Hysol® E-20NS™

PRODUCTION DESCRIPTION

Hysol® E-20NS™ provides the following product characteristics:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Epoxy</td>
</tr>
<tr>
<td>Chemical Type (Resin)</td>
<td>Epoxy</td>
</tr>
<tr>
<td>Chemical Type (Hardener)</td>
<td>Amine</td>
</tr>
<tr>
<td>Appearance (Resin)</td>
<td>Off-white&lt;sup&gt;LMS&lt;/sup&gt;</td>
</tr>
<tr>
<td>Appearance (Hardener)</td>
<td>Tan to Light Green&lt;sup&gt;LMS&lt;/sup&gt;</td>
</tr>
<tr>
<td>Appearance (Mixture)</td>
<td>Off-white&lt;sup&gt;LMS&lt;/sup&gt;</td>
</tr>
<tr>
<td>Components</td>
<td>Two component - requires mixing</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Medium</td>
</tr>
<tr>
<td>Mix Ratio, by volume</td>
<td>Resin : Hardener 2 : 1</td>
</tr>
<tr>
<td>Mix Ratio, by weight</td>
<td>Resin : Hardener 100 : 48</td>
</tr>
<tr>
<td>Cure</td>
<td>Room temperature cure after mixing</td>
</tr>
<tr>
<td>Application</td>
<td>Bonding</td>
</tr>
</tbody>
</table>

TYPICAL CURING PERFORMANCE

Gel Time

Gel time, 100 °C, minutes 40 to 80<sup>LMS</sup>

Cure Speed vs. Time

The graph below shows shear strength developed with time on abraded, acid etched aluminum lapshears @ 25 °C with an average bondline gap of 0.1 to 0.2 mm and tested according to ISO 4587.

TYPICAL PROPERTIES OF CURED MATERIAL

Physical Properties:

- Glass Transition Temperature (Tg), °C 87
- Shore Hardness, ISO 868, Durometer D 84 to 94<sup>LMS</sup>
- Tensile Strength, ISO 527-2, % 4
- Elongation, ISO 527-2 % 23

Electrical Properties:

- Dielectric Breakdown Strength, IEC 60243-1, kV/mm 24

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 2 hours @ 65 °C

- Lap Shear Strength, ISO 4587:
  - Aluminum 0.12 to 0.13 mm gap N/mm²  ≥3.47<sup>LMS</sup> (psi) (500)

Cured for 5 days @ 22 °C

- Lap Shear Strength, ISO 4587:
  - Steel (grit blasted) N/mm²  19.2 (psi) (2,790)
  - Aluminum (acid etched & abraded), 0.1 to 0.2 mm gap N/mm²  17.3 (psi) (2,500)
  - Aluminum (anodised) N/mm²  9 (psi) (1,300)

Hydroxy E-20NS™ is a non-sagging industrial grade epoxy adhesive. Once mixed, the two component epoxy cures at room temperature to form an off white, tough bondline, which provides high peel resistance and high shear strengths. When fully cured, the epoxy is resistant to a wide range of chemicals and solvents, and acts as an excellent electrical insulator. Develops strong, tough bonds on aluminum, stainless steel and other metals, as well as glass, ceramics, and plastics. Its non-sagging formula is well suited for use on vertical surfaces to avoid run-off.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Resin:

- Specific Gravity @ 25 °C 1.3 to 1.6<sup>LMS</sup>
- Flash Point - See MSDS
- Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):
  - Spindle 7, speed 20 rpm, 80,000 to 280,000<sup>LMS</sup>

Hardener:

- Specific Gravity @ 25 °C 1.4 to 1.6<sup>LMS</sup>
- Flash Point - See MSDS
- Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):
  - Spindle 7, speed 50 rpm, 30,000 to 90,000<sup>LMS</sup>

Mixed:

- Specific Gravity @ 25 °C 1.43
- Working life, minutes 20
- Tack Free Time, minutes 20

<sup>LMS</sup> Links to Henkel Material Safety Data Sheets
### Typical Environmental Resistance

- **Stainless steel**: N/mm² 8.5 (psi) 1,230
- **Polycarbonate**: N/mm² 13.2 (psi) 1,290
- **Nylon**: N/mm² 1.4 (psi) 210
- **Wood (Fir)**: N/mm² 9.9 (psi) 1,440

### Block Shear Strength, ISO 13445:

- **PVC**: N/mm² 8.9 (psi) 1,290
- **ABS**: N/mm² 11.2 (psi) 1,620
- **Epoxy**: N/mm² 22.9 (psi) 3,320
- **Acrylic**: N/mm² 2.1 (psi) 300
- **Glass**: N/mm² 9.3 (psi) 1,350

### Chemical/Solvent Resistance

<table>
<thead>
<tr>
<th>Environment</th>
<th>°C</th>
<th>500 h</th>
<th>1000 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>87</td>
<td></td>
<td>125</td>
</tr>
<tr>
<td>Motor oil (10W30)</td>
<td>87</td>
<td>120</td>
<td>135</td>
</tr>
<tr>
<td>Unleaded gasoline</td>
<td>87</td>
<td></td>
<td>105</td>
</tr>
<tr>
<td>Water/glycol 50/50</td>
<td>87</td>
<td>115</td>
<td>115</td>
</tr>
<tr>
<td>Salt fog</td>
<td>22</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>95% RH</td>
<td>38</td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>Condensing Humidity</td>
<td>49</td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>Water</td>
<td>22</td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>Acetone</td>
<td>22</td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>22</td>
<td></td>
<td>105</td>
</tr>
</tbody>
</table>

### General Information

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Material Safety Data Sheet (MSDS).

### Directions for use:

1. For high strength structural bonds, remove surface contaminants such as paint, oxide films, oils, dust, mold release agents and all other surface contaminants.
2. Use gloves to minimize skin contact. DO NOT use solvents for cleaning hands.
3. **Dual Cartridges**: To use simply insert the cartridge into the application gun and start the plunger into the cylinders using light pressure on the trigger. Next, remove the cartridge cap and expel a small amount of adhesive to be sure both sides are flowing evenly and freely. If automatic mixing of resin and hardener is desired, attach the mixing nozzle to the end of the cartridge and begin dispensing the adhesive. For hand mixing, expel the desired amount of the adhesive and mix thoroughly. Mix for approximately 15 seconds after uniform color is obtained.
4. For maximum bond strength apply adhesive evenly to both surfaces to be joined.
5. Application to the substrates should be made within 20 minutes. Larger quantities and/or higher temperatures will reduce this working time.
6. Join the adhesive coated surfaces and allow to cure at 25 °C for 24 hours for high strength. Heat up to 93 °C, will speed curing.
7. Keep parts from moving during cure. Contact pressure is necessary. Maximum shear strength is obtained with a 0.1 to 0.2 mm bond line.
8. Excessive uncured adhesive can be cleaned up with ketone type solvents.

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**Chemical/Solvent Resistance**

Aged under conditions indicated and tested @ 22 °C.

- **Environment**
  - **°C**: Temperature
  - **500 h**: % of initial strength
  - **1000 h**: % of initial strength

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**Hot Strength**

Tested at temperature

- **% Strength @ 22 °C**
  - Temperature, °C

Cured for 5 days @ 22 °C

**Lap Shear Strength, ISO 4587:**

- **Aluminum (acid etched & abraded)**, 0.1 to 0.2 mm gap

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**Heat Aging**

Aged at temperature indicated and tested @ 22 °C

- **% Initial Strength @ 22 °C**
  - Exposure Time, hours

Cured for 12 hours @ 65 °C followed by 4 hours @ 22 °C
Loctite Material Specification™

LMS dated June 16, 2006 (Resin) and LMS dated July 9, 2001 (Hardener). Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Loctite Quality.

Storage
Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

Optimal Storage: 8 °C to 21 °C. Storage below 8 °C or greater than 28 °C can adversely affect product properties. Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Conversions

<table>
<thead>
<tr>
<th>Formula</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>(°C x 1.8) + 32</td>
<td>°F</td>
</tr>
<tr>
<td>kV/mm x 25.4</td>
<td>V/mil</td>
</tr>
<tr>
<td>mm / 25.4</td>
<td>inches</td>
</tr>
<tr>
<td>µm / 25.4</td>
<td>mil</td>
</tr>
<tr>
<td>N x 0.225</td>
<td>lb</td>
</tr>
<tr>
<td>N/mm x 5.71</td>
<td>lb/in</td>
</tr>
<tr>
<td>N/mm² x 145</td>
<td>psi</td>
</tr>
<tr>
<td>MPA x 145</td>
<td>psi</td>
</tr>
<tr>
<td>N·m x 8.851</td>
<td>lb·in</td>
</tr>
<tr>
<td>N·m x 0.738</td>
<td>lb·ft</td>
</tr>
<tr>
<td>N·mm x 0.142</td>
<td>oz·in</td>
</tr>
<tr>
<td>mPA·s = cP</td>
<td></td>
</tr>
</tbody>
</table>

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