301

NEWPORT HIGH PERFORMANCE MATERIALS

MITSUBISHI CHEMICAL CARBON FIBER AND COMPOSITES

Technical Data Sheet

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

Typical applications
Sporting goods
Marine
Medical
Industrial manufacturing

Out life
30 days at 70°F (21°C)

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

Description
301 is a 250°F (121°C) to 300°F (149°C) cure, toughened, controlled flow epoxy resin system that has been the industry standard for over 30 years. Versatile processing, excellent mechanical properties, and long out time make 301 suitable for a variety of applications.

Benefits/features
- Excellent mechanical properties
- Moderate tack
- Good toughness
- Controlled flow
- Flexible processing

Variants
- 301-5: Snap cure (3 min. at 300°F, 10 min. at 275°F)
- 301-2: Long gel (18% increase compared to 301)
- 301-T: Clearer aesthetics (Separate TDS)

Tack variants
Higher
301-1
301 (Standard tack)
301-D
Lower
301-D2

Application
301 can be supplied with 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
301 is typically cured at 250°F - 300°F (121°C - 149°C) depending on part size and complexity. With extended cure times, larger scale structures can be cured as low as 195°F-220°F (90°C-104°C). Low, medium and high pressure molding techniques may be used for curing. Recommended cure cycle is 50 psi (345 kPa); 3°F (1.7°C)/min ramp to 275°F (135°C); hold for 60 minutes, cool to <140°F (60°C).

Cure temperature °F (°C)	Cure time
200 (93)	5 – 7 hrs
225 (107)	3 - 4 hr
250 (120)	1 - 2 hr

Cure temperature °F (°C)	Cure time
275 (135)	20 – 40 mins
300 (150)	7 - 15 mins
320 (160)	4 - 7 mins

Note: These times are for press cure only. Oven or autoclave will increase cure time.

Please contact your account manager or MCCFC technical support to discuss specific applications.

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

Property	Value
Gel time @ 275°F (135°C), minutes	3 – 5
Specific gravity	1.22
T_g (DMA, E'), °F (°C)	248 (120)
CTE, ppm/°C	70 ± 10 (below T_g)

Outgassing properties tested in accordance with ASTM E595

Property	Resin	NCT301 LT 145gsm 35%RC
Average value TML (Total mass loss)	0.49%	0.19%
Average value WVR (Water vapor recovered)	0.38%	0.12%
Percent CVCM (Collected volatile condensable materials)	<0.01	<0.01%

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

34-700 CARBON UNITAPE

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

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	344 (2370)
0° Tensile modulus, Msi (GPa)		19.4 (133)
Poison's ratio		0.289
0° Compressive strength, ksi (MPa)	SACMA 1R-94	244 (1680)
0° Compressive modulus, Msi (GPa)		19.5 (134)
0° Flexural strength, ksi (MPa)	ASTM D790	249 (1710)
0° Flexural modulus, Msi (GPa)		19.8 (136)
Short beam shear strength, ksi (MPa)	SACMA 8R-94	14.0 (96.5)

37-800 CARBON UNITAPE

34%RC, autoclave cured, 60 psi, 90 minutes at 275°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	408 (2810)
0° Tensile modulus, Msi (GPa)		21.2 (146)
0° Compressive strength, ksi (MPa)	ASTM D695mod	217 (1500)
0° Compressive modulus, Msi (GPa)		19.1 (131)
0° Flexural strength, ksi (MPa)	ASTM D790	226 (1560)
0° Flexural modulus, Msi (GPa)		18.2 (125)
Short beam shear strength, ksi (MPa)	ASTM D2344	13.9 (95)

HR40 CARBON UNITAPE

31%RC, autoclave cured, 85 psi, 30 minutes at 170°F then 120 minutes at 255°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	371 (2550)
0° Tensile modulus, Msi (GPa)		34.1 (235)
0° Compressive strength, ksi (MPa)	SACMA 1R-94	159 (1090)
0° Flexural strength, ksi (MPa)	ASTM D790	226 (1550)
0° Flexural modulus, Msi (GPa)		30.4 (209)
Short beam shear strength, ksi (MPa)	SACMA 8R-94	12.7 (87.5)

TRH50 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)	ASTM D3039	442 (3040)
0° Tensile modulus, Msi (GPa)		21.7 (149)
0° Compressive strength, ksi (MPa)	ASTM D695mod	240 (1650)
0° Flexural strength, ksi (MPa)	ASTM D790	250 (1720)
0° Flexural modulus, Msi (GPa)		21.1 (145)
90° Flexural strength, ksi (MPa)	ASTM D790	19.8 (136)
Short beam shear strength, ksi (MPa)	ASTM D2344	13.3 (91.7)

TR50S CARBON UNITAPE

34%RC, autoclave cured, 60 psi, 90 minutes at 275°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	373 (2570)
0° Tensile modulus, Msi (GPa)		20.4 (140)
90° Tensile strength, ksi (MPa)		9.19 (63.7)
90° Tensile modulus, Msi (GPa)		1.26 (8.68)
0° Compressive strength, ksi (MPa)	ASTM D695mod	228 (1570)
0° Compressive modulus, Msi (GPa)		20.7 (142)
90° Compressive strength, ksi (MPa)		38.6 (266)
90° Compressive modulus, Msi (GPa)		1.45 (10.0)
0° Flexural strength, ksi (MPa)	ASTM D790	244 (1680)
0° Flexural modulus, Msi (GPa)		18.1 (124)
90° Flexural strength, ksi (MPa)		22.7 (156)
Short beam shear strength, ksi (MPa)	ASTM D2344	13.9 (95)
±45° IPS Strength @5% Strain, ksi (MPa)	ASTM D3518	7.1 (48)
±45° IPS Modulus, Msi (GPa)		0.53 (3.6)

E-GLASS UNITAPE

36%RC, autoclave cured, 60 psi, 90 minutes at 275°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	179 (1230)
0° Tensile modulus, Msi (GPa)		7.2 (49.6)
0° Compressive strength, ksi (MPa)	ASTM D695mod	234 (1610)
0° Compressive modulus, Msi (GPa)		7.4 (51.0)
0° Flexural strength, ksi (MPa)	ASTM D790	196 (1350)
0° Flexural modulus, Msi (GPa)		7.1 (49.0)
Short beam shear strength, ksi (MPa)	ASTM D2344	13.3 (92)

7781 E-GLASS FABRIC

39%RC, autoclave cured, 30 psi, 90 minutes at 260°F, normalized to 60%FV

Property	Test method	RT	RT_{wet}*
0° Tensile strength, ksi (MPa)	ASTM D638 Type II	91.9 (633)	74.0 (510)
0° Tensile modulus, Msi (GPa)		4.6 (31)	5.0 (34)
0° Compressive strength, ksi (MPa)	ASTM D695mod	84.2 (580)	77.9 (537)
0° Compressive modulus, Msi (GPa)		4.5 (31)	4.5 (31)
0° Flexural strength, ksi (MPa)	ASTM D790	137 (944)	108 (774)
0° Flexural modulus, Msi (GPa)		5.4 (37)	4.9 (33)
Short beam shear strength, ksi (MPa)	SACMA 8R-94	10.3 (71.0)	8.3 (57)

*Wet conditioning = 2 hour water boil, weight gain = 0.25%

TR30S 3K PLAINWEAVE CARBON FABRIC

38%RC, autoclave cured, 60 psi, 90 minutes at 275°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	158 (1090)
0° Tensile modulus, Msi (GPa)		12.3 (84.8)
Poison's ratio		.035
0° Compressive strength, ksi (MPa)	ASTM D695 mod	124 (855)
0° Compressive modulus, Msi (GPa)		11.4 (78.6)
0° Flexural strength, ksi (MPa)	ASTM D790	189 (1300)
0° Flexural modulus, Msi (GPa)		11.6 (80.0)
Short beam shear strength, ksi (MPa)	ASTM D2344	10.0 (69)

TR30S 3K 2x2 TWILL CARBON FABRIC

42%RC, autoclave cured, 58 psi (vent at 20 psi), 90 minutes at 275°F, results as tested

Property	Test method	RT	RT_{wet}*
0° Tensile strength, ksi (MPa)	ASTM D638 Type I	103 (710)	77 (530)
0° Tensile modulus, Msi (GPa)		9.9 (68)	8.7 (60)
0° Compressive strength, ksi (MPa)	SACMA 1R-94	89 (610)	50 (350)
0° Flexural strength, ksi (MPa)	ASTM D790	121 (830)	59 (410)
0° Flexural modulus, Msi (GPa)		7.3 (50)	6.6 (46)
Short beam shear strength, ksi (MPa)	SACMA 8R-94	10.6 (73)	4.1 (28)

**Wet conditioning = 14-day water immersion @ 160°F (71°C)*

BIMAX-L™ ±45° BIAXIAL CARBON FABRIC

42%RC, autoclave cured, 80 psi, 90 minutes at 275°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (MPa)	ASTM D3039	118 (814)
0° Tensile modulus, Msi (GPa)		10 (69)
0° Compressive strength, ksi (MPa)	ASTM D6641	107 (738)
0° Compressive modulus, Msi (GPa)		8.8 (61)
0° Flexural strength, ksi (MPa)	ASTM D790	30 (207)
0° Flexural modulus, Msi (GPa)		1.9 (13)
45° Longitudinal Tensile strength, ksi (MPa)	ASTM D3039	46 (317)
45° Transverse Tensile strength, ksi (MPa)		46 (317)
45° Compressive strength, ksi (MPa)	ASTM D6641	36 (248)
Short beam shear strength, ksi (MPa)	ASTM D2344	7.4 (51)

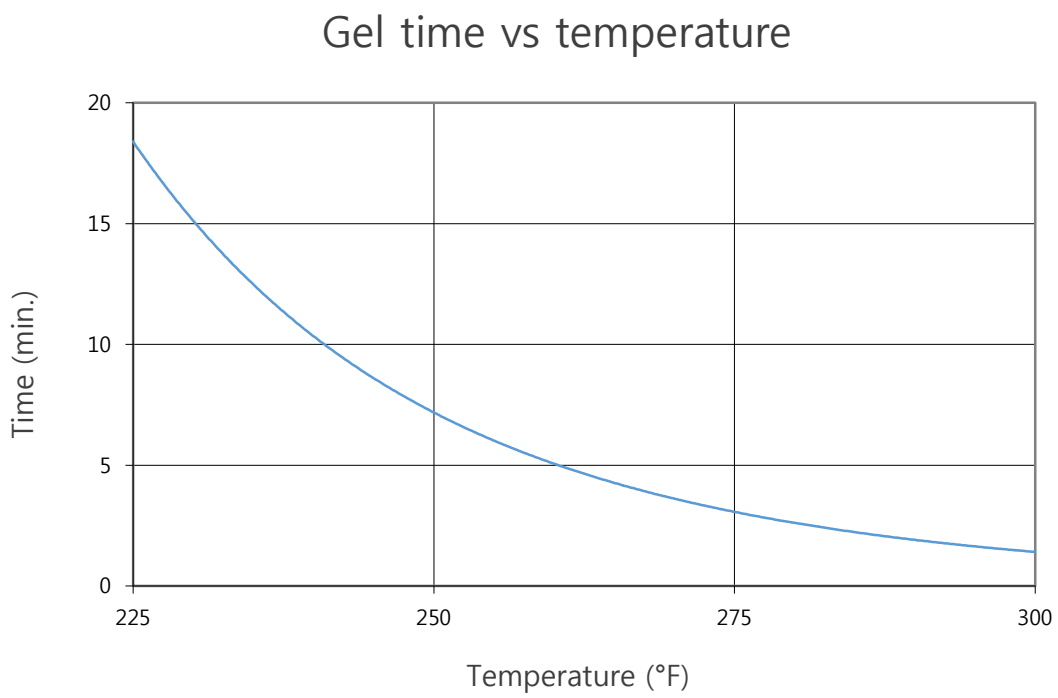
BIMAX™ is a trademark of A&P Technology, Inc.

QISO-L™ ±60° TRIAXIAL CARBON FABRIC

42%RC, autoclave cured, 80 psi, 90 minutes at 275°F, normalized to 60%FV

Property	Test method	RT
0° Tensile strength, ksi (Mpa)	ASTM D3039	123 (848)
0° Flexural strength, ksi (MPa)	ASTM D790	103 (710)
0° Flexural modulus, Msi (GPa)		5.7 (39)
0° Open hole tensile strength, ksi (Mpa)	ASTM D5766	71 (490)
0° Open hole compressive strength, ksi (Mpa)	ASTM D6484	56 (386)
0° Compressive strength, ksi (MPa)	ASTM D6641	93 (641)
90° Compressive strength, ksi (MPa)		82 (565)
90° Tensile strength, ksi (Mpa)	ASTM D3039 mod	95 (656)
Short beam shear strength, ksi (MPa)	ASTM D2344	9.5 (66)

QISO-L™ is a trademark of A&P Technology, Inc.



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Technical Data Sheet

CORPORATE OFFICE
Composite Materials Division
1822 Reynolds Avenue
Irvine, CA 92614

Tel: (949) 253-5680
Fax: (949) 253-5692
www.mccfc.com
compositesales@mccfc.com

THE KAITEKI COMPANY
Mitsubishi Chemical Holdings Group