2019 Capabilities & Product Selection Guide

EPALLOY® Specialty Epoxy Resins
ERISYS® Epoxy Functional Reactive Modifiers
Hypro® Reactive Liquid Polymers
HyPox® Elastomer Modified Epoxy Resins
OMICURE® Curing Agents, Accelerators and Catalysts
When your application requires high performance, turn to CVC Thermoset Specialties for resins, modifiers and additives.

CVC Thermoset Specialties provides specialty epoxies and other thermoset resins in demanding applications.

- Composites
- Adhesives
- Coatings
- Electrical Insulation

Automobile and aircraft frames, corrosion resistant pipes and valves, graphite golf club shafts and tennis racquet frames, electronic laminates, jet skis and marine hulls are just a few of the applications that benefit from our products.

The CVC Legacy

Emerald Performance Materials® created CVC Thermoset Specialties to combine the expertise of the Hypro® Reactive Liquid Polymer (RLP) Line, a proprietary technology developed by BFGoodrich, and the specialty epoxy materials from CVC Specialty Chemicals Inc. CVC Thermoset Specialties’ technologies enhance thermoset performance in technically sophisticated applications around the world.

The Hypro RLP product family, previously sold under the Hycar® trade name, continues to grow and expand with new products and new application platforms in coatings, adhesives, composites, and electrical insulation.

CVC Specialty Chemicals had been creating and manufacturing specialty epoxy resins since 1982. Over the years, the company expanded its manufacturing and R&D capabilities, and its product offerings of specialty and elastomer-modified epoxies, epoxy-reactive modifiers, catalysts and accelerators for epoxy formulators.
CVC’s specialty raw materials are critical building blocks for applications in coatings, adhesives, composites, civil engineering and electronics. These building blocks include five product platforms –

- **EPALLOY®** Specialty Epoxy Resins
- **ERISYS®** Epoxy Functional Reactive Modifiers
- **Hypro®** Reactive Liquid Polymers
- **HyPox®** Elastomer Modified Epoxy Resins
- **OMICURE®** Catalysts, Accelerators and Curing Agents

**EPALLOY** specialty epoxy resins deliver improved performance in high performance maintenance/marine coatings, adhesives, encapsulants and composites. CVC offers four families of specialty epoxy resins:

- EPALLOY 8000 - Phenol Novolac Epoxy
- EPALLOY 7000 - Bis-A Modified Novolac Epoxy and Blends
- EPALLOY 5000 - Cycloaliphatic Epoxy
- ERISYS - Resorcinol Epoxy and Resorcinol Novolac Epoxy

These specialty epoxy resins provide better chemical resistance, thermal performance, modulus, cure speed and UV resistance than standard liquid epoxy resins.

**ERISYS** epoxy functional reactive modifiers enhance performance, reduce viscosity, and improve handling and processing of epoxy formulations. CVC offers one of the broadest ranges of epoxy-functional modifiers:

- ERISYS GE 5, 6, 7 & 8 Series - Aliphatic Monoglycidyl Ethers
- ERISYS GE 10 Series - Aromatic Monoglycidyl Ethers
- ERISYS GE 20 Series - Aliphatic Diglycidyl Ethers
- ERISYS GE 30 Series - Aliphatic Triglycidyl Ethers
- ERISYS GS Series - Glycidyl Esters
- ERISYS GA Series - Glycidyl Amines
- ERISYS GE 40 & 60 Series - Aliphatic Polyglycidyl Ethers

Their benefits include enhanced flexibility and toughness, while maintaining chemical resistance and UV stability. Some of the products are high in bio-renewal content.

**Hypro RLP** Reactive Liquid Polymers are low molecular weight synthetic rubber with chemical functionality. These reactive additives incorporate rubber properties into epoxies, acrylates, vinyl esters and polyesters. They improve the toughness and low-temperature properties in coatings, adhesives, sealants and composites. Hypro reactive liquid polymers are butadiene homo-polymer and butadiene-acrylonitrile copolymers with terminal functionality.

- Hypro CTBN - Carboxyl-Terminated Butadiene-Acrylonitrile Copolymer
- Hypro ATBN - Amine-Terminated Butadiene-Acrylonitrile Copolymer
- Hypro ETBN - Epoxy-Terminated Butadiene-Acrylonitrile Copolymer
- Hypro VTBNX - Methacrylate(Vinyl)-Terminated Butadiene-Acrylonitrile Copolymer

The toughness shows in many attributes: crack resistance, fracture toughness, impact resistance, resilience, interlaminar adhesion, peel adhesion and thermo cycling.

**HyPox** elastomer modified epoxies enhance fracture toughness, low temperature mechanical properties, impact/crack/chip-resistance, peel strength and/or flexibility of epoxy coatings, adhesives, sealants and composites.

- HyPox R - Hypro CTBN Modified Epoxy Resin
- HyPox D - Dimer Acid Modified Epoxy Resin
- HyPox U - Urethane Modified Epoxy Resin

HyPox RF and RM elastomer-modified low viscosity epoxy resins combine high elastomer content with the convenience of handling epoxy resins.

**OMICURE** dicyandiamide, boron-based catalysts, and substituted urea catalysts are key components of latent, 1K heat cured epoxy systems.

- **OMICURE** - DDA Dicyandiamide
- **OMICURE** - Substituted Urea Accelerators
- **OMICURE** - Miscellaneous Catalysts, Curatives, Accelerators

They control the cure speed and reduce cure temperatures of dicyandiamide cured formulations and help optimize productivity, energy use, and ultimate physical properties.
**EPALLOY® Specialty Epoxy Resins**

Improved chemical resistance, thermal performance, modulus, cure speed and UV stability are just a few of the performance advantages with EPALLOY Specialty Epoxy Resins and blends over other standard resins. These products bring the critical difference to high performance coatings, composites and adhesives applications. Technologies and product lines include:

- Phenol Novolac Epoxy Resins (EPALLOY 8000 Series)
- Resorcinol and Resorcinol Modified Novolac Epoxy Resins (ERISYS RDGE & RN Series)
- Bis-A Modified Novolac Epoxy Resins (EPALLOY 7000 Series)
- Cycloaliphatic Epoxy Resins (EPALLOY 5000 Series)

### Phenol Novolac Epoxy Resins

- Excellent chemical resistance
- High-functionality, cross-link density & $T_g$

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Average Epoxy Functionality</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bisphenol F Epoxy Resins</strong></td>
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</tr>
<tr>
<td>EPALLOY 8220</td>
<td>2.05</td>
<td>1,800 - 2,800</td>
<td>164 - 176</td>
<td>0.10</td>
<td>2</td>
<td>Lowest viscosity Bis-F resin. Near monomeric product for blends to prevent crystallization in Bis-A resins.</td>
</tr>
<tr>
<td>EPALLOY 8230</td>
<td>2.15</td>
<td>3,500 - 4,700</td>
<td>164 - 176</td>
<td>0.10</td>
<td>3</td>
<td>Standard low viscosity non-crystallizing resin for excellent 100% solids coatings and composite applications. Resistant to 98% sulfuric acid and strong polar solvents.</td>
</tr>
<tr>
<td><strong>Epoxy Phenol Novolac Resins</strong></td>
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</tr>
<tr>
<td>EPALLOY 8240</td>
<td>2.35</td>
<td>6,000 - 7,100</td>
<td>164 - 176</td>
<td>0.10</td>
<td>3</td>
<td>Lowest viscosity unmodified epoxy novolac available. Lower in viscosity than standard Bis-A resin. EPALLOY 8240 is preferred for secondary containment tank linings and industrial flooring.</td>
</tr>
<tr>
<td>EPALLOY 8250</td>
<td>2.60</td>
<td>18,000 - 28,000</td>
<td>165 - 178</td>
<td>0.10</td>
<td>3</td>
<td>Mid-range functionality epoxy novolac with viscosity only slightly higher than standard Bis-A resin. For high temperature, highly corrosive applications. Preferred replacement for novolac based vinyl esters.</td>
</tr>
<tr>
<td>EPALLOY 8280</td>
<td>2.8</td>
<td>1,100-1,700 @ 52°C</td>
<td>172 - 179</td>
<td>0.10</td>
<td>2</td>
<td>Mid-range functionality for improved $T_g$ and corrosion resistance.</td>
</tr>
<tr>
<td>EPALLOY 8330</td>
<td>3.60</td>
<td>20,000 - 30,000 @ 52°C</td>
<td>171 - 183</td>
<td>0.10</td>
<td>3</td>
<td>Standard epoxy novolac for highest chemical resistance and $T_g$.</td>
</tr>
<tr>
<td>EPALLOY 8350</td>
<td>3.60</td>
<td>30,000 - 50,000 @ 52°C</td>
<td>175 - 184</td>
<td>0.10</td>
<td>3</td>
<td>Higher viscosity equivalent to 8330.</td>
</tr>
<tr>
<td>EPALLOY 8370</td>
<td>3.90</td>
<td>15,000 - 35,000 @ 72°C</td>
<td>205 - 212</td>
<td>0.10</td>
<td>3</td>
<td>Highest functionality epoxy phenol novolac resin.</td>
</tr>
</tbody>
</table>
## EPALLOY® Specialty Epoxy Resins (cont.)

### Multifunctional and Faster Cure

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Average Epoxy Functionality</th>
<th>Viscosity at 72°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multifunctional Epoxy Resin</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EPALLOY 9000</td>
<td>3.0</td>
<td>5,500 - 6,500</td>
<td>160 - 180</td>
<td>0.8</td>
<td>2</td>
<td>High functionality, low melt viscosity resin for high temperature applications and T&lt;sub&gt;g&lt;/sub&gt; modification of other epoxy resins.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 52°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modified Bis-A Epoxy Resin</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EPALLOY 7200</td>
<td>2,000 - 4,000</td>
<td>195 - 215</td>
<td>0.5</td>
<td>2</td>
<td>Modified BPA epoxy to provide for faster cure for all temperatures. Eliminates blushing in slower curing epoxies. Excellent for coatings.</td>
</tr>
</tbody>
</table>

### Resorcinol Epoxy Resin
- Low-viscosity modifier
- Excellent chemical resistance

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Average Epoxy Functionality</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resorcinol Epoxy Resin</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ERISYS RDGE</td>
<td>2.0</td>
<td>300 - 500</td>
<td>120 - 135</td>
<td>0.10</td>
<td>2</td>
<td>Resorcinol Diglycidyl Ether. Very low viscosity, high reactivity epoxy resin. Modifying resin for novolacs in corrosion resistant coatings and composites.</td>
</tr>
</tbody>
</table>
### EPALLOY® Specialty Epoxy Resins (cont.)

#### Resorcinol Modified Phenol Novolac Epoxy Resins
- Maximum chemical resistance

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Average Epoxy Functionality</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERISYS RF50</td>
<td>2.0</td>
<td>700 - 1,400</td>
<td>140 - 155</td>
<td>0.15</td>
<td>2</td>
<td>Non-crystallizing lowest viscosity resorcinol/phenol novolac epoxy resin.</td>
</tr>
<tr>
<td>ERISYS RN25</td>
<td>2.4</td>
<td>5,000 - 6,500</td>
<td>152 - 165</td>
<td>0.10</td>
<td>5</td>
<td>Non-crystallizing medium viscosity resorcinol/phenol novolac epoxy resin.</td>
</tr>
<tr>
<td>ERISYS RN3650</td>
<td>2.8</td>
<td>7,000 - 9,000</td>
<td>141 - 156</td>
<td>0.10</td>
<td>3</td>
<td>Highest functionality resorcinol modified phenol novolac epoxy resin. Maximum chemical resistance and $T_g$.</td>
</tr>
</tbody>
</table>

#### Bisphenol A/F Modified Phenol Novolac Epoxy Resins

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Average Epoxy Functionality</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPALLOY 7138</td>
<td>2.0</td>
<td>5,500 - 7,500</td>
<td>175 - 185</td>
<td>0.10</td>
<td>1</td>
<td>Low viscosity non-crystallizing novolac modified Bis-A epoxy resin. Excellent replacement for high purity Bis-A resins in filament winding applications.</td>
</tr>
<tr>
<td>EPALLOY 7170</td>
<td>2.05</td>
<td>7,000 - 10,000</td>
<td>177 - 187</td>
<td>0.10</td>
<td>2</td>
<td>Non-crystallizing Bis-A/F resin. 30% epoxidized Bis-F content.</td>
</tr>
<tr>
<td>EPALLOY 9237-70</td>
<td>2.10</td>
<td>5,000 - 7,000</td>
<td>170 - 181</td>
<td>0.10</td>
<td>2</td>
<td>Non-crystallizing Bis-A modified Bis-F epoxy resin. Highest Bis-F content and highest $T_g$ in this class.</td>
</tr>
</tbody>
</table>
### EPALLOY® Specialty Epoxy Resins (cont.)

**Cycloaliphatic Epoxy Resins**
- Excellent for non-yellowing coatings, electrical insulating components
- Bis-A free epoxy resins

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>APHA Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogenated Bisphenol A Epoxy Resins</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EPALLOY 5000</td>
<td>1,300 - 2,500</td>
<td>210 - 230</td>
<td>0.2</td>
<td>100</td>
<td>UV Resistant, lower viscosity cycloaliphatic alternative to standard Bis-A resin. Applications include weatherable coatings as replacement to urethane coatings. Excellent adhesion to metal.</td>
</tr>
<tr>
<td>EPALLOY 5001LC</td>
<td>2,000 - 4,500</td>
<td>200 - 220</td>
<td>0.3</td>
<td>3 Gardner</td>
<td>Faster cure version of EPALLOY 5000 through increased epoxy functionality. (Functionality = 2.4) Ideal for weatherable coatings.</td>
</tr>
<tr>
<td>Cycloaliphatic Glycidyl Ester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPALLOY 5200</td>
<td>700 - 900</td>
<td>160 - 180</td>
<td>—</td>
<td>100</td>
<td>Low viscosity Cycloaliphatic Glycidyl Ester epoxy resin used mostly in applications for outdoor electrical insulation designed for medium and high voltage.</td>
</tr>
</tbody>
</table>

Other resin blends available upon request on a made-to-order basis.

### Bisphenol A Epoxy Resin
- Medium Molecular Weight Bisphenol-A Epoxy Resin

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNMODIFIED</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Undiluted Bisphenol A Epoxy Resin</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EPALLOY 7192</td>
<td>0 - V (1)</td>
<td>230 - 280</td>
<td>0.1</td>
<td>3</td>
<td>Undiluted high molecular weight semi-solid Bisphenol A epoxy resin well suited for tough, durable formulations with improved adhesion.</td>
</tr>
</tbody>
</table>

Other resin blends available upon request on a made-to-order basis.

(1) Gardner-Holdt Viscosity - 70% in Butyl Carbitol
EPALLOY® Specialty Epoxy Resins (cont.)

Resin Solutions

<table>
<thead>
<tr>
<th>Product Name</th>
<th>NV%</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW on Solids, g/eq</th>
<th>HCC, max</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EPALLOY 7200 SOLUTIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Modifying resin for high solids primers with fast tack free time.</td>
</tr>
<tr>
<td>Modified Bisphenol A</td>
<td></td>
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</tr>
<tr>
<td>Epoxy Resin Solutions</td>
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<td></td>
</tr>
<tr>
<td>EPALLOY 7200 MIBK90</td>
<td>89 - 91</td>
<td>3,000 - 8,000</td>
<td>208 - 238</td>
<td>0.5</td>
<td>2</td>
<td>90% solids in Methyl Isobutyl Ketone</td>
</tr>
<tr>
<td>EPALLOY 7200 X90</td>
<td>89 - 91</td>
<td>9,000 - 13,000</td>
<td>195 - 215</td>
<td>0.5</td>
<td>2</td>
<td>90% solids in Xylene</td>
</tr>
<tr>
<td><strong>EPALLOY 8330 SOLUTIONS</strong></td>
<td></td>
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<td></td>
<td>Solutions of high functionality epoxy novolacs in solvents for film coatings.</td>
</tr>
<tr>
<td>Epoxy Phenol Novolac Solutions</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>EPALLOY 8330 MAK80</td>
<td>79 - 81</td>
<td>800 - 1,300</td>
<td>171 - 183</td>
<td>0.10</td>
<td>3</td>
<td>80% solids in Methyl n-Amyl Ketone</td>
</tr>
<tr>
<td>EPALLOY 8330 MEK85</td>
<td>84 - 86</td>
<td>800 - 1,400</td>
<td>171 - 183</td>
<td>0.10</td>
<td>3</td>
<td>85% solids in Methyl Ethyl Ketone</td>
</tr>
<tr>
<td><strong>EPALLOY 8350 SOLUTIONS</strong></td>
<td></td>
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</tr>
<tr>
<td>Epoxy Phenol Novolac Solutions</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>EPALLOY 8350 X80</td>
<td>79 - 81</td>
<td>1,200 - 3,000</td>
<td>175 - 184</td>
<td>0.1</td>
<td>3</td>
<td>80% solids in Xylene</td>
</tr>
<tr>
<td><strong>EPALLOY 8370 SOLUTIONS</strong></td>
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</tr>
<tr>
<td>Epoxy Phenol Novolac Solutions</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>EPALLOY 8370 A85</td>
<td>84 - 86</td>
<td>5,000 - 7,000</td>
<td>205 - 212</td>
<td>—</td>
<td>3</td>
<td>85% solids in Acetone</td>
</tr>
</tbody>
</table>

Other resin solutions available upon request on a made-to-order basis.
ERISYS GE Series glycidyl ether modifiers are low molecular weight epoxy functional products based on alcohols, glycols and phenols. The product line covers a broad range of TSCA approved modifiers from monofunctional to multifunctional materials. Classified at right.

### Monofunctional - Glycidyl Ethers

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>HCC, max %</th>
<th>APHA Color, max</th>
<th>Flash Point °F</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERISYS GE-5</td>
<td>2 max</td>
<td>145 - 155</td>
<td>0.91 - 0.92</td>
<td>0.10</td>
<td>100</td>
<td>&gt;129</td>
<td>n-Butyl Glycidyl Ether. Most efficient epoxy functional diluent available.</td>
</tr>
<tr>
<td>ERISYS GE-6</td>
<td>1 - 4</td>
<td>205 - 235</td>
<td>0.90 - 0.93</td>
<td>0.10</td>
<td>100</td>
<td>197</td>
<td>2-Ethylhexyl Glycidyl Ether. Excellent replacement for Butyl Glycidyl Ether as a low viscosity reactive diluent.</td>
</tr>
<tr>
<td>ERISYS GE-7</td>
<td>1 - 6</td>
<td>220 - 235</td>
<td>0.89 - 0.91</td>
<td>0.05</td>
<td>100</td>
<td>&gt;200</td>
<td>C₆-C₈ Aliphatic Glycidyl Ether. Natural alcohol based. Used for high solids coatings, tooling and civil engineering applications.</td>
</tr>
<tr>
<td>ERISYS GE-8</td>
<td>5 - 10</td>
<td>275 - 300</td>
<td>0.88 - 0.90</td>
<td>0.05</td>
<td>100</td>
<td>&gt;200</td>
<td>C₁₀-C₁₂ Aliphatic Glycidyl Ether. Natural alcohol based. Used in flooring, aggregate bonding and adhesives.</td>
</tr>
<tr>
<td>ERISYS GE-10</td>
<td>5 - 10</td>
<td>170 - 195</td>
<td>1.07 - 1.09</td>
<td>0.10</td>
<td>ⁱ Gardner</td>
<td>&gt;250</td>
<td>⁰-Cresyl Glycidyl Ether. Viscosity modifier for construction, flooring and casting. Excellent moisture tolerance.</td>
</tr>
<tr>
<td>ERISYS GE-11</td>
<td>20 - 30</td>
<td>215 - 240</td>
<td>1.01 - 1.03</td>
<td>0.10</td>
<td>ⁱ Gardner</td>
<td>&gt;250</td>
<td>p-tertiary Butyl Phenyl Glycidyl Ether. Modifier for Bisphenol A resins to eliminate crystallization. Good electrical properties. Easier to handle vs. GE-10 or GE-13.</td>
</tr>
<tr>
<td>ERISYS GE-13</td>
<td>4 - 7</td>
<td>150 - 165</td>
<td>1.10 - 1.13</td>
<td>0.10</td>
<td>² Gardner</td>
<td>237</td>
<td>Phenyl Glycidyl Ether. Lowest viscosity aromatic modifier. Excellent for electrical applications and for preparing resin/curing agent adducts.</td>
</tr>
</tbody>
</table>
ERISYS® Epoxy Functional Reactive Modifiers (cont.)

**Difunctional- Glycidyl Ethers**

- Reduce viscosity – maintain physical properties better than monofunctional diluents
- Use higher concentrations

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>HCC, max %</th>
<th>APHA Color, max</th>
<th>Flash Point °F</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERISYS GE-20</td>
<td>10 - 18</td>
<td>125 - 137</td>
<td>1.05 - 1.07</td>
<td>0.10</td>
<td>100</td>
<td>&gt;230</td>
<td>Neopentyl Glycol Diglycidyl Ether. Aliphatic difunctional modifier for filament winding, coatings and electrical applications.</td>
</tr>
<tr>
<td>ERISYS GE-21</td>
<td>10 - 18</td>
<td>120 - 130</td>
<td>1.09 - 1.11</td>
<td>0.10</td>
<td>100</td>
<td>&gt;230</td>
<td>1,4-Butanediol Diglycidyl Ether. Aliphatic difunctional modifier for improved flexibility over GE-20 at comparable viscosity.</td>
</tr>
<tr>
<td>ERISYS GE-22</td>
<td>45 - 75</td>
<td>145 - 165</td>
<td>1.07 - 1.09</td>
<td>0.10</td>
<td>100</td>
<td>&gt;230</td>
<td>Cyclohexanedimethanol Diglycidyl Ether. Cycloaliphatic difunctional modifier with outstanding weatherability. Excellent for machinery grouts and adhesives.</td>
</tr>
<tr>
<td>ERISYS GE-25</td>
<td>15 - 23</td>
<td>143 - 156</td>
<td>1.06 - 1.08</td>
<td>0.10</td>
<td>300</td>
<td>&gt;230</td>
<td>1,6-Hexanediol Diglycidyl Ether. Aliphatic difunctional epoxy reactive diluent.</td>
</tr>
<tr>
<td>ERISYS GE-24</td>
<td>60 - 70</td>
<td>310 - 330</td>
<td>1.05 - 1.07</td>
<td>0.10</td>
<td>60 APHA</td>
<td>&gt;300</td>
<td>Polypropylene Glycol Diglycidyl Ether. Diepoxy of an aliphatic polyglycol used as a diluent and/or flexibilizer in high viscosity, brittle epoxy formulations.</td>
</tr>
<tr>
<td>ERISYS GE-35</td>
<td>300 - 500</td>
<td>550 - 650</td>
<td>1.01 - 1.03</td>
<td>—</td>
<td>8</td>
<td>&gt;200</td>
<td>Castor Oil Triglycidyl Ether. Low viscosity trifunctional flexibilizer. Provides increased impact and thermal shock resistance to epoxy formulations. Low moisture pick-up.</td>
</tr>
<tr>
<td>ERISYS GE-35H</td>
<td>300 - 500</td>
<td>550 - 650</td>
<td>1.01 - 1.08</td>
<td>—</td>
<td>8</td>
<td>&gt;200</td>
<td>Castor Oil Glycidyl Ether. Lower modulus version of GE-35.</td>
</tr>
<tr>
<td>ERISYS GE-36</td>
<td>200 - 320</td>
<td>620 - 680</td>
<td>1.02 - 1.04</td>
<td>0.10</td>
<td>2</td>
<td>&gt;200</td>
<td>Propoxylated Glycerin Triglycidyl Ether. Aliphatic trifunctional flexibilizer. Used in severe thermal cycling conditions.</td>
</tr>
<tr>
<td>ERISYS GE-38</td>
<td>1,070 - 1,390</td>
<td>160 - 180</td>
<td>1.21 - 1.25</td>
<td>0.7</td>
<td>3</td>
<td>200</td>
<td>Polyglycerol-3-Polyglycidyl Ether. Flexible epoxy. Not TSCA registered.</td>
</tr>
</tbody>
</table>

**Flexibilizers**

- Reduce viscosity, increase flexibility and elongation – improve impact resistance & toughening
- Lower $T_g$ and modulus

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Flash Point °F</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERISYS GE-24</td>
<td>60 - 70</td>
<td>310 - 330</td>
<td>1.05 - 1.07</td>
<td>0.10</td>
<td>60 APHA</td>
<td>&gt;300</td>
<td>Polypropylene Glycol Diglycidyl Ether. Diepoxy of an aliphatic polyglycol used as a diluent and/or flexibilizer in high viscosity, brittle epoxy formulations.</td>
</tr>
<tr>
<td>ERISYS GE-35</td>
<td>300 - 500</td>
<td>550 - 650</td>
<td>1.01 - 1.03</td>
<td>—</td>
<td>8</td>
<td>&gt;200</td>
<td>Castor Oil Triglycidyl Ether. Low viscosity trifunctional flexibilizer. Provides increased impact and thermal shock resistance to epoxy formulations. Low moisture pick-up.</td>
</tr>
<tr>
<td>ERISYS GE-35H</td>
<td>300 - 500</td>
<td>550 - 650</td>
<td>1.01 - 1.08</td>
<td>—</td>
<td>8</td>
<td>&gt;200</td>
<td>Castor Oil Glycidyl Ether. Lower modulus version of GE-35.</td>
</tr>
<tr>
<td>ERISYS GE-36</td>
<td>200 - 320</td>
<td>620 - 680</td>
<td>1.02 - 1.04</td>
<td>0.10</td>
<td>2</td>
<td>&gt;200</td>
<td>Propoxylated Glycerin Triglycidyl Ether. Aliphatic trifunctional flexibilizer. Used in severe thermal cycling conditions.</td>
</tr>
<tr>
<td>ERISYS GE-38</td>
<td>1,070 - 1,390</td>
<td>160 - 180</td>
<td>1.21 - 1.25</td>
<td>0.7</td>
<td>3</td>
<td>200</td>
<td>Polyglycerol-3-Polyglycidyl Ether. Flexible epoxy. Not TSCA registered.</td>
</tr>
</tbody>
</table>
ERISYS® Epoxy Functional Reactive Modifiers (cont.)

Multifunctional- Glycidyl Ethers
- Increase cross-link density and lower viscosity
- Use at much higher levels

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Flash Point °F</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aliphatic Glycidyl Ether</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERISYS GE-30</td>
<td>100 - 200</td>
<td>135 - 150</td>
<td>1.14 - 1.16</td>
<td>0.10</td>
<td>100 APHA</td>
<td>&gt;200</td>
<td>Trimethylolpropane Triglycidyl Ether. Low viscosity, high functional epoxy modifier. Excellent for 100% solids adhesives and coatings.</td>
</tr>
<tr>
<td>ERISYS GE-31</td>
<td>200 - 300</td>
<td>150 - 170</td>
<td>1.19 - 1.21</td>
<td>0.10</td>
<td>4</td>
<td>&gt;200</td>
<td>Trimethyloltriglycidyl Ether. Low viscosity, high functional epoxy modifier. Use to increase crosslink density and enhance chemical resistance.</td>
</tr>
<tr>
<td><strong>Polymethyl Glycidyl Ether</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERISYS GE-40</td>
<td>900 - 1,200</td>
<td>156 - 170</td>
<td>1.27 - 1.33</td>
<td>1.5</td>
<td>2</td>
<td>&gt;300</td>
<td>Pentaerythritol Glycidyl Ether. Medium viscosity tetrafunctional reactive modifier. Compatible with most standard epoxy resins at all concentrations. Not TSCA registered.</td>
</tr>
<tr>
<td>ERISYS GE-60</td>
<td>8,000 - 18,000</td>
<td>160 - 195</td>
<td>1.27 - 1.30</td>
<td>0.50</td>
<td>7</td>
<td>&gt;320</td>
<td>Sorbitol Polyglycidyl Ether. Aliphatic polyfunctional modifier to impart higher reactivity and crosslink density to epoxy resin formulations and crosslink acid functional polymers. Bis-A replacement alternative.</td>
</tr>
<tr>
<td>ERISYS GE-61</td>
<td>4,000 - 7,000</td>
<td>160 - 195</td>
<td>–</td>
<td>–</td>
<td>3</td>
<td>–</td>
<td>Sorbitol Polyglycidyl Ether. 100% water soluble used as a crosslinker in acrylics and polyurethane dispersions.</td>
</tr>
</tbody>
</table>

Glycidyl Esters

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Flash Point °F</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERISYS GS-110</td>
<td>5 - 15</td>
<td>238 - 256</td>
<td>0.95 - 0.97</td>
<td>0.30</td>
<td>50 APHA</td>
<td>&gt;250</td>
<td>Glycidyl Ester of Neodecanoic Acid. Efficient and economical diluent for viscosity reduction.</td>
</tr>
<tr>
<td>ERISYS GS-120</td>
<td>400 - 900</td>
<td>390 - 470</td>
<td>0.97 - 1.00</td>
<td>2.0</td>
<td>9</td>
<td>&gt;200</td>
<td>Diglycidyl Ester of Dimer Acid. Flexibilizing modifier for rigid epoxy resin systems.</td>
</tr>
</tbody>
</table>

Glycidyl Amine

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Viscosity at 25°C, cP</th>
<th>EEW, g/eq</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>HCC, max %</th>
<th>Gardner Color, max</th>
<th>Flash Point °F</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERISYS GA-240</td>
<td>1,600 - 3,000</td>
<td>95 - 110</td>
<td>1.14 - 1.16</td>
<td>0.3</td>
<td>5</td>
<td>&gt;420</td>
<td>Epoxidized meta-Xylyleneamine. Will increase crosslink density of modified systems. An alternative to MY-720 in tetra-functional epoxy matrix. Safer alternative to polyaziridines in acrylic emulsions.</td>
</tr>
</tbody>
</table>
Hypro® Reactive Liquid Polymers (RLP)

Hypro Reactive Liquid Polymers (RLP) are synthetic rubber with chemical functionality. They incorporate rubber properties into brittle thermoset resins, adhesives, coatings and composites.

Hypro RLP combine the benefits of a low molecular weight butadiene-acrylonitrile rubber with terminal chemical functionality. They impart toughness, improve adhesion, and extend performance to low temperatures. The toughness shows in many attributes: crack resistance, fracture toughness, impact resistance, resilience, interlaminar adhesion, peel adhesion and thermal cycling.

The Hypro RLP Toughening Mechanism

With the proper selection of acrylonitrile content, RLP will be soluble with thermoset resins. When the resin system cures, the Hypro RLP terminal functionality reacts into the thermoset resin, and the synthetic rubber precipitates to form discreet rubber particles. These micron-scale particles absorb strain energy. Picture 1 shows a magnification of cured epoxy resin. It is a brittle, glassy resin. Picture 2 shows the same epoxy modified with Hypro RLP. The discrete rubber particles provide the toughening and the epoxy matrix maintains the strength of the unmodified epoxy.

Typical Levels – Hypro RLP Toughened Systems

The optimum Hypro RLP level varies with the type of resin. The general guidelines are that most systems require 5 phr to provide enough rubber particles for significant toughening and that above 20 phr enough RLP remains soluble with the resin, and it acts as a flexibilizer in addition to a toughening agent.

Epoxy composites and structural adhesives typically have < 15 phr, and sealants and coatings typically have >25 phr. Unsaturated polyester composites tend to have < 3 phr, and vinyl ester tends to have 5-to-10 phr. Acrylic adhesives and sealants tend to have multiple toughening agents and the Hypro RLP may be up to 20 phr.

Figure 1 graphically depicts the general guideline for RLP incorporation, demonstrating the relationships between CTBN content, T_g and toughness.
Hypro® Reactive Liquid Polymers (cont.)

Hypro CTBN typically requires chemical modification for effective incorporation into thermoset chemistries. Choice of terminal chemistry will depend on the application and end-use.

CVC Thermoset Specialties offers CTBN with alternative terminal reactivity (Figure 2) and the HyPox elastomer-modified epoxy resins for easy incorporation by formulators.

The Hypro CTBN can be used directly in epoxy-anhydride systems and in unsaturated polyester. Other thermoset systems require chemical modification.

Amine Terminated Butadiene-Acrylonitrile (ATBN) are typically used as co-curing agents to epoxies and isocyanates in ambient-cure adhesives, coatings, sealants and in some heat-cured composites.

Methacrylate (Vinyl) Terminated Butadiene-Acrylonitrile (VTBNX) can be the primary toughening agent in acrylic adhesives, sealants, and composites as well as complementary toughening agents in vinyl ester and in unsaturated polyester composites and adhesives.

Epoxy-Terminated Butadiene-Acrylonitrile (ETBN) include both glycidyl esters of a CTBN and epoxy adducts of CTBN. Some of these are sold as HyPox Elastomer-Modified Epoxy Resins. The Hypro ETBN and the HyPox resins are toughening agents for epoxy coatings, adhesives and composites. Other specialty applications are as toughening agents for cyanate esters and for unsaturated polyester. Many formulators perform custom reactions with the Hypro CTBN to meet the requirements of their systems.

Figure 2. Hypro CTBN and Derivatives Chemical Structure
Guidelines for Pre-Reacting Hypro® RLP Adducts

The Hypro CTBN synthetic rubbers are butadiene polymers and butadiene-acrylonitrile copolymers with carboxyl groups at the polymer chain ends. Most formulators use a pre-reacted CTBN to attain the optimum benefits. The pre-reaction may be a simple modification of the carboxyl to another reactive moiety or a reaction with resins (typically epoxy or vinyl ester) to make a master batch ready for dilution.

The typical process steps
1. Choose the epoxy resin most compatible with the final product.
2. Choose the Hypro CTBN for the desired compatibility and performance.
3. Combine a molar excess (10:1) or weight excess (60:40) of epoxy to CTBN.
4. Heat and react under dry nitrogen with agitation until the acid number is <1.
   a. Typical temperatures range from 60°C with catalyst to 175°C for solid resins.
   b. Typical time is 30 minutes-to-7 hours and varies with temperature and catalyst.
5. Dilute with additional epoxy resin to the desired CTBN concentration, typically 6-to-12phr for composites and structural adhesives.

Processing options
1. Catalysts increase the reaction rate, and the resultant adduct tends to increase in viscosity with time. Catalyst options include triphenyl phosphine (preferred), ethyltriphenylphosphoniumiodide, benzyl dimethyl amine, and other esterification catalysts.
2. Epoxy resin can be co-reacted with CTBN to form an adduct. Addition of these adducts in the epoxy matrix increases ductility and toughness after cure.

Other processing notes
1. Solid epoxy-CTBN adducts can be made by adducting solid epoxy resin or by advancing liquid epoxy and CTBN with BPA or by vulcanizing CTBN-epoxy adducts.
2. Vinyl ester-CTBN adducts can be one step—combine epoxy resin, CTBN, and methacrylic acid and react or multi-step—react epoxy and CTBN before adding and reacting methacrylic acid. This typically requires a stabilizer.
3. Water-dispersed CTBN-epoxy adducts for electrodeposition coating require several subsequent steps after producing the CTBN-epoxy adduct.
## Hypro® Reactive Liquid Polymers (cont.)
### Carboxyl-Terminated Butadiene (CTB) and Butadiene-Acrylonitrile (CTBN) Polymers

Carboxyl-terminated butadiene (CTB) and butadiene-acrylonitrile (CTBN) copolymers improve toughness, low-temperature properties, chemical and water resistance in epoxy, coating, vinyl ester, SMC/BMC, acrylic, plastisol and other thermoset systems. Global standard as a chemical intermediate for adducts for thermoset systems.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Acrylonitrile %</th>
<th>Viscosity* at 27°C, cP</th>
<th>Carboxyl Eq., phr</th>
<th>Acid Number, mgKOH/g</th>
<th>Molecular Weight, g/mol</th>
<th>Functionality</th>
<th>Gardner Color, max</th>
<th>Glass Transition, $T_g$, °C</th>
<th>Specific Gravity at 25°C, g/cm³</th>
<th>Solubility Parameter, (cal/cm³)¹/²</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypro 2000X162 CTB</td>
<td>0</td>
<td>50,000</td>
<td>0.045</td>
<td>25</td>
<td>4,200</td>
<td>1.9</td>
<td>3</td>
<td>-77</td>
<td>0.907</td>
<td>8.14</td>
<td>Chemical intermediate to incorporate polybutadiene into other resins.</td>
</tr>
<tr>
<td>Hypro 1300X31 CTBN</td>
<td>10</td>
<td>65,000</td>
<td>0.050</td>
<td>30</td>
<td>3,800</td>
<td>1.9</td>
<td>5</td>
<td>-66</td>
<td>0.924</td>
<td>8.46</td>
<td>Copolymer with 10% acrylonitrile, increased compatibility with filled systems.</td>
</tr>
<tr>
<td>Hypro 1300X47 CTBN</td>
<td>10</td>
<td>6,750</td>
<td>0.050</td>
<td>30</td>
<td>3,800</td>
<td>1.9</td>
<td>5</td>
<td>-66</td>
<td>0.920</td>
<td>--</td>
<td>Hypro 1300X31 with 18% styrene, increased toughness, crack resistance, and adhesion promoter in UPE.</td>
</tr>
<tr>
<td>Hypro 1300X9 CTBNX</td>
<td>18</td>
<td>135,000</td>
<td>0.052</td>
<td>29</td>
<td>3,550</td>
<td>1.9</td>
<td>9</td>
<td>-52</td>
<td>0.948</td>
<td>8.82</td>
<td>Most popular balance of compatibility, viscosity, and toughening.</td>
</tr>
<tr>
<td>Hypro 1300X13 CTBN</td>
<td>26</td>
<td>500,000</td>
<td>0.057</td>
<td>32</td>
<td>3,150</td>
<td>1.9</td>
<td>5</td>
<td>-39</td>
<td>0.960</td>
<td>9.15</td>
<td>Higher level of acrylonitrile, good compatibility with Bis-A, Bis-F, and phenol-novolac epoxies.</td>
</tr>
<tr>
<td>Hypro 1300X9 CTBNX</td>
<td>18</td>
<td>160,000</td>
<td>0.067</td>
<td>38</td>
<td>3,600</td>
<td>2.4</td>
<td>4</td>
<td>-52</td>
<td>0.955</td>
<td>8.87</td>
<td>CTBN with 2.4 functionality, excellent for composites and vinyl ester resins.</td>
</tr>
<tr>
<td>Hypro 1300X18 CTBNX</td>
<td>22</td>
<td>350,000</td>
<td>0.070</td>
<td>39</td>
<td>3,400</td>
<td>2.4</td>
<td>5</td>
<td>-46</td>
<td>0.961</td>
<td>8.99</td>
<td>CTBN with 2.4 functionality, excellent for composites and vinyl ester resins.</td>
</tr>
</tbody>
</table>

Note 1 - Hypro 1300X8 is also available as Hypro 1300X8F with an FDA compliant stabilizer.
Note 2 - Hypro 1300X13 is also available as Hypro 1300X13F with an FDA compliant stabilizer and as 1300X13NA (lower sodium version) and 1300X13CL (lower chloride version).

* Viscosity reflects mid-point.
### Hypro® Reactive Liquid Polymers (cont.)
**Amine-Terminated Butadiene (ATB) and Butadiene-Acrylonitrile (ATBN) Polymers**

Amine-terminated butadiene (ATB) and butadiene-acrylonitrile (ATBN) copolymers enhance toughness, flexibility, low-temperature properties and adhesion to substrates in two part amine cured epoxies, and impact resistance and adhesion to substrates in two part coatings. Typical uses include structural adhesives, coatings and linings for improved corrosion resistance, construction joint sealers and mastics, powder coatings and filament-wound pressure vessels.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Acrylonitrile %</th>
<th>Viscosity* at 27°C, cP</th>
<th>AHN, g/eq</th>
<th>AEW,* g/eq</th>
<th>Amine Value, mgKOH/g</th>
<th>Molecular Weight</th>
<th>Functionality</th>
<th>Gardner Color, max</th>
<th>Glass Transition, Tg, °C</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>Free Amine, %</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypro 2000X173 ATB</td>
<td>0</td>
<td>185,000</td>
<td>950</td>
<td>950</td>
<td>59</td>
<td>4,450</td>
<td>1.9</td>
<td>3</td>
<td>-80</td>
<td>0.915</td>
<td>4.0</td>
<td>Amine-terminated polybutadiene, lowest polarity, excellent compatibility with fillers, cross-links at double bonds, reacts at terminal amine moiety.</td>
</tr>
<tr>
<td>Hypro 1300X21 ATBN</td>
<td>10</td>
<td>160,000</td>
<td>1,200</td>
<td>1,200</td>
<td>47</td>
<td>4,050</td>
<td>1.9</td>
<td>8</td>
<td>-65</td>
<td>0.938</td>
<td>2.0</td>
<td>Co-curable in polyurethane and epoxy adhesives and sealants. Excellent low-temperature properties.</td>
</tr>
<tr>
<td>Hypro 1300X16 ATBN</td>
<td>18</td>
<td>200,000</td>
<td>900</td>
<td>900</td>
<td>62</td>
<td>3,800</td>
<td>1.8</td>
<td>8</td>
<td>-51</td>
<td>0.956</td>
<td>3.5</td>
<td>Most popular balance of compatibility, viscosity, and toughening. Excellent in adhesives, composites and coatings.</td>
</tr>
<tr>
<td>Hypro 1300X35 ATBN</td>
<td>26</td>
<td>500,000</td>
<td>700</td>
<td>700</td>
<td>80</td>
<td>3,500</td>
<td>1.8</td>
<td>10</td>
<td>-38</td>
<td>0.978</td>
<td>7.0</td>
<td>Highest level of acrylonitrile, best compatibility with polar components.</td>
</tr>
<tr>
<td>Hypro 1300X45 ATBN</td>
<td>18</td>
<td>375,000</td>
<td>1,850</td>
<td>1,850</td>
<td>30</td>
<td>3,800</td>
<td>1.8</td>
<td>8</td>
<td>-55</td>
<td>0.955</td>
<td>&lt;0.1</td>
<td>Hypro 1300X16 with no residual amine (AEP), designed for electrodeposition and powder coatings.</td>
</tr>
<tr>
<td>Hypro 1300X42 ATBN</td>
<td>18</td>
<td>100,000</td>
<td>225</td>
<td>450</td>
<td>125</td>
<td>3,800</td>
<td>1.8</td>
<td>10</td>
<td>-59</td>
<td>0.942</td>
<td>10.0</td>
<td>Similar to Hypro 1300X16 with primary amine (2-methylpentamethylenediamine)—No AEP.</td>
</tr>
</tbody>
</table>

For Hypro 1300X42 ATBN, a primary amine terminated material, Weight per Active Hydrogen is AEW/2.

* Viscosity and AEW reflect mid-point.
Hypro® Reactive Liquid Polymers (cont.)
Epoxy-Terminated Butadiene (ETB) and Butadiene-Acrylonitrile (ETBN) Glycidyl Ester Polymers

Glycidyl-esters of butadiene (ETB) and butadiene-acrylonitrile (ETBN) copolymers incorporate 100% rubber toughening into epoxy matrix without pre-reaction or additional epoxy resin. Excellent for epoxy composites and adhesives. Contains no Bisphenol A or Bisphenol A Diglycidyl Ether (BADGE).

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Acrylonitrile %</th>
<th>Viscosity* at 27°C, cP</th>
<th>Viscosity* at 52°C, cP</th>
<th>EEW, g/eq</th>
<th>Acid number, mgKOH/g</th>
<th>Molecular Weight</th>
<th>Gardner Color, max</th>
<th>Tg, °C</th>
<th>Solids, %</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypro 2000X174 ETB</td>
<td>0</td>
<td>20,000</td>
<td>3,500</td>
<td>2,800</td>
<td>&lt;0.1</td>
<td>4,350</td>
<td>7</td>
<td>-77</td>
<td>100</td>
<td>Lowest viscosity epoxy-functional rubber toughener, good compatibility with fillers.</td>
</tr>
<tr>
<td>Hypro 1300X68 ETBN</td>
<td>18</td>
<td>300,000</td>
<td>20,000</td>
<td>2,500</td>
<td>&lt;0.1</td>
<td>3,700</td>
<td>8</td>
<td>-52</td>
<td>100</td>
<td>Balanced viscosity and compatibility, excellent for mix-and-use epoxy adhesives and for composites.</td>
</tr>
<tr>
<td>Hypro 1300X63 ETBN</td>
<td>26</td>
<td>725,000</td>
<td>40,000</td>
<td>2,000</td>
<td>&lt;0.1</td>
<td>3,300</td>
<td>11</td>
<td>-39</td>
<td>100</td>
<td>Best compatibility with Bis-A, Bis-F, and novalac epoxies for shelf stable systems.</td>
</tr>
</tbody>
</table>

Hypro 2000X174, 1300X68 and 1300X63 are developmental products and specification ranges are subject to change based on manufacturing history.

* Viscosity and EEW reflect mid-point.

Epoxy-Terminated Butadiene-Acrylonitrile (ETBN) Resin Adducts

Epoxy-terminated butadiene-acrylonitrile (ETBN) resin adducts with no excess epoxy. The Hypro ETBN have much higher rubber content when compared to HyPox CTBN-modified epoxies.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Acrylonitrile %</th>
<th>Viscosity* at 27°C, cP</th>
<th>Viscosity* at 52°C, cP</th>
<th>EEW, g/eq</th>
<th>Acid number, mgKOH/g</th>
<th>Molecular Weight</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>Elastomer Content, %</th>
<th>Solids, %</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypro 1300X40 ETBN</td>
<td>18</td>
<td>1,450</td>
<td>N.A.</td>
<td>2,300</td>
<td>&lt;1.5</td>
<td>4,230</td>
<td>0.945</td>
<td>40</td>
<td>50 (styrene)</td>
<td>Toughening agent for vinyl ester, acrylic, UPE resins and composites. Improves crack-resistance and appearance in Sheet Molding Compounds (SMC).</td>
</tr>
</tbody>
</table>

* Viscosity and EEW reflect mid-point.
Methacrylate (vinyl) terminated butadiene (VTB) and butadiene-acrylonitrile (VTBNX) liquid rubber for low temperature toughness, impact resistance and improved resilience in acrylic adhesives, sealants and coatings and in vinyl ester composites. The new, LC versions have less color and are more stable for longer shelf life.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Acrylonitrile %</th>
<th>Acid Number, mgKOH/g</th>
<th>Viscosity* @ 27°C, cp</th>
<th>Molecular Weight</th>
<th>Functionality</th>
<th>Gardner Color, max</th>
<th>Glass Transition, Tg °C</th>
<th>Specific Gravity at 25°C, g/cc</th>
<th>Solubility Parameter, (cal/cm³)¹/₂</th>
<th>Solids, %</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypro 2000X168LC VTB</td>
<td>0.0</td>
<td>4.0</td>
<td>80,000</td>
<td>4,450</td>
<td>1.9</td>
<td>3</td>
<td>-80</td>
<td>0.929</td>
<td>8.40</td>
<td>100</td>
<td>Lowest Tg, lowest viscosity, most effective for lower temperature properties. More stable, less color.</td>
</tr>
<tr>
<td>Hypro 1300X33LC VTBNX</td>
<td>18.0</td>
<td>4.0</td>
<td>250,000</td>
<td>3,900</td>
<td>2.4</td>
<td>4</td>
<td>-49</td>
<td>0.967</td>
<td>8.90</td>
<td>100</td>
<td>Best balance of viscosity, low temperature properties and improved adhesion. More stable, less color.</td>
</tr>
<tr>
<td>Hypro 1300X43LC VTBNX</td>
<td>21.5</td>
<td>4.0</td>
<td>400,000</td>
<td>3,700</td>
<td>2.4</td>
<td>5</td>
<td>-45</td>
<td>0.981</td>
<td>9.09</td>
<td>100</td>
<td>Excellent improvement in adhesion, resilience, toughness. More stable, less color.</td>
</tr>
</tbody>
</table>

Hypro 2000X168LC is a developmental product and specification ranges are subject to change based on manufacturing history. Properties in the table reflect target properties only.

* Viscosity reflects mid-point.
### HyPox® Elastomer Modified Epoxy Resins

Elastomer modification to epoxy resins is a valuable way to merge the benefits of alternate polymer chemistry with the convenience of conventional 1 or 2 part epoxy handling and performance. CVC offers CTBN modification for toughening and chip resistance, Dimer Acid modification for flexibility and Urethane modification for adhesion to difficult surfaces.

These are grouped under the series designation:
- Dimer Acid Modified Epoxy Resins (HyPox D Series)
- Urethane Modified Epoxy Resins (HyPox U Series)
- CTBN Modified Resins (HyPox R Series)

Each resin system is further divided by resin base:  
* "A" for Bisphenol A, "F" for Novolacs and "M" for Glycols

#### Dimer Acid Modified Epoxies

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Elastomer Content %</th>
<th>Viscosity* at 52°C, cP</th>
<th>EEW,* g/eq</th>
<th>Gardner Color, max</th>
<th>Acid No., max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>HyPox DA323</td>
<td>40</td>
<td>50,000</td>
<td>660</td>
<td>12</td>
<td>0.1</td>
<td>Bis-A epoxy resin adduct with Dimer Acid. Semi-solid at room temperature. Improves impact resistance, thermal shock and has excellent compatibility with all standard resins and curing agents.</td>
</tr>
</tbody>
</table>

* Viscosity and EEW reflect mid-point.

#### Urethane Modified Epoxies

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Elastomer Content %</th>
<th>Viscosity* at 25°C, cP</th>
<th>EEW,* g/eq</th>
<th>Gardner Color, max</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>HyPox UA10</td>
<td>12</td>
<td>650,000</td>
<td>215</td>
<td>2</td>
<td>Improved adhesion to vinyl and other elastomers.</td>
</tr>
<tr>
<td>HyPox UA11</td>
<td>5</td>
<td>35,000</td>
<td>215</td>
<td>2</td>
<td>Improved adhesion to vinyl and other elastomers.</td>
</tr>
</tbody>
</table>

* Viscosity and EEW reflect mid-point.
### HyPox® Elastomer Modified Epoxy Resins (cont.)

#### CTBN Modified Epoxies

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Elastomer Content %</th>
<th>Viscosity* at 25°C, cP</th>
<th>EEW,* g/eq</th>
<th>Gardner Color, max</th>
<th>Acid Number, mgKOH/g</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bisphenol A Modified</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HyPox RA 95</td>
<td>5 - 7</td>
<td>22,500 @ 52°C</td>
<td>200</td>
<td>4</td>
<td>0.2</td>
<td>Bis-A epoxy resin adduct with solid CTBN for good high-temperature performance and green strength. Is used as a tackifier for adhesives and composites.</td>
</tr>
<tr>
<td>HyPox RA 840</td>
<td>40</td>
<td>190,000</td>
<td>340</td>
<td>10</td>
<td>0.1</td>
<td>Bis-A epoxy resin adduct with 1300X8 CTBN used as a reactive toughener to increase toughness, impact resistance, and peel adhesion in liquid Bis-A systems.</td>
</tr>
<tr>
<td>HyPox RA 1340</td>
<td>40</td>
<td>450,000</td>
<td>350</td>
<td>10</td>
<td>0.1</td>
<td>Bis-A epoxy resin adduct with 1300X13 CTBN used as a reactive toughener to increase toughness, impact resistance, and peel adhesion. Excellent compatibility in liquid Bis-A systems.</td>
</tr>
<tr>
<td>HyPox RA 16213</td>
<td>29</td>
<td>240,000 @ 27°C</td>
<td>265</td>
<td>—</td>
<td>1</td>
<td>Bis-A epoxy resin adduct with 2000X162 CTBN and 1300X13 CTBN. Best combination of rubber toughening and solubility with liquid epoxy with excellent properties at -40°C with Dicyandiamide cured adhesives.</td>
</tr>
<tr>
<td><strong>Bisphenol F Modified</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HyPox RF 1320</td>
<td>20</td>
<td>38,000</td>
<td>215</td>
<td>6</td>
<td>0.1</td>
<td>Bis-F epoxy resin adduct with 1300X13 CTBN to increase toughness, impact resistance, and peel adhesion for low-viscosity epoxy phenol novolac systems.</td>
</tr>
<tr>
<td>HyPox RF 1341</td>
<td>40</td>
<td>225,000</td>
<td>308</td>
<td>—</td>
<td>0.2</td>
<td>Bis-F epoxy resin adduct with 1300X13 CTBN. Higher rubber content for lower dosing level than RF1320 to increase toughness, impact resistance, and peel adhesion for low-viscosity epoxy phenol novolac systems.</td>
</tr>
<tr>
<td>HyPox RF 928</td>
<td>20</td>
<td>55,000</td>
<td>210</td>
<td>10</td>
<td>0.1</td>
<td>Epoxy Phenol Novlac resin adduct with 1300X13 CTBN with 2.3 functionality. Increases toughness, impact resistance, and peel adhesion for medium-viscosity, higher ( T_g ), epoxy phenol novolac systems.</td>
</tr>
<tr>
<td>HyPox RF 933</td>
<td>20</td>
<td>150,000</td>
<td>220</td>
<td>10</td>
<td>0.1</td>
<td>Epoxy Phenol Novlac resin adduct with 1300X13 CTBN with 2.6 functionality. Highest functionality for best chemical and heat resistance to increase toughness, impact resistance, and peel adhesion.</td>
</tr>
<tr>
<td><strong>Glycol Modified</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HyPox RM 20</td>
<td>50</td>
<td>6,000</td>
<td>290</td>
<td>10</td>
<td>0.1</td>
<td>Neopentyl Glycol Diglycidyl ether adduct with 1300X8 CTBN having lower viscosity than liquid Bis-A epoxy resin. Increases flexibility, impact resistance, resilience to fatigue and improves adhesion.</td>
</tr>
<tr>
<td>HyPox RM 22</td>
<td>50</td>
<td>20,000</td>
<td>340</td>
<td>10</td>
<td>0.1</td>
<td>Cyclohexanedimethanol Diglycidyl ether adduct with 1300X13 CTBN having higher viscosity and better compatibility than RM20. Increases flexibility, impact resistance, resilience to fatigue and improves adhesion.</td>
</tr>
<tr>
<td><strong>Solid Bisphenol A Modified</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HyPox RK 84L</td>
<td>32</td>
<td>—</td>
<td>1,375</td>
<td>Amber</td>
<td>—</td>
<td>Solid Bis-A epoxy resin modified 1300X13 CTBN useful as a reactive toughener for structural reinforcement in solid Bis-A systems.</td>
</tr>
<tr>
<td>HyPox RK 820</td>
<td>20</td>
<td>—</td>
<td>950</td>
<td>Amber</td>
<td>—</td>
<td>Solid Bis-A epoxy resin modified 1300X8 CTBN useful as a reactive toughener for structural reinforcement in solid Bis-A systems.</td>
</tr>
</tbody>
</table>

* Viscosity and EEW reflect mid-point.
OMICURE® Curing Agents, Accelerators & Catalysts

Accelerating the cure speed or lowering the cure temperature is the role of these versatile additions. Whether the need is for acceleration of Dicyandiamide (Dicy) and anhydrides or catalytic cures of epoxy resins, a CVC product is available to fit your needs for latency or cure profile.

These products include:
- Dicyandiamide (OMICURE DDA Series)
- Substituted Urea Accelerators for Dicyandiamide (OMICURE U Series)
- Boron-Based Catalysts (OMICURE B Series)

Curing Agents

Dicyandiamide Curing Agent – Typical use levels in DGEBA from 5-10 phr.

- Common curative for 1k epoxy systems
  - composites and prepregs
  - automotive, adhesives and coatings

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Onset Melting Point (°C)</th>
<th>Particle Size</th>
<th>Color</th>
<th>Typical Flow Control Content</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dicyandiamide Curing Agent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMICURE DDA 5</td>
<td>207-212</td>
<td>4μ &lt;2μ &lt;7μ &lt;10μ</td>
<td>White</td>
<td>2 to 3%</td>
<td>Ultra-fine particle size Dicyandiamide for the most critical applications. Provides for excellent dispersability, maximum reactivity, uniform cure, and low settling potential.</td>
</tr>
<tr>
<td>OMICURE DDA 10</td>
<td>207-212</td>
<td>12μ &lt;4μ &lt;11μ &lt;30μ</td>
<td>White</td>
<td>1.5 to 2.5%</td>
<td>Fine particle size with good dispersability, reactivity and uniform cure.</td>
</tr>
<tr>
<td>OMICURE DDA 50</td>
<td>207-212</td>
<td>21μ &lt;7μ &lt;16μ &lt;40μ</td>
<td>White</td>
<td>1.5 to 2.5%</td>
<td>Intermediate particle size product provides for cost effective, stable, one part systems for elevated temperature cure applications.</td>
</tr>
</tbody>
</table>

Aromatic Amine Curing Agent

<table>
<thead>
<tr>
<th>Product Name</th>
<th>MP, °C</th>
<th>Color</th>
<th>Use Level PHR</th>
<th>Gardner Color, max</th>
<th>Glass Transition, Tg °C</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aromatic Amine/Curing Agent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMICURE 33-DDS</td>
<td>167-175</td>
<td>Tan to Off-White</td>
<td>36</td>
<td>—</td>
<td>—</td>
<td>Safer replacement for MDA. 33-DDS cured systems can yield higher compressive strength, higher HDT and less brittleness than MDA.</td>
</tr>
</tbody>
</table>
OMICURE® Curing Agents, Accelerators & Catalysts (cont.)

OMICURE Substituted Urea Accelerators

Accelerators used with Dicyandiamide to lower required cure temperatures and increase speed of reaction

- Lower the reaction temperature and time for dicy-epoxy cure
  - reduces stability (shelf life) of mixed systems
- Optimum level = 1-5 phr

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Typical Melting Point (°C)</th>
<th>Color</th>
<th>Use level PHR with Dicyandiamide</th>
<th>Particle Size (Regular Grade)</th>
<th>Time to Double in Viscosity @ 25°C(weeks)</th>
<th>Time to Cure to 95% Full Cure(3)</th>
<th>Tg (°C)</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMICURE U-405M</td>
<td>126 - 136</td>
<td>off-white</td>
<td>1 - 5</td>
<td>80</td>
<td>10</td>
<td>22, 9</td>
<td>118</td>
<td>Phenyl Dimethyl Urea</td>
</tr>
<tr>
<td>OMICURE U-24M</td>
<td>180 - 195</td>
<td>off-white</td>
<td>1 - 5</td>
<td>80</td>
<td>10</td>
<td>20, 7</td>
<td>127</td>
<td>2,4-Toluene bis Dimethyl Urea - Isomer Grade</td>
</tr>
<tr>
<td>OMICURE U-410M</td>
<td>180 - 195</td>
<td>off-white</td>
<td>1 - 5</td>
<td>80</td>
<td>10</td>
<td>18, 7</td>
<td>123</td>
<td>80/20 Toluene bis Dimethyl Urea - Technical Grade</td>
</tr>
<tr>
<td>OMICURE U-52M</td>
<td>220 - 230</td>
<td>off-white</td>
<td>1 - 5</td>
<td>80</td>
<td>55</td>
<td>27, 12</td>
<td>127</td>
<td>4,4’-Methylene bis (phenyl dimethyl urea) Isomer Grade</td>
</tr>
<tr>
<td>OMICURE U-35M</td>
<td>190 - 210</td>
<td>off-white</td>
<td>1 - 5</td>
<td>80</td>
<td>134</td>
<td>46, 15</td>
<td>124</td>
<td>Cycloaliphatic bisurea</td>
</tr>
<tr>
<td>OMICURE U-210M</td>
<td>172 - 182</td>
<td>off-white</td>
<td>1 - 5</td>
<td>80</td>
<td>16</td>
<td>29, 15</td>
<td>121</td>
<td>N-(4-chlorophenyl) N, N-Dimethyl Urea</td>
</tr>
</tbody>
</table>

(1) with DGEBA (EEW=190) and dicy
(2) substituted urea @ 3phr; dicy @ 8phr; with DGEBA (EEW=190)
(3) Cure - DSC scan at 20°C/minute to 275°C, substituted urea @ 3phr; dicy @ 8phr, with DGEBA (EEW=190)
(4) some unmicronized products are available as made to order

Catalysts

<table>
<thead>
<tr>
<th>Product Name</th>
<th>MP, °C</th>
<th>Color</th>
<th>Use Level PHR</th>
<th>Gardner Color, max</th>
<th>Glass Transition, Tg, °C</th>
<th>Description / Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMICURE 24EMI</td>
<td>liquid</td>
<td>Brown</td>
<td>0.1-10(1)</td>
<td>16</td>
<td>—</td>
<td>Accelerator for Anhydrides and catalyst for high temperature epoxies. Faster reactivity vs. BDMA or tertiary amine substituted phenols.</td>
</tr>
<tr>
<td>OMICURE BC-120</td>
<td>25-35</td>
<td>Amber/Brown</td>
<td>0.1-10(1)</td>
<td>—</td>
<td>130(2)</td>
<td>Can be used as sole curing agent or as accelerator for Anhydrides, Dicyandiamide or Aromatic Amines. Clear, compatible formulations. Very long room temperature shelf life.</td>
</tr>
</tbody>
</table>

(1) low levels to accelerate acid anhydrides, mid-range or higher levels as sole curing agent. Determine optimum concentration empirically.
(2) with DGEBA, EEW=190; @ 8phr
EPALLOY® 9000
Tris hydroxyl phenyl ethane
CAS no: 87093-13-8

ERISYS® RDGE, RDGE-H
Resorcinol diglycidyl ether
CAS no: 101-90-6

EPALLOY® 5000
Hydrogenated Bisphenol-A diglycidyl ether
CAS no: 30583-72-3

EPALLOY® 5200
Hexahydro phthalic acid diglycidyl ester
CAS no: 5493-45-8

ERISYS® GA 240
Glycidyl amine of m-xylenediamine
CAS no: 63738-22-7

EPALLOY® 7200
Modified Bisphenol-A diglycidyl ether

EPALLOY® 8000 Series
Phenol novolac epoxy resin
ALIPHATIC MONOGLYCIDYL ETHERS

**ERISYS® GE 5**
- n-Butyl glycidyl ether
- CAS no: 2426-08-6

**ERISYS® GE 6**
- 2-Ethyl hexyl glycidyl ether
- CAS no: 2461-15-6

**ERISYS® GE 7**
- p-tert butyl glycidyl ether
- CAS no: 3101-60-8

**ERISYS® GE 8**
- 1,4-Butanediol diglycidyl ether
- CAS no: 2425-79-8

**ERISYS® GE 10**
- Cresyl glycidyl ether
- CAS no: 2210-79-9

**ERISYS® GE 11**
- p-tert butyl glycidyl ether
- CAS no: 3101-60-8

**ERISYS® GE 13**
- Phenyl glycidyl ether
- CAS no: 122-60-1

**AROMATIC MONOGLYCIDYL ETHERS**

**ERISYS® GE 10**
- Cresyl glycidyl ether
- CAS no: 2210-79-9

**ERISYS® GE 11**
- p-tert butyl glycidyl ether
- CAS no: 3101-60-8

**ERISYS® GE 13**
- Phenyl glycidyl ether
- CAS no: 122-60-1

ALIPHATIC DIGLYCIDYL ETHER MODIFIERS

**ERISYS® GE 21**
- 1,4-Butanediol diglycidyl ether
- CAS no: 2425-79-8

**ERISYS® GE 22 & 22S**
- 1,4-Cyclohexane dimethanol diglycidyl ether
- CAS no: 14228-73-0

**ERISYS® GE 24**
- Polypropylene glycol(400) diglycidyl ether
- CAS no: 26142-30-3

**ERISYS® GE 25**
- 1,6-Hexanediol diglycidyl ether
- CAS no: 16096-31-4

**ERISYS® GE 29**
- Dibromo Neopentyl glycol diglycidyl ether
- CAS no: 31452-80-9

**ERISYS® EGDGE**
- Ethylene glycol diglycidyl ether
- CAS no: 2224-15-9
Chemical Structures (cont.)

ALIPHATIC TRIGLYCIDYL ETHER MODIFIERS

ERISYS® GE 30
Trimethylol propane triglycidyl ether
CAS no: 30499-70-8

ERISYS® GE 31
Trimethylol ethane triglycidyl ether
CAS no: 68460-21-9

ERISYS® GE 35 & 35H
Castor oil glycidyl ether
CAS no: 74398-71-3

ERISYS® GE 36
Propoxylated glycol triglycidyl ether
CAS no: 37237-76-6
Approximate MW = 2000

ERISYS® GE 38
Poly glycerol-3-polyglycidyl ether
CAS no: 118549-88-5

ERISYS® GE 31
Trimthylol ethane triglycidyl ether
CAS no: 68460-21-9

ERISYS® GE 8
C12-C14 glycidyl ether
CAS no: 68609-97-2

POLYFUNCTIONAL GLYCIDYL ETHER

ERISYS® GE 40
Pentaerythritol polyglycidyl ether
CAS no: 30973-88-7

GLYCIDYL ESTER MODIFIERS

ERISYS® GS 110
Glycidyl ester of neodecanoic acid
CAS no: 26761-45-5

ERISYS® GE 60 & GE 61 (100% water soluble)
Sorbitol polyglycidyl ether
CAS no: 68412-01-1

ERISYS® GS 120
Dimer Acid Diglycidyl Ester
CAS no: 68475-94-5
Chemical Structures (cont.)
OMICURE® SUBSTITUTED UREA ACCELERATORS

OMICURE® U-210M
CAS no: 150-68-5

OMICURE® U-405M
CAS no: 101-42-8

OMICURE® U-35M
CAS no: 39992-90-0

OMICURE® U-24M
CAS no: 17526-94-2

OMICURE® U-52M
CAS no: 10097-09-3

OMICURE® U-24M & U-410M
CAS no: 17526-94-2

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