ENGAGE™ Polyolefin Elastomers

Product Selection Guide

ENGAGE™ Polyolefin Elastomers (POEs) are designed to offer customers improved impact performance, melt strength, and processability over a broad spectrum of markets and applications. They can offer exceptional performance and a unique balance of properties when used alone or in blends and compounds. The grade breadth includes ethylene octene and ethylene butene copolymers over a wide range of densities and melt flow rates.

In addition, the ENGAGE™ HM POE product line places increased emphasis on high melt strength and toughness. And, our most recent innovation – ENGAGE™ XLT POE – offers opportunities to produce lighter, thinner thermoplastic olefin (TPO) parts with increased stiffness, comparable impact strength, improved fit and finish, and reduced cycle times versus the leading impact modifier.

Figure 1: ENGAGE™ Polyolefin Elastomers Products

- Ethylene Octene
- Ethylene Butene
- ENGAGE™ XLT
- ENGAGE™ HM

<table>
<thead>
<tr>
<th>Grade</th>
<th>Melt Index, g/10 min (2.16 kg @ 190°C)</th>
<th>Density, g/cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM 7256</td>
<td>0.860</td>
<td>0.890</td>
</tr>
<tr>
<td>ENR™ 7256</td>
<td>0.860</td>
<td>0.890</td>
</tr>
<tr>
<td>XLT 8677</td>
<td>0.860</td>
<td>0.890</td>
</tr>
<tr>
<td>HM 7487</td>
<td>0.860</td>
<td>0.890</td>
</tr>
<tr>
<td>XLT 8677</td>
<td>0.860</td>
<td>0.890</td>
</tr>
</tbody>
</table>

- Ethylene Octene
- Ethylene Butene
- ENGAGE™ XLT
- ENGAGE™ HM

More Elastomeric

(1) All grades shown are commercialized as ENGAGE™ Polyolefin Elastomer products, except for grades noted as ENR.
(2) Typical properties; not to be construed as specifications. Users should confirm results by their own tests.
(3) ENR designates a developmental grade. If products are described as “experimental” or “developmental,” (1) product specifications may not be fully determined; (2) analysis of hazards and caution in handling and use are required; (3) there is greater potential for Dow to change specifications and/or discontinue production; and (4) although Dow may from time to time provide samples of such products, Dow is not obligated to supply or otherwise commercialize such products for any use or application whatsoever.

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Innovative Solutions for Your Processes and Applications

Designed to improve impact performance, melt strength, or overall processability, ENGAGE™ Polyolefin Elastomers are available in a wide range of grades to meet the most demanding processing and performance needs. They are compatible with most olefinic materials and offer unique capabilities that can enhance your product. Applications include: automotive TPOs; plastics modification; thermoplastic elastomers (TPEs); wire and cable coatings; consumer goods; foams; footwear; noise vibration harshness (NVH) applications; and extrusion or injection molded goods. Some of the features and benefits relative to these applications follow.

Soft and Hard TPO Compounds

- Excellent physical properties including elasticity, toughness, and low temperature ductility
- High melt strength grades that enhance extrusion thermoform processing and reduce surface gloss
- High-efficiency grades, including ENGAGE™ XLT POEs, for superior impact performance

Wire and Cable Coatings

- Enhance physical properties when combined with fillers or when peroxide- or irradiation-crosslinked

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Table 1: Typical Properties of ENGAGE™ POE Ethylene Octene Grades

<table>
<thead>
<tr>
<th>Property</th>
<th>8842(2)</th>
<th>8180(2)</th>
<th>8130(2)</th>
<th>8150(2)</th>
<th>8100(2)</th>
<th>8200(2)</th>
<th>8400(2)</th>
<th>8407(2)</th>
<th>8452</th>
<th>8411</th>
<th>8003</th>
<th>8401</th>
<th>8440</th>
<th>8450</th>
<th>8402</th>
<th>8540</th>
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<tbody>
<tr>
<td>Ethylene Octene Grades</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density, g/cm³ ASTM D792</td>
<td>0.857</td>
<td>0.863</td>
<td>0.864</td>
<td>0.868</td>
<td>0.870</td>
<td>0.870</td>
<td>0.875</td>
<td>0.880</td>
<td>0.885</td>
<td>0.897</td>
<td>0.902</td>
<td>0.902</td>
<td>0.902</td>
<td>0.902</td>
<td>0.908</td>
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<td>Melt Index, g/10 min (2.16 kg @ 190°C) ASTM D1238</td>
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<td>13</td>
<td>0.5</td>
<td>1</td>
<td>5</td>
<td>30</td>
<td>3</td>
<td>18</td>
<td>1</td>
<td>30</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
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<td>Mooney Viscosity Mu (ML 1+4 @ 121°C) ASTM D1646</td>
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<td>37</td>
<td>4</td>
<td>33</td>
<td>24</td>
<td>8</td>
<td>2</td>
<td>11</td>
<td>3</td>
<td>23</td>
<td>2</td>
<td>13</td>
<td>20</td>
<td>10</td>
<td>2</td>
<td>20</td>
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<tr>
<td>Total Crystallinity, % ASTM D2240</td>
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<td>16</td>
<td>13</td>
<td>16</td>
<td>18</td>
<td>19</td>
<td>21</td>
<td>20</td>
<td>24</td>
<td>25</td>
<td>25</td>
<td>27</td>
<td>33</td>
<td>29</td>
<td>34</td>
<td>34</td>
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<tr>
<td>Durometer Hardness (Shore A) ASTM D2240</td>
<td>54</td>
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<td>63</td>
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<td>73</td>
<td>66</td>
<td>72</td>
<td>74</td>
<td>81</td>
<td>84</td>
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<td>86</td>
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<td>90</td>
<td>88</td>
<td>90</td>
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<tr>
<td>Durometer Hardness (Shore D) ASTM D2240</td>
<td>11</td>
<td>16</td>
<td>13</td>
<td>20</td>
<td>22</td>
<td>17</td>
<td>20</td>
<td>24</td>
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<td>36</td>
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<tr>
<td>DSC Melting Peak, °C Rate 10°C/min ASTM D1003(3)</td>
<td>38</td>
<td>47</td>
<td>56</td>
<td>55</td>
<td>60</td>
<td>59</td>
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<td>93</td>
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<td>97</td>
<td>96</td>
<td>104</td>
</tr>
<tr>
<td>Haze, % ASTM D1003(3)</td>
<td>N.D.</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>11</td>
<td>17</td>
<td>23</td>
<td>45</td>
<td>56</td>
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<tr>
<td>2% Secant Flexural Modulus, MPa ASTM D790</td>
<td>4.0</td>
<td>7.7</td>
<td>7.3</td>
<td>14.4</td>
<td>13.1</td>
<td>10.8</td>
<td>10.5</td>
<td>16.8</td>
<td>20.5</td>
<td>32.6</td>
<td>30.6</td>
<td>54.3</td>
<td>81.5</td>
<td>78.3</td>
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<td>107.8</td>
</tr>
<tr>
<td>Ultimate Tensile Strength, MPa (508 mm/min) ASTM D638</td>
<td>3.0</td>
<td>6.3</td>
<td>2.4</td>
<td>9.5</td>
<td>9.76</td>
<td>5.7</td>
<td>2.8</td>
<td>11.2</td>
<td>7.3</td>
<td>18.2</td>
<td>8.5</td>
<td>20.4</td>
<td>24.8</td>
<td>22.4</td>
<td>11.3</td>
<td>27.9</td>
</tr>
<tr>
<td>Ultimate Tensile Elongation, % (508 mm/min) ASTM D638</td>
<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;600</td>
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<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;600</td>
</tr>
</tbody>
</table>

1) Typical properties only, compression molded samples; not to be construed as specifications. Users should confirm results by their own tests.
2) This grade is talc dusted for improved product handling; properties may be measured before the addition of talc.
3) ENGAGE™ 8400 Polyolefin Elastomer is available in the European region. ENGAGE™ 8407 Polyolefin Elastomer is available globally.
4) Dow Method. Test protocols and additional information available upon request.
5) Haze measured only for non-talc containing products. "N.D." indicates no data available.
### General Purpose
- Improve look and feel of soft and hard goods
- Lighter weight, more flexible parts
- Improve resiliency for foam applications
- Excellent filler acceptance for masterbatch applications

### Extrusion Applications
- Tough, yet flexible
- Several extrusion grades are available for faster extrusion rates for more parts production per cycle
- Excellent clarity and low haze
- High melt strength grades available for improved forming capability

### Injection Molding Applications
- Better impact resistance properties and performance
- Excellent adhesion to other polyolefins for overmolding

### Excellent Processability
- Versatility for use in thermoplastic and thermoset applications
- Can be used as a “neat” polymer or as a value-enhancing ingredient in compound formulations

### Differentiated HM grades offer melt strength and shear thinning for extrusion, thermoforming, and blow molding applications
- ENGAGED™ XLT POEs help reduce cycle times via improved flow and faster setting
- Compatible with most olefins
- Pellet form for easy handling, mixing, forming, and processing on plastic or rubber equipment
- Recyclable for in-process scrap re-use advantages and for environmental sustainability

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**Table 2: Typical Properties of ENGAGE™ POE Ethylene Butene, HM, and XLT Grades**

<table>
<thead>
<tr>
<th>Property</th>
<th>Ethylene Butene Grades</th>
<th>HM Grades</th>
<th>XLT Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density, g/cm³ ASTM D792</td>
<td>0.862</td>
<td>0.860</td>
<td>0.861</td>
</tr>
<tr>
<td>Melt Index, g/10 min (2.16 kg @ 190°C) ASTM D1238</td>
<td>1.2</td>
<td>5</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>Mooney Viscosity, MU (ML 1+4 @ 121°C) ASTM D1646</td>
<td>19</td>
<td>24</td>
<td>45</td>
</tr>
<tr>
<td>Total Crystallinity, %</td>
<td>12</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Durometer Hardness (Shore A) ASTM D2240</td>
<td>52</td>
<td>65</td>
<td>88</td>
</tr>
<tr>
<td>DSC Melting Peak, °C Rate 10°C/min</td>
<td>34</td>
<td>64</td>
<td>99</td>
</tr>
<tr>
<td>Glass Transition Temperature, °C DSC Inflection Point</td>
<td>-58</td>
<td>-51</td>
<td>31</td>
</tr>
<tr>
<td>Haze, % ASTM D1003</td>
<td>N.D.</td>
<td>6</td>
<td>N.D.</td>
</tr>
<tr>
<td>2% Secant Flexural Modulus, MPa ASTM D790</td>
<td>4</td>
<td>14.2</td>
<td>25.3</td>
</tr>
<tr>
<td>Ultimate Tensile Strength, MPa (508 mm/min) ASTM D638</td>
<td>2.0</td>
<td>5.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Ultimate Tensile Elongation, % (508 mm/min) ASTM D638</td>
<td>&gt;600</td>
<td>&gt;600</td>
<td>&gt;1000</td>
</tr>
</tbody>
</table>

---

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(4) Measured at 150°C.

(5) Dow Method. Test protocols and additional information available upon request.

(6) Haze measured only for non-talc containing products. "N.D." indicates no data available.

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