



BUILDING TRUST



AL 2020

AL 2021, AL 2022, or AL 2023 Hardeners Technical Data Sheet HIGH PERFORMANCE LAMINATING SYSTEM

Flame-Retardant, Tg 131 – 154°F (55-68°C)

DESCRIPTION

AL 2020 resin with AL 2021, AL 2022, or AL 2023 hardeners is a specially formulated flame-retardant system for laminated parts. It is suitable for use with glass, carbon and aramid fabrics, and parts can be heated immediately for faster process times.

APPLICATIONS

- High performance automotive body panels used in NASCAR flame-retardancy applications
- Suitable for vacuum-bagging and RTM
- No need to wait for a room temperature gel, can be put directly into the oven

PROPERTIES

- Low viscosity for good wet-out
- Non-Halogen flame retardancy
- Self-extinguishing
- Three hardener choices (fast/medium/slow)
- RoHS and REACH compliant
- Epoxy (non-styrene)
- Excellent bond to all fabrics
- Suitable for aramid fiber laminates

Physical Properties

	Units	AL 2020 Resin	AL 2021 Hardener	AL 2022 Hardener	AL 2023 Hardener
Composition		Epoxy	Amine	Amine	Amine
Mix Ratio, by weight		100	22	24	30
Appearance		Clear Liquid	Clear Liquid	Clear Liquid	Clear Liquid
Color		Light Amber	Light Amber	Light Amber	Light Amber
Viscosity @ 77°F (25°C) mPa.s	Brookfield LVT	3,500	35	62	70
Density @ 77°F (25°C) lbs./gal. (g/cc)	ASTM D 1480	9.74 (1.17)	7.99 (.96)	7.91 (.95)	7.97 (.96)
Viscosity, mixed @ 77°F (25°C) mPa.s	Brookfield LVT		1,000	1,375	1,300
Gel time, 130g at 77°F (25°C)	Minutes		61	222	480



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Neat Cured Properties tested at 74°F (23°C)

	Test Method	Unit(s)	With AL 2021 Hardener	With AL 2022 Hardener	With AL 2023 Hardener
Glass Transition Temperature (Tg) * R.T Cure **150°F Post-Cure ***212°F Post-Cure	ASTM E1545	°F (°C)	126 (52) 131 (55) 180 (82)	103 (39) 154 (68) 140 (60)	124 (51) 140 (60) 133 (56)
Hardness * R.T Cure **150°F Post-Cure ***212°F Post-Cure	ASTM D-2240	Shore D	85 87 90	83 87 89	79 87 86
Flexural Strength * R.T. Cure ** 150°F Post-Cure ***212°F Post-Cure	ASTM D790	psi (MPa)	10,128 (70) 15,500 (107) 19,121 (132)	11,303 (78) 18,800 (130) 14,731 (102)	11,390 (79) 12,500 (86) 15,624 (108)
Flexural Modulus * R.T. Cure ** 150°F Post-Cure ***212°F Post-Cure	ASTM D790	psi (MPa)	490,440 (3,384) 495,000 (3,410) 498,480 (3,440)	338,972 (2,339) 490,000 (3,380) 424,451 (2,929)	352,537 (2,433) 380,000 (2,620) 440,208 (3,037)
Tensile Strength * R.T. Cure ** 150°F Post-Cure ***212°F Post-Cure	ASTM D638	psi (MPa)	5,875 (41) 11,500 (79) 12,262 (85)	4,475 (31) 8,500 (59) 3,964 (27)	8,373 (58) 7,500 (52) 10,559 (73)
Tensile Modulus * R.T. Cure ** 150°F Post-Cure ***212°F Post-Cure	ASTM D638	psi (MPa)	311,990 (2,153) 315,000 (2,170) 286,440 (1,976)	253,857 (1,752) 275,000 (1,900) 287,591 (1,984)	245,785 (1,696) 245,000 (1,690) 286,107 (1,974)
Tensile Elongation * R.T. Cure ** 150°F Post-Cure ***212°F Post-Cure	ASTM-D638	%	2.2 5.1 6.5	2.0 4.0 1.5	6.0 3.7 6.3

*cured-7 days at 77°F/25°F **cured 3 hours at 150°F (66°C) ***cured 4 hours at 212°F (100°C)

Results are average values on laboratory prepared test samples

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Composite Cured Properties tested at 74°F (23°C)* Room Temperature Cured*					
	Test Method	Unit(s)	With AL 2021 Hardener	With AL 2022 Hardener	With AL 2023 Hardener
Flexural Strength	ASTM D790	psi (MPa)	38,220 (264)	35,588 (246)	29,676 (205)
Flexural Modulus	ASTM D790	psi (MPa)	1,820,864 (12,564)	2,037,377 (14,057)	1,824,218 (12,587)
Tensile Strength	ASTM D638	psi (MPa)	38,416 (265)	38,952 (269)	42,563 (294)
Tensile Modulus	ASTM D638	psi (MPa)	841,197 (5,804)	844,524 (5,827)	1,016,931 (7,017)
Tensile Elongation	ASTM D638	%	6.9	7.2	6.6

*Average values on laboratory prepared test samples, cured 7 days at 77°F (25°C)

Composite layup – 8 layers, Volan A 7500 10 oz. glass cloth, 0-90°rotation, Vacuum bagged. Resin laminate content was 40% (by wt.) for AL 2020/2021 H, 38% for AL 2020/2022 H, 30% for AL 2020/2022 H.

Composite Cured Properties tested at 74°F (23°C)* Heat Cured*					
	Test Method	Unit(s)	With AL 2021 Hardener	With AL 2022 Hardener	With AL 2023 Hardener
Flexural Strength	ASTM D790	psi (MPa)	40,112 (277)	38,411 (265)	35,924 (248)
Flexural Modulus	ASTM D790	psi (MPa)	1,833,914 (12,654)	2,057,968 (14,200)	2,054,694 (14,177)
Tensile Strength	ASTM D638	psi (MPa)	34,851 (240)	36,561 (252)	38,562 (266)
Tensile Modulus	ASTM D638	psi (MPa)	819,255 (5,653)	881,508 (6,082)	1,020,919 (7,044)
Tensile Elongation	ASTM D638	%	6.6	6.4	6.3

*Average values on laboratory prepared test samples, cured 16 – 24 hrs at 77°F (25°C) + 4 Hours @ 212°F (100°C)

Composite layup – 8 layers, Volan A 7500 10 oz. glass cloth, 0-90°rotation, Vacuum bagged. Resin laminate content was 40% (by wt.) for AL 2020/2021, 38% for AL 2020/2022, 30% for AL 2020/2022.

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PROCESSING

After mixing according to the indicated ratio impregnate the reinforcement according to the selected process.
Accelerated cure schedule: The laminate can be immediately placed into up to 150°F (66°C) oven for three hours.
Normal cure schedule: Allow to set 24 hours at room temperature, then post cure up to 200°F if needed.

STORAGE CONDITIONS

This product has a shelf life of 12 months as indicated by the expiration date on the container when stored in original unopened containers between 59 – 77°F (15 – 25°C). Any opened can must be tightly closed.

HANDLING PRECAUTIONS

Normal health and safety precautions should be observed when handling these products :

- Ensure good ventilation
- Wear gloves, and safety glasses

For further information, please consult the material safety data sheet.

DISCLAIMER

The information contained in this technical data sheet results from research and tests conducted in our laboratories under precise conditions. Seller cannot anticipate all conditions under which seller's products, or the products of other manufacturers in combination with seller's products, may be used. It is the responsibility of the user to determine the suitability of the SikaAxson's products, under their own conditions, before commencing with the proposed application. In no event shall SikaAxson US be liable for any direct, indirect, punitive, incidental, special, and/or consequential damages, to property or life, whatsoever arising out of or connected with the use or misuse of our products.

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