Since 1984, Petroferm has been a pioneer in vapor degreasing technologies and alternatives. We are proud to offer an extensive range of products designed to operate in open-top and vacuum vapor degreasers. Our products are excellent drop-in replacements for most chlorinated (TCE, PERC, MC) and hydrochlorofluorocarbon (HCFC) operations.

### LENIIUM nPB SERIES

LENIIUM® ES, LENIIUM GS and LENIIUM XS Solvents are aggressive, non-flammable vapor degreasing products based on n-propyl bromide (nPB). Safe to use on aluminum, titanium, copper, nickel and other metal alloys, these products are very effective in metal cleaning applications including the removal of adhesives, buffing compounds, greases, hydraulic fluids, inks, oils, particulates, resins and waxes. LENIIUM ES is also recommended for electronics cleaning applications requiring the removal of solder paste residues and ionic contaminants from circuit assemblies and components. LENIIUM XS contains additional stabilizer which decreases the risks of the solvent becoming acidic and increases the time intervals between solvent change outs. All three solvents are approved by the US EPA under the Significant New Alternatives Policy (SNAP) program as an alternative to ozone depleting substances.

### LENIIUM F SERIES

LENIIUM FHD, LENIIUM FEC and LENIIUM FRA Solvents are non-flammable vapor degreasing products based on hydrofluorocarbons (HFCs). Safe for use on aluminum, titanium, copper, nickel and other metals as well as most plastics. LENIIUM FHD and LENIIUM FEC effectively remove oils, greases, metalworking and fluorinated fluids as well as polishing compounds. LENIIUM FEC is also effective in electronics cleaning applications removing solder flux residues, pastes and ionic contaminants from circuit assemblies and components. LENIIUM FRA is a milder, VOC-exempt solvent recommended for light duty cleaning and as rinse agent in Petroferm’s patented co-solvent vapor degreasing process as well as bi-solvent cleaning processes. All three products are composed of SNAP-Approved components.

### CO-SOLVENT VAPOR DEGREASING

Co-solvent vapor degreasing using SOLVAG™ Solvating Agents and LENIIUM FRA is particularly suited for dual sump vapor degreasers where conventional vapor degreasing solvents can not be used for performance, environmental or materials compatibility reasons. SOLVAG Solvating Agents, such as SOLVAG SA-24 and SOLVAG SA-70, are selected based on soils of the electronics or metal cleaning processes. Simply adjusting the ratio of these two components in the boil sump allows one to modify the solvency and temperature of the process (see co-solvent ratio chart). SOLVAG Solvating Agents are also compatible with most HFE- based rinse agents.
### Mono-Solvent Comparison – Operating Parameters

<table>
<thead>
<tr>
<th>Properties</th>
<th>Bromine</th>
<th>Fluorine</th>
<th>Chlorine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LENIUM ES</td>
<td>LENIUM GS</td>
<td>LENIUM XS</td>
</tr>
<tr>
<td>Flash Point None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Boiling Point °F / ºC</td>
<td>154 / 68</td>
<td>160 / 71</td>
<td>196 / 90</td>
</tr>
<tr>
<td>Specific Gravity @25°C</td>
<td>1.25</td>
<td>1.32</td>
<td>1.31</td>
</tr>
<tr>
<td>Surface Tension (dyn/cm)</td>
<td>25.9</td>
<td>25.9</td>
<td>25.9</td>
</tr>
<tr>
<td>Vapor Pressure @20°C (mm Hg)</td>
<td>110.8</td>
<td>110.8</td>
<td>110.8</td>
</tr>
<tr>
<td>Specific Heat @25°C (Cal/gm°C)</td>
<td>0.27</td>
<td>0.27</td>
<td>0.27</td>
</tr>
<tr>
<td>Heat of Vaporization (Cal/g)</td>
<td>58.8</td>
<td>58.8</td>
<td>58.8</td>
</tr>
<tr>
<td>Solubility in Water (ppm)</td>
<td>≤2400</td>
<td>2400</td>
<td>2400</td>
</tr>
</tbody>
</table>

### Mono-Solvent Comparison – Environmental, Health and Safety

<table>
<thead>
<tr>
<th>Regulatory</th>
<th>LENIUM ES</th>
<th>LENIUM GS</th>
<th>LENIUM XS</th>
<th>LENIUM FHD</th>
<th>LENIUM FEC</th>
<th>LENIUM FRA</th>
<th>HCFC 225</th>
<th>TCE</th>
<th>PERC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure Limit, 8 hr TWA (ppm)</td>
<td>ACGIH - 10</td>
<td>Mgr - 25</td>
<td>ACGIH - 10</td>
<td>Mgr - 25</td>
<td>ACGIH - 200</td>
<td>Mgr - 25</td>
<td>ACGIH - 10</td>
<td>Mgr - 25</td>
<td>Mgr - 25</td>
</tr>
<tr>
<td>Ozone Depletion Potential (ODP)</td>
<td>0.013-0.018</td>
<td>0.013-0.018</td>
<td>0.013-0.018</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.003</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Global Warming Potential (GWP)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>990</td>
<td>990</td>
<td>990</td>
<td>370</td>
<td>&lt;9</td>
<td>&lt;9</td>
</tr>
<tr>
<td>Volatile Organic Compounds (VOC, g/l)</td>
<td>1250</td>
<td>1320</td>
<td>1310</td>
<td>589</td>
<td>593</td>
<td>Exempt</td>
<td>Exempt</td>
<td>1460</td>
<td>Exempt</td>
</tr>
<tr>
<td>SNAP Approved</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hazardous Air Pollutant (HAP)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Co-Solvent Comparison – Operating Temperatures for Various Solvating Agent/Rinse Agent Ratios (Vol%)

<table>
<thead>
<tr>
<th>Co-Solvent Comparison</th>
<th>LENIUM FRA SOLVAG SA-24/</th>
<th>LENIUM FRA SOLVAG SA-70/</th>
<th>LENIUM FRA SOLVAG ES/</th>
<th>LENIUM FRA AXAREL 9100/</th>
</tr>
</thead>
<tbody>
<tr>
<td>40/60</td>
<td>114 °F (46 °C)</td>
<td>118 °F (48 °C)</td>
<td>115.6 °F (46 °C)</td>
<td>112.6 °F (45 °C)</td>
</tr>
<tr>
<td>50/50</td>
<td>122 °F (50 °C)</td>
<td>124 °F (51 °C)</td>
<td>116 °F (47 °C)</td>
<td>113.4 °F (45 °C)</td>
</tr>
<tr>
<td>60/40</td>
<td>132 °F (56 °C)</td>
<td>130 °F (54 °C)</td>
<td>116.6 °F (47 °C)</td>
<td>113.8 °F (45 °C)</td>
</tr>
<tr>
<td>70/30</td>
<td>145 °F (63 °C)</td>
<td>138 °F (59 °C)</td>
<td>117.6 °F (48 °C)</td>
<td>115.2 °F (46 °C)</td>
</tr>
<tr>
<td>80/20</td>
<td>165 °F (74 °C)</td>
<td>152 °F (67 °C)</td>
<td>128 °F (53 °C)</td>
<td>122 °F (50 °C)</td>
</tr>
</tbody>
</table>