

## Warm-curing epoxy system based on Araldite® LY 1564 SP\* / Hardener XB 3416\*

**Araldite LY 1564 SP**  
**Hardener XB 3416 (formulated amine hardener)**

|                     |  |  |                      |
|---------------------|--|--|----------------------|
| <b>Applications</b> | Industrial composites Specially made for Wind Mill Blades  |  |                      |
| <b>Properties</b>   | Laminating system with low viscosity and high flexibility. The long pot life of XB 3416 facilitates the production of very large industrial parts. The systems are qualified by Germanischer Lloyd.  |  |                      |
| <b>Processing</b>   | <ul style="list-style-type: none"> <li>• Resin Transfer Moulding (RTM, SCRIMP)</li> <li>• Wet lay-up</li> <li>• Filament Winding</li> </ul>  |  |                      |
| <b>Key data</b>     | <b>Araldite LY 1564 SP</b>   |  |                      |
|                     | Aspect (visual)  | clear liquid                               |                      |
|                     | Colour (Gardner, ISO 4630)   | 1-2  |                      |
|                     | Viscosity at 25 °C (ISO 9371B)   | 1200 - 1400                                | [mPa s]              |
|                     | Density at 25 °C (ISO 1675)  | 1.1 - 1.2                                  | [g/cm <sup>3</sup> ] |
|                     | Flash point (ISO 2719)   | 185  | [°C]                 |
|                     | Storage temperature<br>(see expiry date on original container)   | 2 - 40                                     | [°C]                 |
|                     | <b>Hardener XB 3416</b>  |  |                      |
|                     | Aspect (visual)  | clear colourless to slightly yellow liquid |                      |
|                     | Viscosity at 25 °C (ISO 9371B)   | 15 - 55                                    | [mPa s]              |
|                     | Density at 25 °C (ISO 1675)  | 0.97 - 1,02                                | [g/cm <sup>3</sup> ] |
|                     | Flash point (ISO 2719)   | > 120                                      | [°C]                 |
|                     | Storage temperature<br>(see expiry date on original container)   | 2 - 40                                     | [°C]                 |
| <b>Storage</b>      | <p>Provided that Araldite LY 1564 SP and Hardener XB 3416 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 , BD = Germany, US = United States, IN = India, 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> |
|------------------|---------------------|------------------------|------------------------|
|                  | Araldite LY 1564 SP | 100                    | 100                    |
|                  | Hardener XB 3416    | 34                     | 41                     |

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> |                     | <i>[°C]</i> | <i>[mPa s]</i> |
|------------------------------|---------------------|-------------|----------------|
| (Hoeppler, ISO 9371B)        | LY 1564 SP /XB 3416 | at 25       | 200 - 320      |

| <b>Pot life</b>        |                  | <i>[g]</i> | <i>[min]</i> |
|------------------------|------------------|------------|--------------|
| (Tecam, 23°C, 65 % RH) | LY 1564 /XB 3416 | 100        | 290 - 340    |

| <b>Gel time</b> |                     | <i>[°C]</i> | <i>[min]</i> |
|-----------------|---------------------|-------------|--------------|
| (Hot plate)     | LY 1564 SP /XB 3416 | at 60       | 70 - 90      |
|                 |                     | at 80       | 20 - 27      |
|                 |                     | at 100      | 7 - 12       |
|                 |                     | at 120      | 2 - 6        |

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.

**Properties of the cured, neat formulation**

| <b>Glass transition temperature</b><br>(IEC 1006,<br>DSC, 10 K/min) | <i>Cure:</i>                    | $T_G$               | <i>LY 1564 SP<br/>XB 3416</i> |                            |                               |
|---|---------------------------------|---------------------|-------------------------------|----------------------------|-------------------------------|
|   | 2 days 23 °C                    | [°C]                | 40 - 46                       |                            |                               |
|   | 8 days 23 °C                    | [°C]                | 51 - 57                       |                            |                               |
|   | 20 h 40 °C                      | [°C]                | 61 - 67                       |                            |                               |
|   | 15 h 50 °C                      | [°C]                | 68 - 73                       |                            |                               |
|   | 24 h 50 °C                      | [°C]                | 69 - 75                       |                            |                               |
|   | 10 h 60 °C                      | [°C]                | 70 - 75                       |                            |                               |
|   | 16 h 60 °C                      | [°C]                | 72 - 78                       |                            |                               |
|   | 4 h 80 °C                       | [°C]                | 78 - 83                       |                            |                               |
|   | 8 h 80 °C                       | [°C]                | 80 - 85                       |                            |                               |
|   | 2 h 100 °C                      | [°C]                | 80 - 85                       |                            |                               |
|   | 5 h 100 °C                      | [°C]                | 81 - 87                       |                            |                               |
| <b>Tensile test</b><br>(ISO 527)                                    | <i>LY 1564 SP / XB 3416</i>     |                     | <i>Cure:</i><br>15 h 50 °C    | <i>Cure:</i><br>8 h 80 °C  |                               |
|   | Tensile strength                | [MPa]               | 74 - 78                       | 70 - 75                    |                               |
|   | Elongation at tensile strength  | [%]                 | 4.0 - 4.4                     | 4.5 - 5.0                  |                               |
|   | Ultimate strength               | [MPa]               | 59 - 66                       | 60 - 64                    |                               |
|   | Ultimate elongation             | [%]                 | 7.0 - 7.8                     | 8.0 - 9.0                  |                               |
|   | Tensile modulus                 | [MPa]               | 3100 - 3300                   | 2870 - 3050                |                               |
| <b>Flexural test</b><br>(ISO 178)                                   | <i>LY 1564 SP / XB 3416</i>     |                     | <i>Cure:</i><br>7 days 23 °C  | <i>Cure:</i><br>15 h 50 °C | <i>Cure:</i><br>8 h 80 °C     |
|   | Flexural strength               | [MPa]               | 95 - 110                      | 120 - 135                  | 118 - 130                     |
|   | Elongation at flexural strength | [%]                 | 2.7 - 3.6                     | 5.2 - 5.6                  | 5.5 - 6.5                     |
|   | Ultimate strength               | [MPa]               | 95 - 110                      | 84 - 94                    | 88 - 100                      |
|   | Ultimate elongation             | [%]                 | 2.7 - 3.6                     | 9.0 - 11.0                 | 10.0 - 12.0                   |
|   | Flexural modulus                | [MPa]               | 3470 - 3670                   | 3100 - 3400                | 2900 - 3050                   |
| <b>Fracture properties</b>  |                                 |                     | <i>Cure: 5 h 100 °C</i>       |                            | <i>LY 1564 SP<br/>XB 3416</i> |
| <b>Bend notch test</b><br>(PM 258-0/90)                             | Fracture toughness $K_{1C}$     | [MPa√m]             |                               |                            | 0.95 - 1.05                   |
|   | Fracture energy $G_{1C}$        | [J/m <sup>2</sup> ] |                               |                            | 260 - 310                     |

**Properties of the cured, reinforced formulation**

|   |  |       |   |                               |
|---|--|-------|---|-------------------------------|
| <b>Interlaminar shear test</b><br>(ASTM D 2344) | Short beam: Laminate comprising 12 layers unidirectional<br>E-glass fabric (425 g/m <sup>2</sup> )<br>Laminate thickness t = 3.0 - 3.2 mm<br>Fibre volume content: 63 - 65 % |       |   |                               |
|   |  |       | <i>Cure: 1.5 h 80 °C<br/>+ 5 h 100 °C</i> | <i>LY 1564 SP<br/>XB 3416</i> |
|   | Shear strength   | [MPa] | 53 - 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" (Publ. No. 24264/e).

**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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