



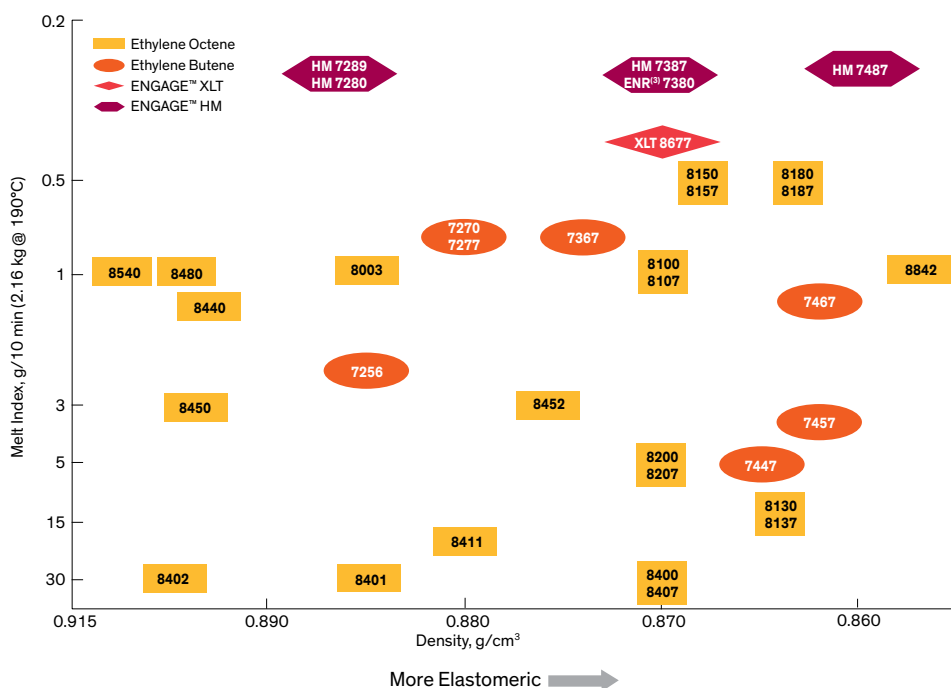
ENGAGE™ Polyolefin Elastomers

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^(1,2)



⁽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.

ENGAGE™
POLYOLEFIN ELASTOMERS

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

Ethylene Octene Grades																
Property	8842 ⁽²⁾	8180 8187 ⁽²⁾	8130 8137 ⁽²⁾	8150 8157 ⁽²⁾	8100 8107 ⁽²⁾	8200 8207 ⁽²⁾	8400 ⁽³⁾ 8407 ^(2,3)	8452	8411	8003	8401	8440	8480	8450	8402	8540
Density, g/cm ³ ASTM D792	0.857	0.863	0.864	0.868	0.870	0.870	0.870	0.875	0.880	0.885	0.885	0.897	0.902	0.902	0.902	0.908
Melt Index, g/10 min (2.16 kg @ 190°C) ASTM D1238	1	0.5	13	0.5	1	5	30	3	18	1	30	1.6	1	3	30	1
Mooney Viscosity, MU (ML 1+4 @ 121°C) ASTM D1646	25	37	4	33	24	8	2	11	3	23	2	13	20	10	2	20
Total Crystallinity, % ⁽⁴⁾	13	16	13	16	18	19	21	20	24	25	25	27	33	29	34	34
Durometer Hardness (Shore A) ASTM D2240	54	63	63	70	73	66	72	74	81	84	84	86	89	90	88	90
Durometer Hardness (Shore D) ASTM D2240	11	16	13	20	22	17	20	24	27	31	26	36	42	43	34	47
DSC Melting Peak, °C Rate 10°C/min ⁽⁴⁾	38	47	56	55	60	59	65	66	76	77	80	93	99	97	96	104
Glass Transition Temperature, °C DSC Inflection Point ⁽⁴⁾	-58	-55	-55	-52	-52	-53	-54	-51	-50	-46	-47	-33	-31	-32	-36	-32
Haze, % ASTM D1003 ⁽⁵⁾	N.D.	2	3	4	9	2	5	2	8	10	6	11	17	23	45	56
2% Secant Flexural Modulus, MPa ASTM D790	4.0	7.7	7.3	14.4	13.1	10.8	10.5	16.8	20.5	32.6	30.6	54.3	81.5	78.3	72.0	107.8
Ultimate Tensile Strength, MPa (508 mm/min) ASTM D638	3.0	6.3	2.4	9.5	9.76	5.7	2.8	11.2	7.3	18.2	8.5	20.4	24.8	22.4	11.3	27.9
Ultimate Tensile Elongation, % (508 mm/min) ASTM D638	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600	>600

⁽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.

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

Table 2: Typical Properties of ENGAGE™ POE Ethylene Butene, HM, and XLT Grades⁽¹⁾

Property	Ethylene Butene Grades						HM Grades				XLT Grade
	7467 ⁽²⁾	7457 ⁽²⁾	7447 ⁽²⁾	7367 ⁽²⁾	7270 7277 ⁽²⁾	7256	HM 7487 ⁽²⁾	HM 7387 ⁽²⁾ ENR ⁽³⁾ 7380	HM 7280	HM 7289	XLT 8677 ⁽²⁾
Density, g/cm ³ ASTM D792	0.862	0.862	0.865	0.874	0.880	0.885	0.860	0.870	0.884	0.891	0.870
Melt Index, g/10 min (2.16 kg @ 190°C) ASTM D1238	1.2	3.6	5	0.8	0.8	2.5	<0.5	<0.5	<0.5	<0.5	0.5
Mooney Viscosity, MU (ML 1+4 @ 121°C) ASTM D1646	19	9	7	24	24	13	47	54	42 ⁽⁴⁾	74 ⁽⁴⁾	45
Total Crystallinity, % ⁽⁵⁾	12	12	13	16	19	23	13	16	25	28	13
Durometer Hardness (Shore A) ASTM D2240	52	50	64	65	80	84	58	66	84	88	51
Durometer Hardness (Shore D) ASTM D2240	12	12	12	23	26	30	14	22	29	31	11
DSC Melting Peak, °C Rate 10°C/min ⁽⁵⁾	34	40	35	51	64	76	37	50	99	99	118
Glass Transition Temperature, °C DSC Inflection Point ⁽⁵⁾	-58	-56	-53	-51	-44	-42	-57	-52	-46	-52	-65
Haze, % ASTM D1003 ⁽⁶⁾	N.D.	N.D.	N.D.	N.D.	3	6	N.D.	56	N.D.	N.D.	N.D.
2% Secant Flexural Modulus, MPa ASTM D790	4	4.7	7.6	14.2	22.1	33.6	1.2	11.5	25.3	43.5	6.3
Ultimate Tensile Strength, MPa (508 mm/min) ASTM D638	2.0	1.8	2.4	5.2	13.9	9.3	2.4	9.1	5.1	3.7	3.0
Ultimate Tensile Elongation, % (508 mm/min) ASTM D638	>600	>600	>600	>600	>600	>600	>600	>600	310	200	>1000

⁽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⁾ 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.

⁽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.

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 master-batch 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
- ENGAGE™ 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

North America		Europe/Middle East	00 800 3694 6367	dow.com
U.S. & Canada	1 800 441 4369		00 31 115 672626	dowelastomers.com
	1 989 832 1426	Italy	800 783 825	
Mexico	+ 1 800 441 4369	South Africa	00 800 99 5078	
Latin America		Asia Pacific	+ 800 7776 7776	
Argentina	+ 54 11 4319 0100		+ 603 7965 5392	
Brazil	+ 55 11 5188 9000		+ 86 21 3851 4988	
Colombia	+ 57 1 219 6000	China	+ 400 889 0789	
Mexico	+ 52 55 5201 4700			

The principles of Responsible Care® and Sustainable Development influence the production of printed literature for The Dow Chemical Company ("Dow"). As a contribution towards the protection of our environment, Dow's printed literature is produced in small quantities and on paper containing recovered/post-consumer fiber and using 100 percent soy-based ink whenever possible.

NOTICE: Any photographs of end-use applications in this document represent potential end-use applications but do not necessarily represent current commercial applications, nor do they represent an endorsement by Dow of the actual products. Further, these photographs are for illustration purposes only and do not reflect either an endorsement or sponsorship of any other manufacturer for a specific potential end-use product or application, or for Dow, or for specific products manufactured by Dow.

NOTICE: No freedom from infringement of any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, the Customer is responsible for determining whether products and the information in this document are appropriate for the Customer's use and for ensuring that the Customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. Dow assumes no obligation or liability for the information in this document. **NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.**

NOTICE: 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.

NOTICE REGARDING MEDICAL APPLICATION RESTRICTIONS: Dow will not knowingly sell or sample any product or service ("Product") into any commercial or developmental application that is intended for:

- long-term or permanent contact with internal bodily fluids or tissues. "Long-term" is contact which exceeds 72 continuous hours;
- use in cardiac prosthetic devices regardless of the length of time involved ("cardiac prosthetic devices" include, but are not limited to, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems, and ventricular bypass-assisted devices);
- use as a critical component in medical devices that support or sustain human life; or
- use specifically by pregnant women or in applications designed specifically to promote or interfere with human reproduction.

Dow requests that customers considering use of Dow products in medical applications notify Dow so that appropriate assessments may be conducted.

Dow does not endorse or claim suitability of its products for specific medical applications. It is the responsibility of the medical device or pharmaceutical manufacturer to determine that the Dow product is safe, lawful, and technically suitable for the intended use. **DOW MAKES NO WARRANTIES, EXPRESS OR IMPLIED, CONCERNING THE SUITABILITY OF ANY DOW PRODUCT FOR USE IN MEDICAL APPLICATIONS.**

This document is intended for use in North America.

Published August, 2015.

© 2015 The Dow Chemical Company