Performance Products
JEFFCAT® catalysts
For the polyurethane industry – Europe, Africa & Middle East
Huntsman’s large and growing family of unique industry-leading JEFFCAT® catalysts brings strength, power and speed to a wide range of urethane applications. The widespread use of these catalysts in making polyether and polyester foams, coatings, elastomers, and high-modulus urethane plastics, attests to the value of our advanced technologies and our 40-plus years of experience with urethane chemicals.

<table>
<thead>
<tr>
<th>JEFFCAT® catalyst</th>
<th>Description</th>
<th>Typical Properties</th>
<th>Typical Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL PURPOSE CATALYSTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZF-20</td>
<td>Bio-Dimethylaminomethoxyether -- A very strong, highly efficient blowing catalyst.</td>
<td>189</td>
<td>Flexible Foam Slabstock Molded Ester Ether HNLMolded Matelastics RIM, RIM, Rigid Foam (PUR) Packaging Foam Rigid Foam (PUR)</td>
</tr>
<tr>
<td>ZF-22</td>
<td>5% ZF-20 in dipropylene glycol</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td>ZF-24</td>
<td>12.5% ZF-20 in dipropylene glycol</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>ZF-25</td>
<td>17.5% ZF-20 in dipropylene glycol</td>
<td>207</td>
<td></td>
</tr>
<tr>
<td>DMEA</td>
<td>N,N-dimethyl ethanolamine</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td>TD-100</td>
<td>Triethylene diamine</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>TD-33A</td>
<td>33% TD-100 in dipropylene glycol</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>TD-EG</td>
<td>33.3% TD-100 in monoethylene glycol</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>BDMA</td>
<td>Benzylidinemethane</td>
<td>181</td>
<td></td>
</tr>
<tr>
<td>DMCHA</td>
<td>N,N-dimethyl cyclohexylamine -- Widely used catalyst for all types of rigid foams.</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>PMDETA</td>
<td>Pentamethyldiethylenetriamine -- Especially useful as catalyst for HCF/CI-based rigid foams.</td>
<td>201</td>
<td></td>
</tr>
<tr>
<td>ZR-40</td>
<td></td>
<td>227</td>
<td></td>
</tr>
<tr>
<td>Z-80</td>
<td>N,N,N',N'',N''-pentamethyldipropylene triamine--Low odor catalyst with a good balance between gel, Used in rigid and flexible foam applications.</td>
<td>227</td>
<td></td>
</tr>
<tr>
<td><strong>FLEXIBLE POLYESTER FOAM CATALYSTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEM</td>
<td>N-ethylethylmorpholine -- Promotes surface cure for flexible polyester foams and excellent processing in polyester-based flexible foams.</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>NMM</td>
<td>N-methylethylmorpholine -- Good solidifier in making polyester foams. Also useful in high vis rigid molded applications.</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>DMP</td>
<td>Dimethylpiperazine -- Good catalyst in making polyester foams. Also promotes surface cure in different applications.</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>MM-70</td>
<td>Reduced odor amine catalyst blend for flexible polyester foams.</td>
<td>157</td>
<td></td>
</tr>
<tr>
<td>DM-70</td>
<td>Improves green strength and can be used for charcoal polyester-based flexible foams.</td>
<td>151</td>
<td></td>
</tr>
</tbody>
</table>

* initial boiling point  ‡ with decomposition  † theoretical OH Number including polyol, amine, acid and water functionalities  n.d. not determined
### LOW EMISSION CATALYSTS / REACTIVE CATALYSTS

<table>
<thead>
<tr>
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<tr>
<td>ZF-10</td>
<td>N,N,N′-trimethyl-N′-hydroxyethyl-1,3-propanediamine -- Blowing, catalytic activity catalyst that is highly efficient. Used in foams requiring low emissions.</td>
<td>CH Number = 295</td>
<td>Rigid Foam (PIR) Coatings, Adhesives, Elastomers, RIM, RRIM, Microcellular, Blended, Thin-Film, Bonding, Rigid Foam (PUR), Flexible Foam, One-Component Systems</td>
</tr>
<tr>
<td>LE-60</td>
<td>Reactive blowing catalyst used in foams requiring low emissions.</td>
<td>Viscosity @35°C = 384</td>
<td>[\text{specific gravity} ]</td>
</tr>
<tr>
<td>LE-310</td>
<td>Low emission reactive gel catalyst blend which can replace JEFFCAT® TD-33A on an equivalent part basis. Can be used in a wide variety of flexible slabstock and high-resiliency (HR) foam grades.</td>
<td>Boiling Point = 514</td>
<td>[\text{microcellulars, elastomers, rim, rrim, rigid foam (pur), flexible foam, one-component systems} ]</td>
</tr>
<tr>
<td>Z-131</td>
<td>Formulated reactive amine catalyst blend. Excellent gel catalyst for low emissions automotive and flexible foam applications.</td>
<td>Flash Point = 407</td>
<td>[\text{spray foam, rigid} ]</td>
</tr>
<tr>
<td>LE-425</td>
<td>Formulated low emission catalyst blend with balanced gel and blow characteristics.</td>
<td>Viscosity @35°C = 460</td>
<td>[\text{one-component} ]</td>
</tr>
</tbody>
</table>

### SPECIALTY AMINE CATALYSTS

<table>
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<tr>
<td>DPA</td>
<td>N,N,N′-trimethyl-N′-hydroxyethyl-1,3-propanediamine -- Blowing, catalytic activity catalyst that is highly efficient. Used in foams requiring low emissions.</td>
<td>Flash Point = 514</td>
<td>Flex</td>
</tr>
</tbody>
</table>
Auxiliary products

**JEFFAMINE® polyetheramines**
In RIM reaction injection molding technology, the use of JEFFAMINE® polyetheramines can improve various physical characteristics such as thermal, abrasion and impact resistance, tear strength, solvent stability and dynamic fatigue. Similar characteristics are also seen in more standard polyurethane foam systems. The typically-used materials are JEFFAMINE® D-2000 and JEFFAMINE® T-5000 amines.

JEFFAMINE® polyetheramines, due to their very fast reaction with isocyanates, provide an extremely quick, un-catalyzed exotherm in the foam. This phenomenon can be termed a thermo-kick. This effect is most helpful in cold ambient temperatures or where heat losses have to be overcome, such as with cold substrates, molds and highly-filled systems. The very rapid primary amine/isocyanate reaction can also be utilized when it is beneficial to build cross linking and thixotropy quickly into the system. The thermo-kick is strongest with a low molecular weight diamine such as JEFFAMINE® D-230 or JEFFAMINE® D-400 amine, whilst JEFFAMINE® T-403 amine will give a greater degree of cross-linking and a quicker thixotropic effect, as a result being tri-functional and highly branched.

**JEFFSOL® propylene carbonate**
Propylene carbonate acts as an excellent solvent for both isocyanate and polyols. It can be used both as a compatibiliser for systems and as a highly effective viscosity depressant.

**Cleaning solvents**
Huntsman has developed a range of environmentally-friendly, biodegradable, high solvency power solvents, which can be efficiently used in the polyurethane industry. Solvent C 500 is an excellent solvent system to reduce the viscosity of formulations, the product has also proven to be successful as a cleaner solvent for isocyanate prepolymermers. Resin Cleaner KM was developed for the removal of uncured or partially cured polyurethane compounds from tools, mixing heads or for flushing lines. Solvent 1581 is a low-VOC solvent system with high solvency power developed for use in cleaning applications.

**Specialty catalyst blends**
In addition to the standard products, a range of specialty amine catalysts has been formulated to meet specific technical requirements. Additional formulated catalyst blends may be produced to satisfy customer needs.
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