

Advanced Materials



Structural Composites

MATRIX SYSTEMS FOR INDUSTRIAL COMPOSITES

DATA SHEET

Hot curing epoxy system based on Araldite[®] LY 564* / Aradur[®] 917* / Accelerator 960-1*

Araldite LY 564 is a low-viscosity epoxy resin
Aradur 917 is an anhydride hardener
Accelerator 960-1 is used as an amine accelerator

Applications	Industrial composites (tubes, pipes, profiles)																																																		
Properties	Araldite LY 564 with Aradur 917 and Accelerator 960-1 exhibits a low mix viscosity at room temperature in combination with a long pot life. Nevertheless very short cure cycles can be achieved at cure temperatures above 120 °C for an economical production. The system shows good fibre impregnation properties and is easy to process. The cured system has excellent mechanical properties.																																																		
Processing	<ul style="list-style-type: none"> • Filament Winding • Pultrusion • Wet lay-up • Resin Transfer Moulding (RTM) 																																																		
Key data	<p>Araldite LY 564</p> <table border="1"> <tr> <td>Aspect (visual)</td> <td>clear liquid</td> <td></td> </tr> <tr> <td>Colour (Gardner,</td> <td>1 - 2</td> <td></td> </tr> <tr> <td>Viscosity at 25 °C (ISO 12058-1))</td> <td>1200 - 1400</td> <td>[mPa s]</td> </tr> <tr> <td>Density at 25 °C (ISO 1675)</td> <td>1.1 - 1.2</td> <td>[g/cm³]</td> </tr> <tr> <td>Flash point</td> <td>185</td> <td>[°C]</td> </tr> </table> <p>Aradur 917</p> <table border="1"> <tr> <td>Aspect (visual)</td> <td>clear liquid</td> <td></td> </tr> <tr> <td>Colour (Gardner,</td> <td>≤ 2</td> <td></td> </tr> <tr> <td>Viscosity at 25 °C (ISO 12058-1)</td> <td>50 - 100</td> <td>[mPa s]</td> </tr> <tr> <td>Density at 25 °C (ISO 1675)</td> <td>1.20 - 1.25</td> <td>[g/cm³]</td> </tr> <tr> <td>Flash point</td> <td>195</td> <td>[°C]</td> </tr> </table> <p>Accelerator 960-1</p> <table border="1"> <tr> <td>Aspect (visual)</td> <td>light yellow liquid</td> <td></td> </tr> <tr> <td>Colour (Gardner,</td> <td>≤ 8</td> <td></td> </tr> <tr> <td>Viscosity at 25 °C (ISO 12058-1)</td> <td>150 - 300</td> <td>[mPa s]</td> </tr> <tr> <td>Density at 25 °C (ISO 1675)</td> <td>0.95 - 0.97</td> <td>[g/cm³]</td> </tr> <tr> <td>Flash point</td> <td>110 - 120</td> <td>[°C]</td> </tr> <tr> <td>Storage temperature in every case (see expiry date on original container)</td> <td>2 - 40</td> <td>[°C]</td> </tr> </table>			Aspect (visual)	clear liquid		Colour (Gardner,	1 - 2		Viscosity at 25 °C (ISO 12058-1))	1200 - 1400	[mPa s]	Density at 25 °C (ISO 1675)	1.1 - 1.2	[g/cm ³]	Flash point	185	[°C]	Aspect (visual)	clear liquid		Colour (Gardner,	≤ 2		Viscosity at 25 °C (ISO 12058-1)	50 - 100	[mPa s]	Density at 25 °C (ISO 1675)	1.20 - 1.25	[g/cm ³]	Flash point	195	[°C]	Aspect (visual)	light yellow liquid		Colour (Gardner,	≤ 8		Viscosity at 25 °C (ISO 12058-1)	150 - 300	[mPa s]	Density at 25 °C (ISO 1675)	0.95 - 0.97	[g/cm ³]	Flash point	110 - 120	[°C]	Storage temperature in every case (see expiry date on original container)	2 - 40	[°C]
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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>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

Mix ratio	<i>Components</i>	<i>Parts by weight</i>	<i>Parts by volume</i>
	Araldite LY 564	100	100
	Aradur 917	98	93
	Accelerator 960-1	3	3.5
Processing recommendations	The hardener and accelerator can be premixed to allow the use of two-component mixing/dosing equipment. The temperature where gelation is being carried out should not be higher than necessary. A high gelation temperature induces shrinkage and generates internal stress within the part.		
Initial mix viscosity (Hoepler, ISO 12058-1B)	<i>[°C]</i>		<i>[mPa s]</i>
	at 25		450 - 700
	at 40		100 - 200
Pot life (Tecam, 100 ml, 65 % RH)	<i>[°C]</i>		
	at 23	<i>[h]</i>	80 - 90
	at 50	<i>[min]</i>	210 - 250
Gel time (Hot plate)	<i>[°C]</i>		<i>[min]</i>
	at 80		30 - 40
	at 100		8 - 13
	at 110		5 - 8
	at 120		3 - 5
	at 130		2 - 4
	at 140		1 - 2
	at 150		0.5 - 1.5
Typical cure cycles	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.		
	0.5 - 1 h 130 °C or 4 h 100 °C or 4 h 80 °C + 4 h 120 °C		
	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

Glass transition temperature (IEC 1006, DSC, 10 K/min)		<i>Cure:</i>	T_g [°C]	
4 h 80 °C			88 - 98	
4 h 100 °C			110 - 120	
1 h 130 °C			94 - 102	
4 h 80 °C + 4 h 120 °C			122 - 130	
4 h 80 °C + 4 h 140 °C			115 - 123	
4 h 80 °C + 8 h 140 °C			115 - 123	
4 h 80 °C + 4 h 160 °C			112 - 120	
Tensile test (ISO 527)		<i>Cure:</i>	4 h 80 °C + 4 h 120 °C	
Tensile strength		[MPa]	75 - 91	
Elongation at tensile strength		[%]	4 - 5	
Ultimate strength		[MPa]	75 - 91	
Ultimate elongation		[%]	4.5 - 5.5	
Tensile modulus		[MPa]	3100 - 3200	
Flexural test (ISO 178)		<i>Cure:</i>	4 h 100 °C	4 h 80 °C + 4 h 120 °C
Flexural strength		[MPa]	150 - 165	140 - 150
Elongation at flexural strength		[%]	6 - 7	6 - 7
Flexural modulus		[MPa]	3250 - 3450	3000 - 3100
Fracture properties Bend notch test (PM 258-0/90)		<i>Cure:</i>	4 h 80 °C + 4 h 120 °C	
Fracture toughness K_{1C}		[MPa \sqrt{m}]	0.59 - 0.7	
Fracture energy G_{1C}		[J/m ²]	100 - 125	
Water absorption (ISO 62)		<i>Immersion:</i>	<i>Cure:</i>	4 h 80 °C + 4 h 120 °C
1 day H ₂ O 23 °C		[%]	0.13 - 0.15	
10 days H ₂ O 23 °C		[%]	0.40 - 0.45	
Flexural test (ISO 178)		Laminate comprising 12 layers unidirectional E-glass fabric (425 g/m ²) Fibre volume content: 59 - 64 % Laminate thickness t = 3.0 - 3.3 mm		
		<i>Cure:</i>	4 h 80 °C + 4 h 120 °C	
Flexural strength		[MPa]	880 - 980	
Elongation at flexural strength		[%]	2.0 - 2.2	
Flexural modulus		[MPa]	44000 - 46000	
Interlaminar shear strength (ASTM D 2344)		Short beam: Laminate comprising 12 layers unidirectional E-glass fabric (425 g/m ²) Fibre volume content: 59 - 64 % Laminate thickness t = 3.0 - 3.3 mm		
		<i>Cure:</i>	4 h 80 °C + 4 h 120 °C	
Shear strength		[MPa]	54 - 58	

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.

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