

Advanced Materials  
Structural Composites

**HUNTSMAN**

MATRIX SYSTEMS FOR INDUSTRIAL COMPOSITES

DATA SHEET

**Warm to hot curing epoxy system based on  
Araldite® LY 556\* / Aradur® 22962\***

Araldite LY 556 is an epoxy resin  
Aradur 22962 is a cycloaliphatic polyamine

<b>Applications</b>	<ul style="list-style-type: none"> <li>Industrial composites</li> <li>Structural composites</li> </ul>																																													
<b>Properties</b>	Amine-cured laminating system without reactive diluent showing excellent flexibility and high reactivity.																																													
<b>Processing</b>	Filament Winding Pressure Moulding Resin Transfer Moulding (RTM) Wet lay-up																																													
<b>Key data</b>	<table border="1"> <tr> <td colspan="3"><b>Araldite LY 556</b></td> </tr> <tr> <td>Aspect (visual)</td> <td>clear, pale yellow liquid</td> <td></td> </tr> <tr> <td>Colour (Gardner, ISO 4630)</td> <td>≤ 2</td> <td></td> </tr> <tr> <td>Epoxy content (ISO 3000)</td> <td>5.30 - 5.45</td> <td>[eq/kg]</td> </tr> <tr> <td>Epoxy equivalent (ISO 3000)</td> <td>183 - 189</td> <td>[g/eq]</td> </tr> <tr> <td>Viscosity at 25 °C (ISO 12058-1)</td> <td>10000 - 12000</td> <td>[mPa s]</td> </tr> <tr> <td>Density at 25 °C (ISO 1675)</td> <td>1.15 - 1.20</td> <td>[g/cm<sup>3</sup>]</td> </tr> <tr> <td>Flash point (ISO 2719)</td> <td>&gt; 200</td> <td>[°C]</td> </tr> <tr> <td>Storage temperature (see expiry date on original container)</td> <td>2 - 40</td> <td>[°C]</td> </tr> <tr> <td colspan="3"><b>Aradur 22962</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>5 - 20</td> <td>[mPa s]</td> </tr> <tr> <td>Density at 25 °C (ISO 1675)</td> <td>0.89 - 0.90</td> <td>[g/cm<sup>3</sup>]</td> </tr> <tr> <td>Flash point (ISO 2719)</td> <td>≥ 110</td> <td>[°C]</td> </tr> <tr> <td>Storage temperature (see expiry date on original container)</td> <td>2 - 40</td> <td>[°C]</td> </tr> </table>	<b>Araldite LY 556</b>			Aspect (visual)	clear, pale yellow liquid		Colour (Gardner, ISO 4630)	≤ 2		Epoxy content (ISO 3000)	5.30 - 5.45	[eq/kg]	Epoxy equivalent (ISO 3000)	183 - 189	[g/eq]	Viscosity at 25 °C (ISO 12058-1)	10000 - 12000	[mPa s]	Density at 25 °C (ISO 1675)	1.15 - 1.20	[g/cm <sup>3</sup> ]	Flash point (ISO 2719)	> 200	[°C]	Storage temperature (see expiry date on original container)	2 - 40	[°C]	<b>Aradur 22962</b>			Aspect (visual)	clear liquid		Viscosity at 25 °C (ISO 12058-1)	5 - 20	[mPa s]	Density at 25 °C (ISO 1675)	0.89 - 0.90	[g/cm <sup>3</sup> ]	Flash point (ISO 2719)	≥ 110	[°C]	Storage temperature (see expiry date on original container)	2 - 40	[°C]
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<b>Storage</b>	<p>Provided that Araldite LY 556 and Aradur 22962 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>																																													

In addition to the brand name product denomination may show different appendices, which allows us to differentiate between our production sites: e.g., 80 = 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	Components	Parts by weight	Parts by volume
	Araldite LY 556	100	100
Aradur 22962	23	30	

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.

Initial mix viscosity (Hoeppler, ISO 12058-1B)	[°C]	[mPa s]
	at 25	1800 - 2000
	at 50	220 - 270

Pot life (Tecam, 100 ml, 65 % RH)	[°C]	[h]
	at 23	2 - 3

Gel time (Hot plate)	[°C]	[min]
	at 80	18 - 22
	at 100	7 - 10
	at 110	5 - 7
	at 120	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.

Typical cure cycles
15 min 120 °C + 120 min 150 °C or 2 h 80 °C + 2 h 150 °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)		Cure:	$T_g$ [°C]
		2 h 80 °C	95 - 105
		4 h 80 °C	100 - 110
		2 h 100 °C	112 - 122
		15 min 120 °C	123 - 135
		2 h 120 °C	125 - 138
		15 min 120 °C + 2 h 140 °C	146 - 156
		15 min 120 °C + 2 h 150 °C	148 - 158
		15 min 120 °C + 1 h 160 °C	150 - 160
		15 min 120 °C + 2 h 160 °C	153 - 163
<b>Tensile test</b> (ISO 527)		<b>Cure:</b>	<b>15 min 120 °C + 2 h 150 °C</b>
		Tensile strength [MPa]	62 - 72
		Elongation at tensile strength [%]	3.0 - 4
		Ultimate strength [MPa]	62 - 72
		Ultimate elongation [%]	3.0 - 4
		Tensile modulus [MPa]	2750 - 3000
<b>Flexural test</b> (ISO 178)		<b>Cure:</b>	<b>15 min 120 °C + 2 h 150 °C</b>
		Flexural strength [MPa]	130 - 136
		Elongation at flexural strength [%]	7 - 9.5
		Ultimate strength [MPa]	127 - 135
		Ultimate elongation [%]	7.5 - 10
		Flexural modulus [MPa]	2550 - 2800
<b>Fracture properties</b>		<b>Cure:</b>	<b>15 min 120 °C + 2 h 150 °C</b>
<b>Bend notch test</b> (PM 258-0/90)		Fracture toughness $K_{1C}$ [MPa√m]	0.68 - 0.78
		Fracture energy $G_{1C}$ [J/m <sup>2</sup> ]	140 - 175
<b>Water absorption</b> (ISO 62)		<b>Immersion:</b>	<b>Cure:</b>
			<b>15 min 120 °C + 2 h 150 °C</b>
		1 day H <sub>2</sub> O 23 °C [%]	0.13 - 0.17
		10 days H <sub>2</sub> O 23 °C [%]	0.50 - 0.55

### Properties of the cured, reinforced formulation

<b>Flexural test</b> (ISO 178)	Samples: 12 layers E-glass fabrics UD (425 g/m <sup>2</sup> )		
	Laminate thickness = 3.1 - 3.25 mm		
	Fibre volume content: 58 - 62 %		
	Cure: 15 min 120 °C + 2 h 150 °C		
	Flexural strength [MPa]		1000 - 1200
	Elongation at flexural strength [%]		2.6 - 2.8
<b>Interlaminar shear strength</b> (ASTM D 2344)	Samples: 12 layers E-glass fabrics UD (425 g/m <sup>2</sup> )		
	Laminate thickness = 3.1 - 3.25 mm		
	Fibre volume content: 59 - 63 %		
	Cure: 15 min 120 °C + 2 h 150 °C		
Shear strength [MPa]		58 - 62	

<b>Handling precautions</b>	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".
	<b>Personal hygiene</b>
	<i>Safety precautions at workplace</i>
	protective clothing                      yes
	gloves    essential
	arm protectors                              recommended when skin contact likely
	<u>goggles/safety glasses</u> yes
	<i>Skin protection</i>
	before starting work                      Apply barrier cream to exposed skin
	<u>after washing</u> Apply barrier or nourishing cream
	<i>Cleansing of contaminated skin</i>
	Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents
	<i>Disposal of spillage</i>
	Soak up with sawdust or cotton waste and deposit in plastic-lined bin
	<i>Ventilation</i>
	of workshop                                      Renew air 3 to 5 times an hour
	of workplaces                                      Exhaust fans. Operatives should avoid inhaling vapours
<b>First aid</b>	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 <i>inhaling</i> vapours should be moved out of doors immediately. In all cases of doubt call for medical assistance.
<b>Note</b>	Araldite® and Aradur® are registered trademarks of Huntsman LLC or an affiliate thereof in one or more countries, but not all countries.

<p>Huntsman LLC ®Registered trademark</p>  <p>APPROVED TO ISO 9001</p>	<p><b>IMPORTANT:</b> The following supersedes Buyer's documents, SELLER MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No statements herein are to be construed as inducements to infringe any relevant patent. Under no circumstances shall Seller be liable for incidental, consequential or indirect damages for alleged negligence, breach of warranty, strict liability, tort or contract arising in connection with the product(s). Buyer's sole remedy and Seller's sole liability for any claims shall be Buyer's purchase price. Data and results are based on controlled or lab work and must be confirmed by Buyer by testing for its intended conditions of use. The product(s) has not been tested for, and is therefore not recommended for, uses for which prolonged contact with mucous membranes, abraded skin, or blood is intended; or for uses for which implantation within the human body is intended.</p>
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