

AFRPE<sup>®</sup>-4 is an autoclave processable, thermally stable, addition curing thermoset polyimide with an excellent balance of processability, thermo-oxidative stability (TOS), environmental durability, and mechanical performance. This system exhibits exceptional toughness, good dielectric properties, low toxicity (prepregs are based on ethanol and are MDA free), and may be autoclave processed into thick (>1 inch), microcrack-free, low void laminates. AFRPE<sup>®</sup>-4 is the industry preferred product when a combination of processability, thermo-oxidative stability, toughness, and structural performance are required. This state-of-

the-art composite system is available as a prepreg (carbon, glass, quartz, or ceramic reinforcements) or resin.

### Thermo-Oxidative Mass Loss, 4-ply Laminates

Textile	Aging Condition	Mass Loss (%)
16781 S-2	500°F (260°C) / 1000h	<0.1
16781 S-2	700°F (371°C) / 100h	<0.5
T650-35	600°F (316°F) / 1000h	<2.0
T650-35	700°F (371°F) / 100h	<0.5

### Mechanical Properties for 4-ply Laminates

Property	16781 S-2 Glass	T650-35/8HS/ 365 gsm	Test Method
In-Plane Shear Strength, ksi (MPa)			ASTM D3518
75°F (23°C)	43 (294)	24 (165)	
600°F (316°C)	21 (145)	20 (135)	
Aging: 500°F (260°C)/1000h			
75°F (23°C)	26 (179)	15 (103)	
600°F (316°C)	21 (143)	12 (83)	
Aging: 700°F (371°C)/100h			
75°F (23°C)	28 (193)	20 (141)	
600°F (316°C)	18 (129)	16 (113)	
[0°] Tensile Strength, ksi (MPa)			ASTM D3039
75°F (23°C)	88 (610)	136 (938)	
600°F (316°C)	64 (444)	114 (786)	
Aging: 500°F (260°C)/1000h			
75°F (23°C)	72 (499)	88 (604)	
600°F (316°C)	65 (451)	91 (628)	
Aging: 700°F (371°C)/100h			
75°F (23°C)	64 (441)	120 (827)	
600°F (316°C)	54 (376)	103 (710)	
Compression Strength, ksi (MPa)			ASTM D695
75°F (23°C)	56 (386)	99 (686)	
600°F (316°C)	40 (277)	53 (363)	
Aging: 500°F (260°C)/1000h			
75°F (23°C)	65 (449)	71 (492)	
600°F (316°C)	36 (245)	52 (360)	
Aging: 700°F (371°C)/100h			
75°F (23°C)	69 (478)	89 (616)	
600°F (316°C)	36 (251)	48 (332)	

## Mechanical Properties for T650-35/8HS Laminates

Property	6-ply	10-ply	18-ply	24-ply	Test Method
Glass Transition Temperature, °F (°C)					ASTM D7028
Storage Modulus, E'	—	723 (384)	—	714 (379)	
[0°] Tensile Strength, ksi (MPa)					ASTM D3039
75°F (260°C)	137 (945)	—	—	—	
Wet [0°] Tensile Strength, ksi (MPa)					ASTM D3039
75°F (23°C)	107 (738)	—	—	—	
[0°] Tensile Modulus, msi (GPa)					ASTM D3039
75°F (23°C)	10 (69)	—	—	—	
Wet [0°] Tensile Modulus, msi (GPa)					ASTM D3039
75°F (23°C)	9.8 (68)	—	—	—	
Compression Strength, ksi (MPa)					ASTM D6641
75°F (23°C)	—	110 (759)	88 (607)	—	
550°F (288°C)	—	71 (490)	13 (89)	—	
Wet Compression Strength, ksi (MPa)					ASTM D6641
75°F (23°C)	—	87 (600)	—	—	
450°F (232°C)	—	—	50 (345)	—	
500°F (260°C)	—	23 (159)	32 (221)	—	
Compression Modulus, msi (GPa)					ASTM D695
75°F (23°C)	—	9.1 (63)	—	—	
550°F (288°C)	—	9.1 (63)	—	—	
Wet Compression Modulus, msi (GPa)					ASTM D695
75°F (23°C)	—	9.2 (64)	—	—	
500°F (260°C)	—	8.8 (61)	—	—	
Flexural Strength, ksi (MPa)					ASTM D6272
75°F (23°C)	—	132 (910)	128 (883)	129 (890)	
550°F (288°C)	—	83 (572)	—	—	
Wet Flexural Strength, ksi (MPa)					ASTM D6272
75°F (23°C)	—	130 (896)	—	—	
450°F (232°C)	—	—	63 (434)	61 (421)	
500°F (260°C)	—	51 (352)	36 (248)	31 (214)	
Flexural Modulus, msi (GPa)					ASTM D6272
75°F (23°C)	—	13 (89)	—	—	
550°F (288°C)	—	13 (89)	—	—	
Wet Flexural Modulus, msi (GPa)					ASTM D6272
75°F (23°C)	—	14 (96)	—	—	
500°F (260°C)	—	11 (76)	—	—	
Short Beam Shear Strength, ksi (MPa)					ASTM D2344
75°F (23°C)	—	6.7 (46)	8.4 (58)	9.8 (58)	
550°F (288°C)	—	4.4 (30)	—	—	
Wet Short Beam Shear Strength, ksi (MPa)					ASTM D2344
75°F (23°C)	—	7.4 (51)	—	—	
400°F (204°C)	—	—	—	5.8 (40)	
450°F (232°C)	—	—	—	4.2 (29)	
500°F (260°C)	—	3.7 (26)	—	2.1 (15)	

## Mechanical Properties for Unidirectional Tape Laminates

Property	S-2 Glass (AGY 933)	24-ply T650-35 Unsize 12K	Test Method
[0°] Compression Strength, ksi (MPa)			ASTM D695
75°F (23°C)	124 (853)	—	
400°F (204°C)	—	60 (415)	
500°F (260°C)	—	16 (112)	
[90°] Compression Strength, ksi (MPa)			ASTM D695
75°F (23°C)	36 (252)	—	
In-Plane Shear Strength, ksi (MPa)			ASTM D3518
500°F (260°C)	—	21 (143)	
[0°] Short Beam Shear Strength, ksi (MPa)			ASTM D2344
75°F (23°C)	12 (84)	—	
[90°] Short Beam Shear Strength, ksi (MPa)			ASTM D2344
75°F (23°C)	1.6 (11)	—	
[0°] Flexural Strength, ksi (MPa)			ASTM D6272
75°F (23°C)	184 (1269)	—	
[90°] Flexural Strength, ksi (MPa)			ASTM D6272
75°F (23°C)	9.3 (64)	—	
[0°] Interlaminar Shear Strength, ksi (MPa)			ASTM D3846
75°F (23°C)	16 (114)	—	
[90°] Interlaminar Shear Strength, ksi (MPa)			ASTM D3846
75°F (23°C)	7.7 (53)	—	

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