

## Advanced Materials

Structural Composites



MATRIX SYSTEMS FOR INDUSTRIAL COMPOSITES

PROVISIONAL DATA SHEET

## Hot curing epoxy matrix system based on Resin XB 3563 / Aradur® 917 / Accelerator DY 070\*

**XB 3563 is a low-viscosity epoxy resin**  
**Aradur 917 is an anhydride hardener**  
**Accelerator DY 070 is an imidazol accelerator**

<b>Applications</b>	High performance composite parts		
<b>Properties</b>	Extremely low-viscosity, anhydride-cured, reactive diluent free matrix system with a long pot life. Displays very good temperature resistance after post cure.		
<b>Processing</b>	Filament Winding Pressure Moulding		
<b>Key data</b>	<b>Resin XB 3563</b>		
	Aspect (visual)	colourless to light yellow liquid	
	Viscosity at 25 °C (ISO 12058-1)	150 - 500	[mPa s]
	Epoxy index (ISO 3001)	7.00 - 7.63	[eq/kg]
	Density at 25 °C (ISO 1675)	1.15 - 1.19	[g/cm <sup>3</sup> ]
	Flash point (ISO 2719)	202	[°C]
	Storage temperature (see expiry date on original container)	2 - 40 °C	[°C]
	<b>Aradur 917</b>		
	Aspect (visual)	clear liquid	
	Colour (Gardner, ISO 4630)	≤ 2	
	Viscosity at 25 °C (ISO 12058-1)	50 - 100	[mPa s]
	Density at 25 °C (ISO 1675)	1.20 - 1.25	[°C]
	Flash point (ISO 2719)	159	[g/cm <sup>3</sup> ]
	Storage temperature (see expiry date on original container)	2 - 40 °C	[°C]
	<b>Accelerator DY 070</b>		
	Aspect (visual)	clear liquid	
	Colour (Gardner, ISO 4630)	≤ 3	
	Viscosity at 25 °C (ISO 12058-1)	≤ 50	[mPa s]
	Density at 25 °C (ISO 1675)	0.95 - 1.05	[°C]
	Flash point (ISO 2719)	92	[g/cm <sup>3</sup> ]
Storage temperature (see expiry date on original container)	2 - 40 °C	[°C]	
<b>Storage</b>	<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>Because Aradur 917 is sensitive to moisture, storage containers should be ventilated with dry air only.</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

<b>Mix ratio</b>	<i>Components</i>	<i>Parts by weight</i>	<i>Parts by volume</i>
	XB 3563	100	100
	Aradur 917	120	115
	Accelerator DY 070	0.5 - 2	0.6 - 2.4

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.

All the following values were obtained with a formulation using 2 pbw of Accelerator DY 070

<b>Initial mix viscosity</b> (Hoeppler, ISO 9371B)	<i>[°C]</i> at 25	<i>[mPa s]</i> 100 - 200
<b>Pot life</b> (Tecam, 100 ml, 65 % RH)	<i>[°C]</i> at 40	<i>[hours]</i> 24 - 32
<b>Gel time</b> (Hot plate)	<i>[°C]</i> at 90 at 100 at 120 at 140	<i>[min]</i> 40 - 55 26 - 34 8 - 13 3 - 5

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.

<b>Typical cure cycles</b>	1 h 100 °C + 6 h 180 °C or 2 h 120 °C + 6 h 160 °C
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The optimum cure cycle has to be determined case by case depending on the processing and the economic requirements.

## Properties of the cured, neat formulation

The values below were obtained with a formulation using 2 pbw Accelerator DY 070			
<b>Glass transition temperature</b> (IEC 1006, TMA, 10 K/min)	<i>Cure:</i>		$T_g$ [°C]
	1 h 100 °C + 6 h 160 °C		180 - 186
	1 h 100 °C + 6 h 180 °C		198 - 206
	1 h 120 °C + 2 h 160 °C		180 - 186
	1 h 120 °C + 4 h 160 °C		182 - 188
	1 h 120 °C + 8 h 160 °C		188 - 196
	1 h 120 °C + 2 h 180 °C 1 h 120 °C + 6 h 180 °C		196 - 202 198 - 206
<b>Torsional test</b> (ISO 6721 DMA, 2 K/min)	<i>Cure:</i>		1 h 100 °C + 6 h 180 °C
	$T_g$	[°C]	220 - 226
<b>Tensile test</b> (ISO 527)	<i>Cure:</i>		1 h 100 °C + 6 h 180 °C
	Tensile strength	[MPa]	40 - 50
	Elongation at tensile strength	[%]	1.3 - 1.8
	Tensile modulus	[MPa]	2900 - 3000
<b>Flexural test</b> (ISO 178)	<i>Cure:</i>		2 h 120 °C + 6 h 160 °C
			1 h 100 °C + 6 h 180 °C
	Flexural strength	[MPa]	75 - 85
	Elongation at flexural strength	[%]	2.0 - 3.1
	Ultimate strength	[MPa]	75 - 85
	Ultimate elongation	[%]	2.0 - 3.1
Flexural modulus	[MPa]	2900 - 3050	
<b>Fracture properties</b> <b>Bend notch test</b> (PM 258-0/90)	<i>Cure:</i>		2 h 120 °C + 6 h 160 °C
			1 h 100 °C + 6 h 180 °C
	Fracture toughness $K_{1C}$	[MPa $\sqrt{m}$ ]	0.48 - 0.52
	Fracture energy $G_{1C}$	[J/m $^2$ ]	70 - 75
<b>Water absorption</b> (ISO 62)	<i>Immersion:</i>	<i>Cure:</i>	1 h 120 °C + 6 h 160 °C
	4 days H $_2$ O 23 °C	[%]	0.7 - 0.8
	10 days H $_2$ O 23 °C	[%]	1.00 - 1.25
	30 min H $_2$ O 100 °C	[%]	0.20 - 0.35
	60 min H $_2$ O 100 °C	[%]	0.40 - 0.50

## Properties of the cured, reinforced formulation

<b>Interlaminar shear strength</b> (ASTM D 2344)	Short beam: Interglass fabrics IG 92146, Laminate thickness $t = 3$ mm Cure: 2 h 120 °C + 6 h 160 °C		
	Unconditioned	[MPa]	70 - 74
	After 1 h in H $_2$ O 100 °C	[MPa]	56 - 60

**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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 <b>APPROVED TO</b> ISO 9001	