

COMPOSITE TECHNOLOGIES

TECHNICAL DATA SHEET

AX-201XL

*Vacuum Bag Only Processing / Excellent Surface Quality /
Flexible Cure Cycle / Large Part Construction*

Product

AX-201XL is a toughened, epoxy carbon prepreg designed for the manufacture of large parts requiring excellent surface quality using vacuum bag oven curing techniques. Optimum tack and drape characteristics allow for ease of complex part layups as well as having superior out-time for large part manufacturing. AX-201XL prepreg may be cured from 71°C to 121°C (160°F to 250°F) with no post cure required to develop the desired glass transition temperature (Tg) and mechanical properties for 82°C (180°F) use. Structures and components will develop a Tg for continuous service temperatures up to 93°C (200°F). A 121°C (250°F) post cure allows use up to 121°C (250°F).

Typical Applications

- » Outstanding vacuum bag only capability on a wide range of reinforcements.
- » Ideal handling characteristics for medium-large parts requiring 30 day out-time or more.
- » Versatile cure from 71 to 121°C (160 to 250°F) with dry service temps up to 121°C (250°F).
- » May be cured using vacuum bag oven, autoclave, or press molding processes.
- » Suitable for large industrial or marine components.
- » AX-201XL/FR option available for flame retardant properties meeting FAR 25.853.
- » The adhesive AX-2121 was developed to work together with AX-201XL.

Resin Variants

AX-201 material systems are available in the resin variants listed below. Unless specifically stated, the presented data is based on the standard formula.

- » AX-201XL: Standard Formula
- » AX-201XL-LT: Low Tack Version
- » AX-201XL-HT: High Tack Version
- » AX-201XL-C: Cosmetic Version

***Our products are flexible by design:
Additional weights, roll sizes, and reinforcements***

Product Categories and Location of Production

Product Category	Description	AXIOM MATERIALS	KORDSA
AX-3201XL	Fiberglass Fabric (E-Glass, S-Glass, and Quartz)	✓	✓
AX-4201XL	Aramid Fabric (Kevlar®, Twaron®, etc)	✓	✓
AX-5201XL	Carbon Fabric Prepreg (HS, IM, HM)	✓	✓
AX-6201XL	Unidirectional Tape	✓	✓
AX-6201XL-Slit	Slit Tape	✓	✓

Product Reinforcements

Kordsa Composite Europe, Istanbul (Typical, *Additional weights, roll sizes, and reinforcements are available*)

Reinforcement Code	Fiber	Areal Weight (g/ m ²)	Weaving Style	Warp Density (picks / cm)	Weft Density (picks / cm)
TW245	TR30S 3K	245 ± 3%	2*2 TWILL	6.1 ± 0.1 /cm	6.1 ± 0.1 /cm
TW400	34700 12K	400 ± 3%	2*2 TWILL	2.5 ± 0.1 /cm	2.5 ± 0.1 /cm
TW650	34700 12K	650 ± 3%	2*2 TWILL	4 ± 0.1 /cm	4 ± 0.1 /cm

Axiom, Santa Ana, CA (Typical, *Additional weights, roll sizes, and reinforcements are available*)

Reinforcement Code	Fiber	Areal Weight (g/ m ²)	Weaving Style	Warp Density (picks / cm)	Weft Density (picks / cm)
284	3K Carbon, 33MSI	197	2/2 Twill	-	-
284	12K Carbon, 33MSI	671	2/2 Twill	-	-
C-BX 1200	45°/ 45° Double Bias	400	Biaxial	-	-

Slit Tape General Information

Resin System	AX6201XL
Fiber Material	3K, 12K, 24K
Winding Type	Traverse 

Physical Features

Feature	Unit mm	Tolerance mm	Unit inch	Tolerance inch
Slit Width	3,175	+/- 0,127mm	0,125	+/- 0,005"
Slit Width	6,35	+/- 0,127mm	0,25	+/- 0,005"
Slit Width	12,7	+/- 0,127mm	0,5	+/- 0,005"

Packaging

Liner Type	PE Film
Core diameter	3 inches

Resin Matrix Properties

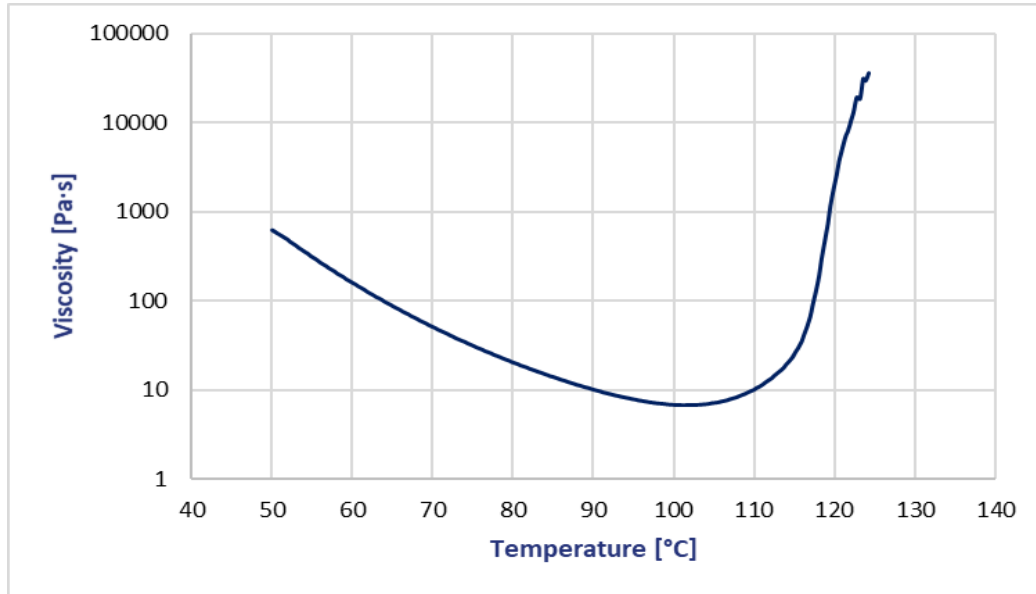


Figure 1 Rheology of AX-201XL

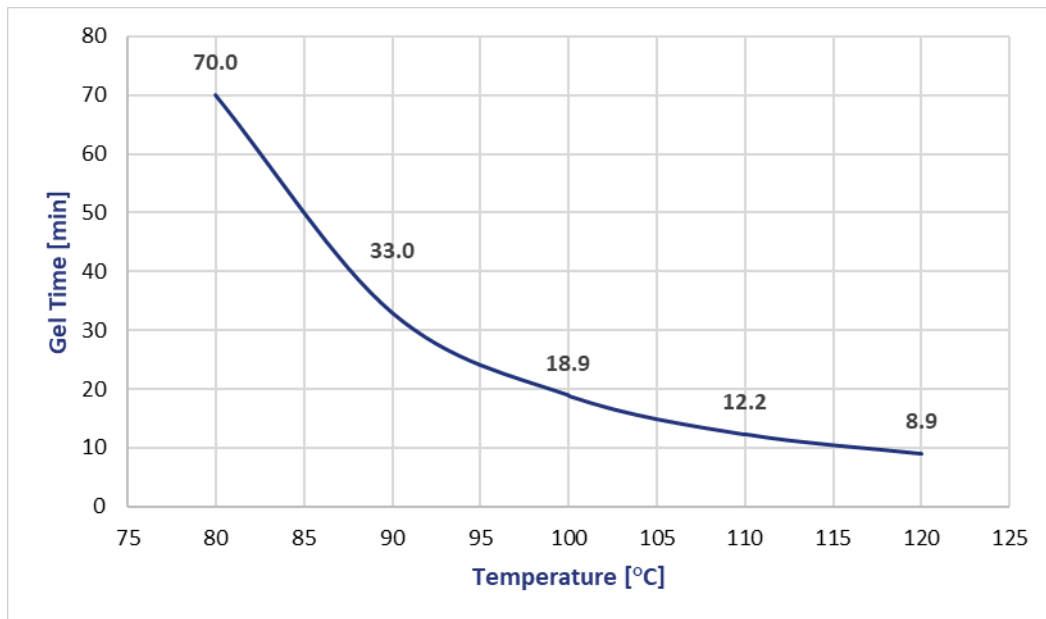


Figure 2 Gel Time of AX-201XL

Resin Properties

Property	Test Method	Value
Resin Density	ASTM D792	1.16 g/cm ³
Resin Color	N/A	Naturally White
Neat Resin DMA °C (°F)	N/A	111-117 (231.8-242.6)
Tensile Strength MPa (ksi)	ASTM D638	38 (5.5)

Recommended Cure Cycles

Optimum properties are achieved under vacuum and 5.5 bar or higher external pressure, and cured according to one of the following:

Cure Temperature (°C)	AX-201XL
80 (176°F)	240 minutes
120 (248°F)	60 minutes

Recommended Autoclave Curing Cycle at 80°C (176°F) of AX-201XL

- 1) Apply full vacuum (-1 bar).
- 2) Apply 5.5 bar positive gauge autoclave pressure with a speed of 0.25 bar/min.
- 3) Reduce the vacuum to a safety value of -0.2 bar when the autoclave pressure reaches approximately 1 bar gauge.
- 4) Heat-up at 3°C/minute to 80°C (176°F).
- 5) Hold at 80°C (176°F) for 4 hours.
- 6) Cool at 3°C/min to 40°C (104°F).
- 7) Release autoclave pressure with 0.25 bar/min when the component reaches 40°C (104°F) or below.

Recommended Autoclave Curing Cycle at 120°C (248°F) of AX-201XL

- 1) Place thermocouple between the layers to track the temperature change,
- 2) Reduce the vacuum to a safety value of -0.2 bar when the autoclave pressure reaches approximately 1 bar gauge.
- 3) Apply minimum 5.5 bar at the beginning of the cycle,
- 4) Ramp up the oven temperature with 1°C/min to 120°C (248°F),
- 5) Keep the laminate at 120°C (248°F) temperature for 60 minutes
- 6) Upon completion of cure, cool the part with 2°C/min to 50°C (122°F),
- 7) Release autoclave pressure with 0.25 bar/min when the component reaches 70°C (158°F) or below.
- 8) Before de-molding the laminate, the temperature should reach minimum 50°C (122°F).

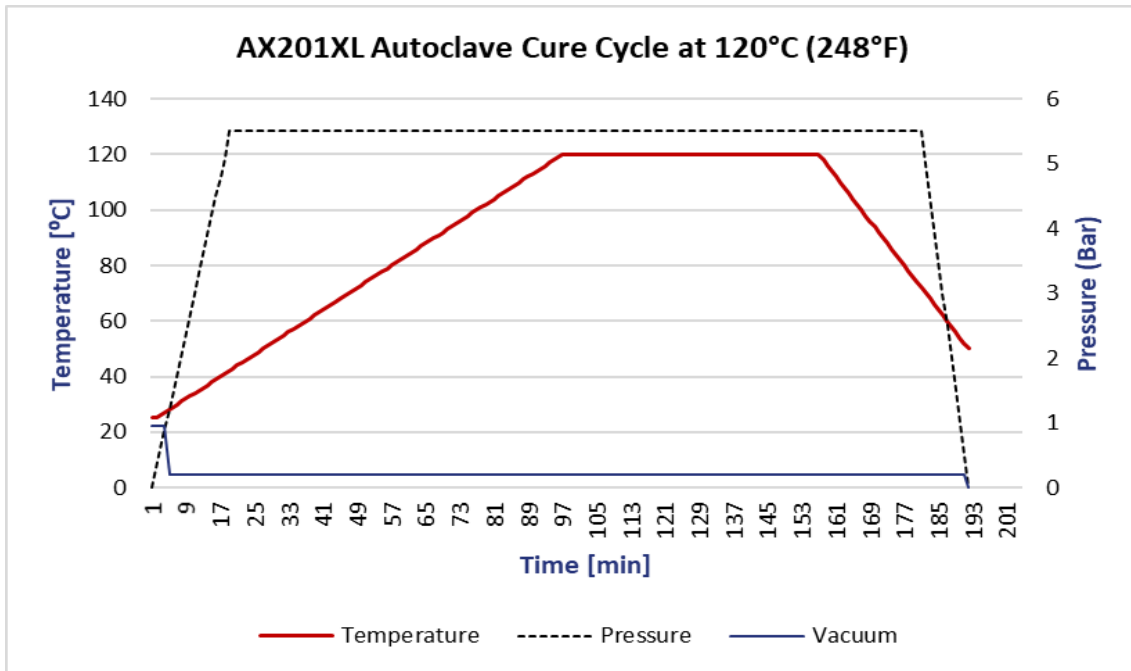


Figure 3 Autoclave Cure Cycle

Recommended Oven Curing Cycle for Cosmetic Application at 120°C (248°F)

- 1) Place thermocouple between the layers to track the temperature change,
- 2) Apply minimum 960 mbar vacuum at the beginning of the cycle.
- 3) Heat 1°C/min to the dwell temperature 70°C
- 4) Keep the laminate at 70°C temperature for 30 minutes
- 5) Ramp up the oven temperature with 1°C/min to 120°C
- 6) Keep the laminate at 120°C temperature for 45 minutes
- 7) Upon completion of cure, cool the part with 1°C/min to 50°C,
- 8) Before de-molding the laminate, the temperature should reach minimum 50°C.

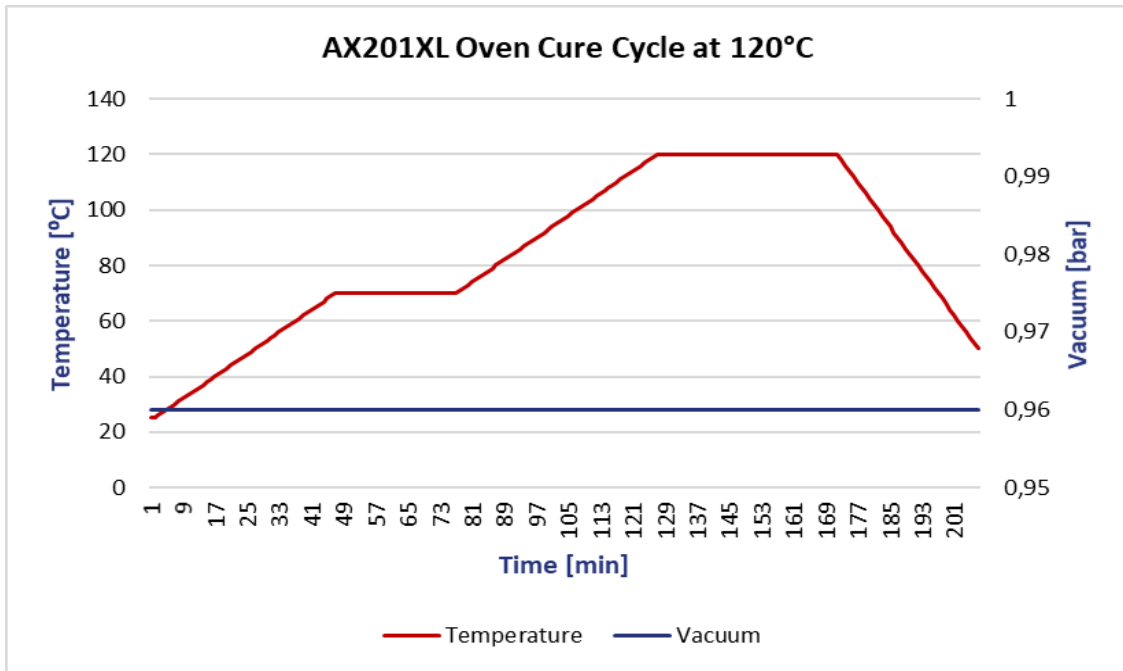


Figure 4 Oven Cure Cycle

Cure Considerations

- Temperature heat up and cool down under pressure is not mandatory.
- AX-201XL prepregs are is vacuum-bag and autoclave compatible.
- Peak operating temperatures generally depend on cure temperature and post cure. For a 120°C (248°F) cure, the service temperature envelope is -55°C to 120°C (-67°F -248°F).

Physical and Mechanical Properties (Examples only. For the wider prepreg range, please contact Kordsa)

Typical AX-5201XL Mechanical Properties
Autoclave Curing Cycle at 120°C (248°F), 5.5 bar

Property	Standard	Test Temp.	Property	TW245 TC33 / 42% RC	PL160 T300 / 42% RC
Tensile 0°	ASTM D3039	RT	Tensile Stress MPa (ksi)	915.8 (132.8)	633.4 (91.9)
			Poisson's Ratio	0.03	0.03
			Modulus GPa (msi)	64.3 (9.3)	55.6 (8.1)
Compression 0°	ASTM D3410	RT	Compressive Stress MPa (ksi)	502.4 (72.9)	517 (75)
			Chord Modulus GPa (msi)	54.9 (8)	49.8 (7.2)
3 Point Bending	ASTM D790	RT	Flexural Strength MPa (ksi)	817 (118.5)	774.7 (112.4)
			Chord Modulus GPa (msi)	50.7 (7.4)	47 (6.8)
ILSS	ASTM D2344	RT	ILSS MPa (ksi)	60.4 (8.8)	65.7 (9.5)
DMA	ASTM D7028-07	Range	E' (°C) (°F)	112.3 (234.2)	115.1 (239.18)
			Tan (δ) (°C) (°F)	125.9 (258.6)	127.9 (262.2)
			E'' (°C) (°F)	122.4 (252.3)	124.7 (256.5)

* The tests were performed with Medium-Tack Version.

Typical AX-5201XL Mechanical Properties

Oven Curing Cycle at 120 °C (248°F)

Property	Standard	Test Temp.	Property	TW245 TC33 / 42% RC	PL160 T300 / 42% RC
Tensile 0°	ASTM D3039	RT	Tensile Stress MPa (ksi)	863 (125.2)	627.7 (91)
			Poisson's Ratio	0.03	0.03
			Modulus GPa (msi)	58.5 (8.5)	56.8 (8.2)
Compression 0°	ASTM D3410	RT	Compressive Stress MPa (ksi)	521.8 (75.7)	441.1 (64)
			Chord Modulus GPa (msi)	53.8 (7.8)	51.5 (7.5)
3 Point Bending	ASTM D790	RT	Flexural Strength MPa (ksi)	854 (123.9)	777.2 (112.7)
			Chord Modulus GPa (msi)	50.9 (7.4)	48.2 (7)
ILSS	ASTM D2344	RT	ILSS MPa (ksi)	61.9 (9)	66.2 (9.6)
DMA	ASTM D7028-07	Range	E' (°C) (°F)	113.2 (235.8)	114.9 (238.8)
			Tan (δ) (°C) (°F)	127.6 (261.7)	128.5 (263.3)
			E'' (°C) (°F)	124.5 (256.1)	125.5 (257.9)

* The tests were performed with Medium-Tack Version.

Typical AX-6201XL Mechanical Properties

Autoclave Curing Cycle at 120°C (248°F), 5.5 bar

Property	Standard	Test Temp.	Property	UD150 Carbon Fiber %35 Resin Content		
Tensile	ASTM D3039	25 °C ¹	0° Tensile Strength MPa (ksi)	2327 (337)		
			0° Tensile Modulus Gpa (msi)	129 (18.7)		
			90° Tensile Strength MPa (ksi)	41.2 (5.95)		
			90° Tensile Modulus Gpa (msi)	7.3 (1.1)		
		(-) 53°C ¹	0° Tensile Strength MPa (ksi)	2464 (357)		
			0° Tensile Modulus Gpa (msi)	127 (18.4)		
		83 °C ²	0° Tensile Strength MPa (ksi)	2105 (305)		
			0° Tensile Modulus Gpa (msi)	126 (18.3)		
			90° Tensile Strength MPa (ksi)	22.7 (3.3)		
			90° Tensile Modulus Gpa (msi)	5.4 (0.8)		
		Compression	ASTM 6641	25 °C ¹	0° Compressive Strength MPa (ksi)	1033 (150)
					0° Compressive Modulus Gpa (msi)	116 (16.8)
90° Compressive Strength MPa (ksi)	159 (23.1)					
90° Compressive Modulus Gpa (msi)	8.8 (1.3)					
[90°/0°]ns Compressive Strength MPa (ksi)	698 (101)					
[90°/0°]ns Compressive Modulus Gpa (msi)	58 (8.4)					
ASTM 6641	(-) 53°C ¹		[90°/0°]ns Compressive Strength MPa (ksi)	811 (118)		
			[90°/0°]ns Compressive Modulus Gpa (msi)	66 (9.6)		
ASTM 6641	83 °C ²		0° Compressive Strength MPa (ksi)	674 (98)		
			0° Compressive Modulus Gpa (msi)	108 (15.6)		

			90° Compressive Strength MPa (ksi)	569 (83)
			90° Compressive Modulus Gpa (msi)	56 (8.1)
	SACMA SRM 1, Tabbed	25 °C ¹	90° Compressive Strength MPa (ksi)	160 (23.2)
		83 °C ²	90° Compressive Strength MPa (ksi)	78 (11.3)
	SACMA SRM 1, Un-tabbed	25 °C ²	90° Compressive Strength MPa (ksi)	104 (15.1)
		83 °C ²	90° Compressive Strength MPa (ksi)	58 (8.4)
Shear, Interlaminar	ASTM D2344	25 °C ¹	0° Shear Strength MPa (ksi)	75 (11.8)
		83 °C ²	0° Shear Strength MPa (ksi)	44 (6.4)

² Dry Conditioning Procedure: Dry at 160°F for 160 hrs

³ Wet Conditioning Procedure: In distilled water at 70 °C for 14 days

Storage Requirements

Shelf life is from date of manufacturing according to storage temperature below. Working life is the cumulation of time outside of storage temperature.

Storage Condition	AX-201XL
Shelf Life at -18°C (-0.4°F)	12 months
Working Life at 24C	Greater than 30 days

Handling & Safety Instructions

- Store prepreg suspended horizontally to avoid flat spots and thinning under the weight of the roll.
- Allow product sufficient time (at least 24 hours) to reach ambient temperatures after removal from cold storage to prevent condensation on the adhesive surface.
- Use the appropriate safety equipment for this product.

Technical Assistance

In a bind? Call us anytime. We provide fast and knowledgeable technical support:

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