Strength @ 5%	$F_{12}$	ASTM D5379	Ksi (MPa)	16.3 (112)	8.14 (56.1)
In-Plane Shear Modulus	$G_{12}$	ASTM D5379	Msi (GPa)	0.51 (3.52)	0.42 (2.9)
Short Beam Shear Strength	SBS	ASTM D2344	Ksi (MPa)	8.91 (61.4)	
Open Hole Compression Strength (QI: 25/50/25)	OHC	ASTM D6484	Ksi (MPa)	39.9 (275)	34.8 (240)
Laminate Density	$\rho$	ASTM D792	g/cc		
Fiber Volume Fraction	$V_f$	ASTM D3171	%		
Cured Ply Thickness	CPT	-	Inches (mm)		

**For more information or purchasing inquiries:**  
 AerospaceSales@toraycma.com | www.toraycma.com | 253-846-1777

### LAMINA/LAMINATE MECHANICAL PROPERTIES: P6111-200 (M46J UD)

PROPERTY	SYMBOL	METHOD	UNITS	RTA
0° Tensile Strength	$F_{1t}$	ASTM D3039	Ksi (MPa)	244 (1682)
90° Tensile Strength	$F_{2t}$	ASTM D3039	Ksi (MPa)	7.4 (51)
0° Tensile Modulus	$E_{1t}$	ASTM D3039	Msi (GPa)	32.6 (225)
90° Tensile Modulus	$E_{2t}$	ASTM D3039	Msi (GPa)	1.3 (9)
0° Compressive Strength	$F_{1c}$	ASTM D6641	Ksi (MPa)	120 (827)
90° Compressive Strength	$F_{2c}$	ASTM D6641	Ksi (MPa)	32 (221)
0° Compressive Modulus	$E_{1c}$	ASTM D6641	Msi (GPa)	26.2 (181)
90° Compressive Modulus	$E_{2c}$	ASTM D6641	Msi (GPa)	1.3 (9)
In-Plane Shear Strength @ 5%	$F_{12}$	ASTM D5379	Ksi (MPa)	10 (68.9)
In-Plane Shear Modulus	$G_{12}$	ASTM D5379	Msi (GPa)	0.55 (3.79)
Short Beam Shear Strength	SBS	ASTM D2344	Ksi (MPa)	9.4 (64.8)
Open Hole Compression Strength (QI: 25/50/25)	OHC	ASTM D6484	Ksi (MPa)	31.1 (214)
Laminate Density	$\rho$	ASTM D792	g/cc	1.52
Fiber Volume Fraction	$V_f$	ASTM D3171	%	51
Cured Ply Thickness	CPT	-	Inches (mm)	0.0084 (0.213)

### LAMINA/LAMINATE MECHANICAL PROPERTIES: F4829-11M (M46J-6K PW)

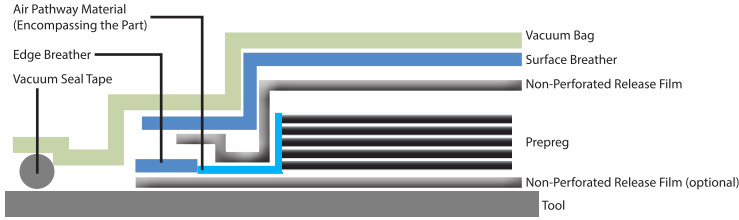
PROPERTY	SYMBOL	METHOD	UNITS	RTA
90° Tensile Strength	$F_{2t}$	ASTM D3039	Ksi (MPa)	83 (572)
90° Tensile Modulus	$E_{2t}$	ASTM D3039	Msi (GPa)	13.8 (95.1)
90° Compressive Strength	$F_{2c}$	ASTM D6641	Ksi (MPa)	70.2 (484)
90° Compressive Modulus	$E_{2c}$	ASTM D6641	Msi (GPa)	12 (82.7)
In-Plane Shear Strength @ 5%	$F_{12}$	ASTM D5379	Ksi (MPa)	9.3 (64.1)
In-Plane Shear Modulus	$G_{12}$	ASTM D5379	Msi (GPa)	0.57 (3.93)
Short Beam Shear Strength	SBS	ASTM D2344	Ksi (MPa)	6.7 (46.2)
Open Hole Compression Strength* (25/50/25)	OHC	ASTM D6484	Ksi (MPa)	31.4 (216)
Fiber Volume Fraction	$V_f$	ASTM D3171	%	48.4
Cured Ply Thickness	CPT	-	Inches (mm)	0.0094 (0.239)

### LAMINA/LAMINATE MECHANICAL PROPERTIES: FGF108-11M

PROPERTY	SYMBOL	METHOD	UNITS	CTA	RTA	ETW
Cured Ply Thickness	CPT	-	Inches (mm)		0.0016 (0.0406)	

**For more information or purchasing inquiries:**  
 AerospaceSales@toraycma.com | www.toraycma.com | 253-846-1777

**BAGGING PROCEDURE**



**Notes:**

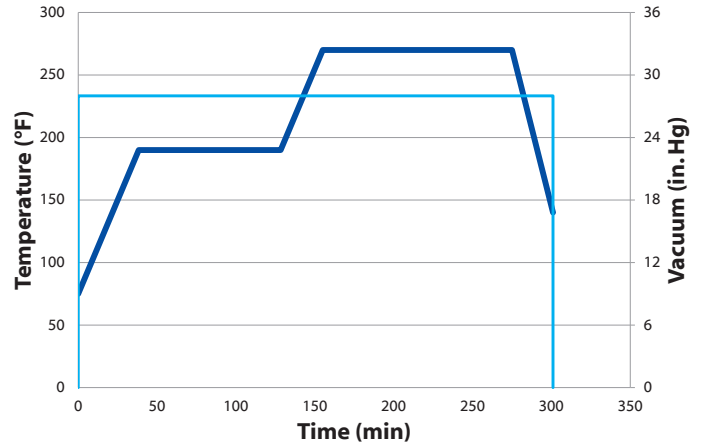
1. During layup, debulk after the first ply and then every 4 plies or as needed
2. It is recommended that panels have a pre-cure vacuum hold depending on size: for small panels 1 hour, for medium sized panels (>1ft<sup>2</sup>) for 3 hours, and for complex layups (ply drops, >2ft<sup>2</sup>) for 16+ hours.
3. The vacuum should be checked for leaks before beginning the cure cycle. The leak rate shall be less than 2.0 inches of Hg (7 kPa) over 5 minutes.

**Please refer to the SDS for handling and disposal.**

**RECOMMENDED OVEN CURE CYCLE**

1. Apply full vacuum\* to the part. A pre-cure hold under vacuum is recommended based on panel size to minimize voids when curing OOA.
2. Ramp to 190 ± 10°F at 3 ± 1°F/min (88 ± 5°C at 0.6-2.8°C/min) and hold for 90-120 minutes.
3. Ramp to 270 ± 10°F at 3 ± 1°F/min (132 ± 5°C at 0.6-2.8°C/min) and hold for 120-150 minutes.
4. Cool oven to 140°F at a max rate of 5°F/min (54°C at 2.8°C/min) before releasing vacuum.

\* Required vacuum level varies depending on elevation. 28" Hg (95 kPa) is the recommended minimum at sea level under average conditions.



**For more information or purchasing inquiries:**  
AerospaceSales@toraycma.com | www.toraycma.com | 253-846-1777