

4708



250-300°F (120-150°C) High T_g Epoxy Resin System

Typical applications

General aviation
Aerospace
Industrial
Sporting goods

Shelf life

6 months at 40°F (4°C)
12 months at 0°F (-18°C)

Out life

30 days at 70°F (21°C)

Description

4708 is a 250°F (120°C) to 300°F (150°C) cure, high T_g, controlled flow epoxy resin system specifically designed for out of autoclave processing. 4708 significantly surpasses the performance of traditional 250°F (120°C) cure resin systems with its high toughness and impact resistance. FAA approved NCAMP B-basis design allowable database is available for specific material configurations.

Benefits/features

- Good dry and wet T_g performance
- Excellent mechanical properties
- Out of autoclave cure capable
- Long out life

Application

The elevated T_g and excellent mechanical properties make 4708 an ideal product for general aviation, aerospace and industrial markets where products are required to retain their mechanical properties under demanding temperatures. Due to its exceptionally high wet T_g, it is particularly suited for applications where hot/wet performance is required.

4708 can be supplied as a matrix for most commercially available fibers (carbon, quartz, aramid, S-glass, E-glass, etc.) in both woven form (designated as NB) as well as unidirectional tape (designated as NCT).

Woven fabrics are available in standard commercial widths up to 60 inches (1.5 m). Unitape widths up to 39 inches (1 m) are available in standard fiber weights ranging from 70-300 gsm (0.014-0.060 psf).

Recommended processing conditions

4708 can be cured at temperatures from 250°F to 300°F (120°C to 150°C) depending on part size and complexity. It was specifically designed for vacuum processing, but also can be autoclave cured.

Vacuum cure cycle

Apply full vacuum, hold at RT for a minimum of 4 hours. Heat from RT to 265±10°F at 5°F/min (130±5.5°C at 2.8°C/min). When temperature reaches 255°F (124°C), hold at temperature for 2 hours. Cool to below 140°F (60°C).

Thicker parts may need to use step cure to reduce the possibility of an exotherm. Please contact MCCFC's technical support for more information.



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CARBON FIBER AND COMPOSITES

Technical Data Sheet



Neat resin [values are average and do not constitute a specification]

Property	Value
Gel time @ 275°F (135°C), minutes	4 – 7
Specific gravity	1.25
Dry T _g (DMA, E'), °F (°C)	293 (145)
Wet T _g (DMA, E'), °F (°C)*	248 (120)

*14 days, 160°F water immersion

Mechanical data [values are average and do not constitute a specification]

MR60H CARBON UNITAPE [NCAMP]

36%RC, vacuum bag cured, 120 minutes at 265°F, normalized by CPT=0.0126 in [52%FV]

Property	Test method	-65°F (-53°C)	RT	180°F (82°C)	180°F (82°C) wet*
0° Tensile strength, ksi (MPa)		401 (2760)	417 (2870)	437 (3010)	433 (2980)
0° Tensile modulus, Msi (GPa)	ASTM D3039	23.6 (162)	24.5 (168)	24.3 (167)	24.1 (166)
90° Tensile strength, ksi (MPa)		-	6.25 (43.1)	-	3.63 (25.0)
90° Tensile modulus, Msi (GPa)		1.28 (8.82)	1.15 (7.93)	-	0.865 (5.96)
0° Compressive strength, ksi (MPa)		248 (1710)	228 (1570)	200 (1370)	181 (1240)
0° Compressive modulus, Msi (GPa)	ASTM D695 mod	20.9 (144)	21.9 (151)	20.9 (144)	21.3 (146)
90° Compressive strength, ksi (MPa)		31.9 (220)	23.9 (164)	-	13.6 (93.7)
90° Compressive modulus, Msi (GPa)		1.39 (9.58)	1.23 (8.48)	-	1.01 (6.96)
0° Flexural strength, ksi (MPa)		-	229 (1570)	184 (1260)	165 (1130)
0° Flexural modulus, Msi (GPa)	ASTM D790	-	22.4 (154)	21.5 (148)	21.9 (151)
90° Flexural strength, ksi (MPa)		-	13.7 (94.4)	-	8.10 (55.8)
±45° In-plane shear strength, ksi (MPa)**	SACMA 5R-94	8.88 (61.2)	8.25 (56.8)	6.96 (48.0)	4.74 (32.6)
±45° In-plane shear modulus, Msi (GPa)**		0.64 (4.4)	0.735 (5.06)	0.440 (3.03)	0.360 (2.48)
0° Short beam shear strength, ksi (MPa)	SACMA 8R-94	12.6 (86.8)	12.7 (87.5)	9.26 (63.8)	7.66 (52.8)
Open hole tensile strength, ksi (MPa)	ASTM D5766	66.1 (455)	76.3 (526)	82.8 (571)	77.0 (531)
Open hole tensile modulus, Msi (GPa)		-	7.30 (50.3)	7.55 (52.0)	7.40 (51.0)
Open hole compressive strength, ksi (MPa)	ASTM D6484	-	39.2 (270)	38.1 (262)	33.6 (231)
Compressive strength after impact, ksi (MPa)	ASTM D7136 ASTM D7137	-	27.7 (191)	-	-

* 160±5°F, 85±5%RH

** @5% strain



HS40 CARBON UNITAPE

35%RC, autoclave cured, 80 psi, 90 minutes at 275°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)		345 (2370)
0° Tensile modulus, Msi (GPa)	ASTM D3039	37.3 (257)
Poisson's ratio		0.229 (1.57)
0° Compressive strength, ksi (MPa)	ASTM D695mod	186 (1280)
0° Compressive modulus, Msi (GPa)		36.8 (253)
0° Flexural strength, ksi (MPa)	ASTM D790	212 (1460)
0° Flexural modulus, Msi (GPa)		32.9 (226)
0° Short beam shear strength, ksi (MPa)	ASTM D2344	12.6 (86)

TR30S 3K PLAINWEAVE CARBON FABRIC

42%RC, autoclave cured, 80 psi, 90 minutes at 265°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	111 (765)
0° Tensile modulus, Msi (GPa)		9.6 (66)
0° Compressive strength, ksi (MPa)	ASTM D695mod	106 (731)
0° Compressive modulus, Msi (GPa)		8.8 (60)
0° Flexural strength, ksi (MPa)	ASTM D790	136 (937)
0° Flexural modulus, Msi (GPa)		8.8 (60)
0° Short beam shear strength, ksi (MPa)	ASTM D2344	9.6 (66)

AS-4C 3K 8HS CARBON FABRIC

40%RC, vacuum bag cured, 120 minutes at 265°F, normalized to 60%FV

Property	Test method	RT	225°F (107°C)	180°F (82°C) wet	200°F (93°C) wet
0° Tensile strength, ksi (MPa)	ASTM D3039	118 (813)	100 (689)	100 (689)	-
0° Tensile modulus, Msi (GPa)		9.1 (62)	8.9 (61)	9.1 (62)	-
0° Compressive strength, ksi (MPa)	ASTM D695 mod	103 (710)	75 (510)	74 (510)	65 (440)
0° Flexural strength, ksi (MPa)	ASTM D790	140 (965)	92 (630)	89 (610)	-
0° Flexural modulus, Msi (GPa)		8.2 (57)	7.4 (51)	7.5 (52)	-
0° Short beam shear strength, ksi (MPa)	SACMA 8R-94	9.9 (68)	6.1 (42)	6.4 (44)	5.5 (37)

7781 E-GLASS FABRIC

38%RC, vacuum bag cured, 120 minutes at 265°F, normalized to 60%FV

Property	Test method	RT	225°F (107°C)	180°F (82°C) wet	200°F (93°C) wet
0° Tensile strength, ksi (MPa)	ASTM D638 Type II	101 (696)	82 (565)	58 (400)	-
0° Tensile modulus, Msi (GPa)		4.7 (32)	5.1 (35)	4.7 (32)	-
0° Compressive strength, ksi (MPa)	ASTM D695mod	115 (793)	84 (579)	72 (496)	66 (455)
0° Compressive modulus, Msi (GPa)		5.0 (34)	-	4.9 (34)	-
0° Flexural strength, ksi (MPa)	ASTM D790	136 (938)	99 (683)	80 (552)	74 (510)
0° Flexural modulus, Msi (GPa)		4.6 (32)	4.3 (30)	4.3 (30)	4.2 (29)
0° Short beam shear strength, ksi (MPa)	SACMA 8R-94	13 (18)	8.8 (12)	5.7 (7.7)	4.5 (6.1)

BIMAX-L™ ±45° BIAxIAL CARBON FABRIC

42%RC, vacuum bag cured, 130 minutes at 265°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	116 (800)
0° Tensile modulus, Msi (GPa)		10.3 (71)
0° Compressive strength, ksi (MPa)	ASTM D6641	106 (731)
0° Compressive modulus, Msi (GPa)		8.6 (59)
0° Flexural strength, ksi (MPa)*	ASTM D790	97.7 (674)
0° Flexural modulus, Msi (GPa)*		5.3 (37)
45° Longitudinal Tensile strength, ksi (MPa)	ASTM D3039	39 (269)
45° Transverse Tensile strength, ksi (MPa)		40 (276)
45° Compressive strength, ksi (MPa)	ASTM D6641	35 (241)
Short beam shear strength, ksi (MPa)	ASTM D2344	8.9 (61)

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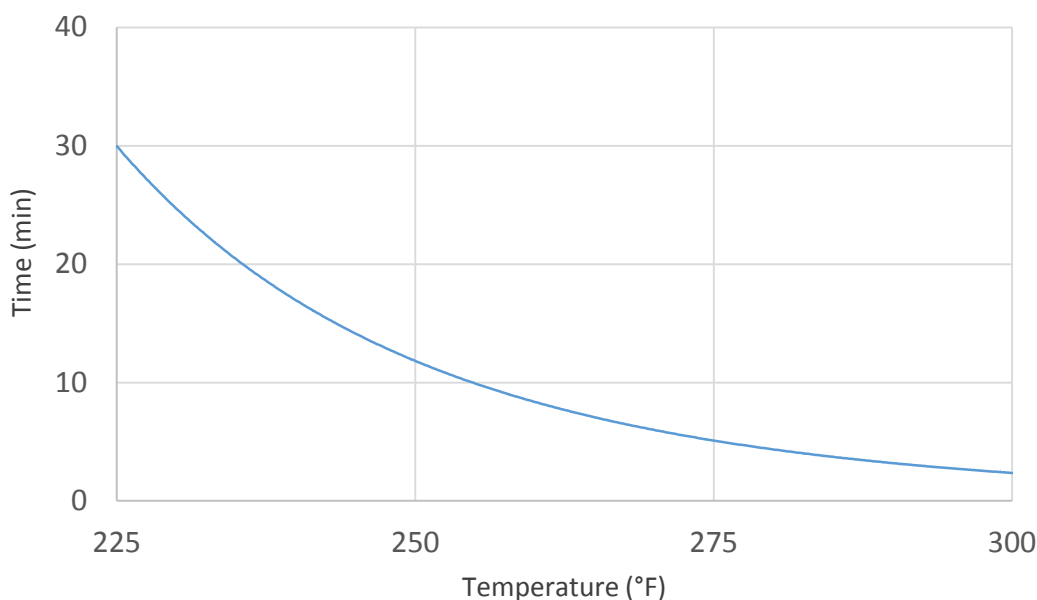


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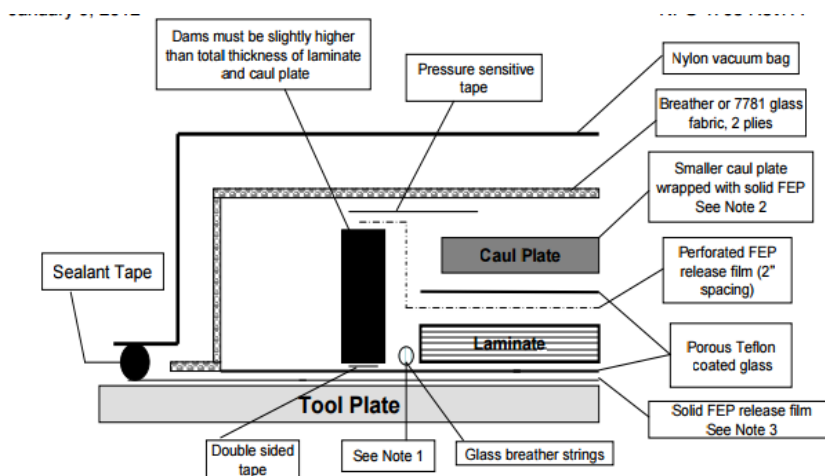
Technical Data Sheet



Gel time vs temperature



Recommended bagging assembly



Notes:

1. Dams can consist of various materials (sealant tape, cork, other stiff materials, but silicone rubber is preferred). For volatile removal they can be wrapped with 7781 glass cloth, or alternatively, 3-4 glass breather strings can be placed against all edges between the dam and the laminate as shown in Fig.2. All materials must connect to the vacuum path. The edge of the dams must be slightly higher than the total thickness of the laminate and the caul (pressure) plate.
2. For optimum laminate quality, the caul (pressure) plate should be smaller than the actual laminate size by 0.25"-0.5" on each side. Recommended plates are made of stainless steel, 0.04" (1 mm) thick.
3. The tool does not require a release film if it has been treated with a release agent.

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