

**Advanced Materials****Araldite® LY 1564\* / Ren HY 5211\*****HOT CURING EPOXY SYSTEM**

Araldite® LY 1564 is an epoxy resin  
Ren® HY 5211 is a formulated amine hardener

<b>APPLICATIONS</b>	<ul style="list-style-type: none"> <li>Industrial composites</li> <li>Structural composites</li> </ul>																											
<b>PROPERTIES</b>	Laminating system																											
<b>PROCESSING</b>	<ul style="list-style-type: none"> <li>Filament Winding</li> <li>Resin Transfer Moulding (RTM)</li> <li>Pressure Moulding</li> <li>Pultrusion</li> </ul>																											
<b>PRODUCT DATA</b>	<table border="1"> <tr> <td colspan="3"><b>Araldite® LY 1564</b></td> </tr> <tr> <td>Aspect (visual)</td> <td>clear liquid</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>1.10 - 1.20</td> <td>[g/cm<sup>3</sup>]</td> </tr> <tr> <td>Epoxide index (ISO 3001)</td> <td>5.80 - 6.05**</td> <td>[Eq/kg]</td> </tr> <tr> <td colspan="3"><b>Ren® HY 5211</b></td> </tr> <tr> <td>Aspect (visual)</td> <td>yellow to brown liquid</td> <td></td> </tr> <tr> <td>Viscosity at 25 °C (ISO 2555)</td> <td>580 - 720 **</td> <td>[mPa s]</td> </tr> <tr> <td>Density at 25 °C (ISO 2811-2)</td> <td>0.98 - 1.02 **</td> <td>[g/cm<sup>3</sup>]</td> </tr> </table>	<b>Araldite® LY 1564</b>			Aspect (visual)	clear liquid		Viscosity at 25 °C (ISO 12058-1)	1200 - 1400 **	[mPa s]	Density at 25 °C (ISO 1675)	1.10 - 1.20	[g/cm <sup>3</sup> ]	Epoxide index (ISO 3001)	5.80 - 6.05**	[Eq/kg]	<b>Ren® HY 5211</b>			Aspect (visual)	yellow to brown liquid		Viscosity at 25 °C (ISO 2555)	580 - 720 **	[mPa s]	Density at 25 °C (ISO 2811-2)	0.98 - 1.02 **	[g/cm <sup>3</sup> ]
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\*\* Specified data are on a regular basis analysed. Data which is described in this document as 'typical' is not analysed on a regular basis and is given for information purposes only. Data values are not guaranteed or warranted unless if specifically mentioned.

**STORAGE** Provided that Araldite® LY 1564 or Ren® HY 5211 are stored in a dry place in their original, properly closed containers at the storage temperatures mentioned in the MSDS they will have the shelf lives indicated on the labels. Partly emptied containers should be closed immediately after use.

\* 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, Cl = 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.

**TYPICAL SYSTEM DATA****PROCESSING DATA**

<b>MIX RATIO</b>	<i>Components</i>	<i>Parts by weight</i>	<i>Parts by volume</i>
	Araldite® LY 1564	100	100
	Ren® HY 5211	30	35

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.

When processing large quantities of mixture the pot life will decrease due to exothermic reaction. It is advisable to divide large mixes into several smaller containers.

<b>INITIAL MIX VISCOSITY</b> (ISO 12058-1)		<i>[°C]</i>	<i>[mPa s]</i>
	LY 1564/HY 5211	at 25	1400 - 1500
		at 40	300 - 400

<b>POT LIFE</b> (TECAM, 23°C, 65 % RH)		<i>[g]</i>	<i>[hours]</i>
	LY 1564/HY 5211	100	26 - 27

<b>GEL TIME</b> (HOT PLATE)		<i>[°C]</i>	<i>[min]</i>
	LY 1564/HY 5211	at 80	200 - 220
		at 100	85 - 95
		at 120	40 - 45
		at 140	18 - 20

<b>VISCOSITY BUILD-UP</b> (ISO 12058-1)		<i>[°C]</i>	<i>[mPa s]</i>	<i>[min]</i>
	LY 1564/HY 5211	at 40	to 1500	145 - 150
		at 60	to 1500	140 - 145

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.

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## PROPERTIES OF THE CURED, NEAT FORMULATION

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<b>GLASS TRANSITION TEMPERATURE</b>	<i>Cure:</i>	$T_G$	LY 1564 HY 5211
(ISO 11357-2, DSC, 10 K/MIN)	4 h 80 °C + 4 h 120 °C	[°C]	130 - 134
	4 h 80 °C + 4 h 140 °C	[°C]	138 - 145
	4 h 80 °C + 4 h 160 °C	[°C]	147 - 153
	4 h 80 °C + 8 h 160 °C	[°C]	147 - 153

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## TENSILE TEST (ISO 527)

*Cure:*  
2 h 80 °C + 2 h 120 °C + 4h 150 °C

Tensile strength	[MPa]	82 - 87
Elongation at tensile strength	[%]	6.0 - 6.5
Ultimate strength	[MPa]	82 - 87
Ultimate elongation	[%]	6.0 - 6.5
Tensile modulus	[MPa]	2700 - 2800

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## FLEXURAL TEST (ISO 178)

*Cure:*  
2 h 80 °C + 2 h 120 °C + 4h 150 °C

Flexural strength	[MPa]	120 - 130
Elongation at flexural strength	[%]	6.0 - 6.5
Ultimate strength	[MPa]	120 - 130
Ultimate elongation	[%]	6.0 - 6.5
Flexural modulus	[MPa]	2700 - 2800

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## FRACTURE PROPERTIES BEND NOTCH TEST (ISO 13586)

*Cure:*  
2 h 80 °C + 2 h 120 °C + 4h 150 °C

Fracture toughness $K_{1C}$	[MPa√m]	0,62 - 0,68
Fracture energy $G_{1C}$	[J/m <sup>2</sup> ]	175 - 180

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## PROPERTIES OF THE CURED, REINFORCED FORMULATION

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Short beam: Laminate comprising 12 layers unidirectional E-glass fabric (425 g/m<sup>2</sup>)  
Laminate thickness t = 3.1 - 3.3 mm  
Fibre volume content: 63 - 65 %

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## INTERLAMINAR SHEAR STRENGTH (ASTM D 2344)

*Cure:*  
2 h 80 °C + 2 h 120 °C + 4h 150 °C

Shear strength	[MPa]	55 - 56
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**HANDLING  
PRECAUTIONS****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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