

Advanced Materials

Structural Composites

HUNTSMAN

MATRIX SYSTEMS FOR INDUSTRIAL COMPOSITES

Provisional DATA SHEET

**Prepreg system based on
Resin XB 3595* / Aradur® 5021* / Hardener XB 3471***

Resin XB 3595 is a low viscosity epoxy resin
Aradur 5021 is a hardener paste
Hardener XB 3471 is a hardener based on polyamine

Applications	Industrial composites		
Properties	Prepreg system with long shelf life and high elongation		
Processing	Prepregging		
Key data	Resin XB 3595		
	Aspect (visual)	Opaque white liquid	
	Viscosity at 25 °C (cone plate viscometer)	6500 - 8000	[mPa s]
	Density at 25 °C (ISO 1675)	1.10 – 1.15	[g/cm ³]
	Storage temperature (see expiry date on original container)	2 - 40 °C	[°C]
	Aradur 5021		
	Aspect (visual)	White viscous paste	
	Viscosity at 25 °C (ISO 12058-1)	70000 - 90000	[mPa s]
	Density at 25 °C (ISO 1675)	1.0	[°C]
	Storage temperature (see expiry date on original container)	< 8	[°C]
	Hardener XB 3471		
	Aspect (visual)	Transparent liquid	
	Density at 25 °C (ISO 1675)	1.0	[°C]
	Flash point (ISO 2719)	≥ 100	[°C]
	Storage temperature (see expiry date on original container)	2 - 40 °C	[°C]
Storage	<p>Provided that the products described above are stored in a dry place in their original, properly closed containers at the above mentioned storage temperatures they will have the shelf lives indicated on the labels.</p> <p>Partly emptied containers should be closed immediately after use.</p> <p>Hardener XB 3471 which has crystallised and looks cloudy can be restored to its original state by heating to 70-80°C.</p>		

* In addition to the brand name product denomination may show different appendices, which allows us to differentiate between our production sites: e.g., BD = Germany, US = United States, IN = India, CI = China, etc.. These appendices are in use on packaging, transport and invoicing documents. Generally the same specifications apply for all versions. Please address any additional need for clarification to the appropriate Huntsman contact.

Processing data

Mix ratio	<i>Components</i>	<i>Parts by weight</i>	<i>Parts by volume</i>
	Resin XB 3595	100	100
	Aradur 5021	20	22
	Hardener XB 3471	14	16
<p>We recommend that the components are weighed with an accurate balance to prevent mixing inaccuracies which can affect the properties of the matrix system. The components should be mixed thoroughly to ensure homogeneity. It is important that the side and the bottom of the vessel are incorporated into the mixing process.</p>			
Initial mix viscosity (cone plate viscometer)		at 25°C	[mPa s] 4500 - 5000
Pot life (Tecam, 100 ml, 65 % RH)	all the 3 components	at 23°C	[min] 230 - 290
Gel time after B-Stage (Hot plate)		at 100°C	[min] 35 - 45
		at 110°C	[min] 22 - 30
		at 120°C	[min] 10 - 15
		at 140°C	[min] 3 - 6
<p>The values shown are for small amounts of pure resin/hardener mix. In composite structures the gel time can differ significantly from the given values depending on the fibre content and the laminate thickness.</p>			
Prepreg production	Impregnation bath temperature		25 – 30°C
	B-Stage (pre reaction)		24-48 h at 23 - 25°C
Prepreg shelf life		at 23°C	~ 8 months

Properties of the cured, neat formulation

Glass transition temperature (IEC 1006, DSC, 10 K/min)	Cure: after B-Stage		T_g [°C]	
		1 h 120°C		65 - 70
	2 h 120°C		65 - 70	
	30' 140°C		65 - 70	
	1 h 140 °C		65 - 70	
	2 h 140°C		65 - 70	
	1 h 120 °C + 1 h 140 °C		67 - 72	
Torsional test (ISO 6721)	after B-Stage	Cure:	1 h 120 °C	2 h 140 °C
	T_g	[°C]	70 - 75	70 - 75
Flexural test (ISO 178)	after B-Stage	Cure:	1 h 120 °C	2 h 140 °C
	Flexural strength	[MPa]	105 - 115	105 - 115
	Elongation at flexural strength	[%]	5.2 - 5.7	5.0 - 5.5
	Ultimate strength	[MPa]	80 - 90	70 - 80
	Ultimate elongation	[%]	10.5 - 11.5	11.0 - 14.0
	Flexural modulus	[MPa]	2850 - 3050	2850 - 3050
Fracture properties Bend Notch test (PM 258-0/90)	after B-Stage	Cure:	1 h 120 °C	2 h 140 °C
	Fracture toughness K_{1c}	[MPa√m]	2.20 - 2.35	2.4 - 2.6
	Fracture energy G_{1c}	[J/m ²]	1400 - 1550	1700 - 1850
Tensile test (ISO 527)	after B-Stage	Cure:	1 h 120 °C	2 h 140 °C
	Tensile strength	[MPa]	60 - 70	60 - 70
	Elongation at tensile strength	[%]	3.0 - 4.0	3.0 - 4.0
	Ultimate strength	[MPa]	50 - 60	45 - 55
	Ultimate elongation	[%]	8.5 - 10.0	10.0 - 14.0
	Tensile modulus	[MPa]	2900 - 3100	2700 - 2950

Properties of the cured, reinforced formulation

12 Layers of unidirectional E-glass fabric (IG 92146)
 Laminate thickness: 3.7 mm
 after B-Stage, Cure: 2h/120°C

**Interlaminar shear
 test**
 (ASTM D2344)

Shear strength	[MPa]	44 - 50
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Flexural test
 (ISO 178)

Flexural strength	[MPa]	850 - 950
Ultimate strength	[MPa]	850 - 950
Ultimate elongation	[%]	2.3 - 2.8
Flexural modulus	[MPa]	31000 - 35000

Handling precautions Mandatory and recommended industrial hygiene procedures should be followed whenever our products are being handled and processed. For additional information please consult the corresponding product safety data sheets and the brochure "Hygienic precautions for handling plastics products".

Personal hygiene

Safety precautions at workplace

protective clothing	yes
gloves	essential
arm protectors	recommended when skin contact likely
goggles/safety glasses	yes

Skin protection

before starting work	Apply barrier cream to exposed skin
after washing	Apply barrier or nourishing cream

Cleansing of contaminated skin

Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents

Disposal of spillage

Soak up with sawdust or cotton waste and deposit in plastic-lined bin

Ventilation

of workshop	Renew air 3 to 5 times an hour
of workplaces	Exhaust fans. Operatives should avoid inhaling vapours

First aid

Contamination of the *eyes* by resin, hardener or mix should be treated immediately by flushing with clean, running water for 10 to 15 minutes. A doctor should then be consulted.

Material smeared or splashed on the *skin* should be dabbed off, and the contaminated area then washed and treated with a cleansing cream (see above). A doctor should be consulted in the event of severe irritation or burns. Contaminated clothing should be changed immediately.

Anyone taken ill after *inhaling* vapours should be moved out of doors immediately. In all cases of doubt call for medical assistance.

Note

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