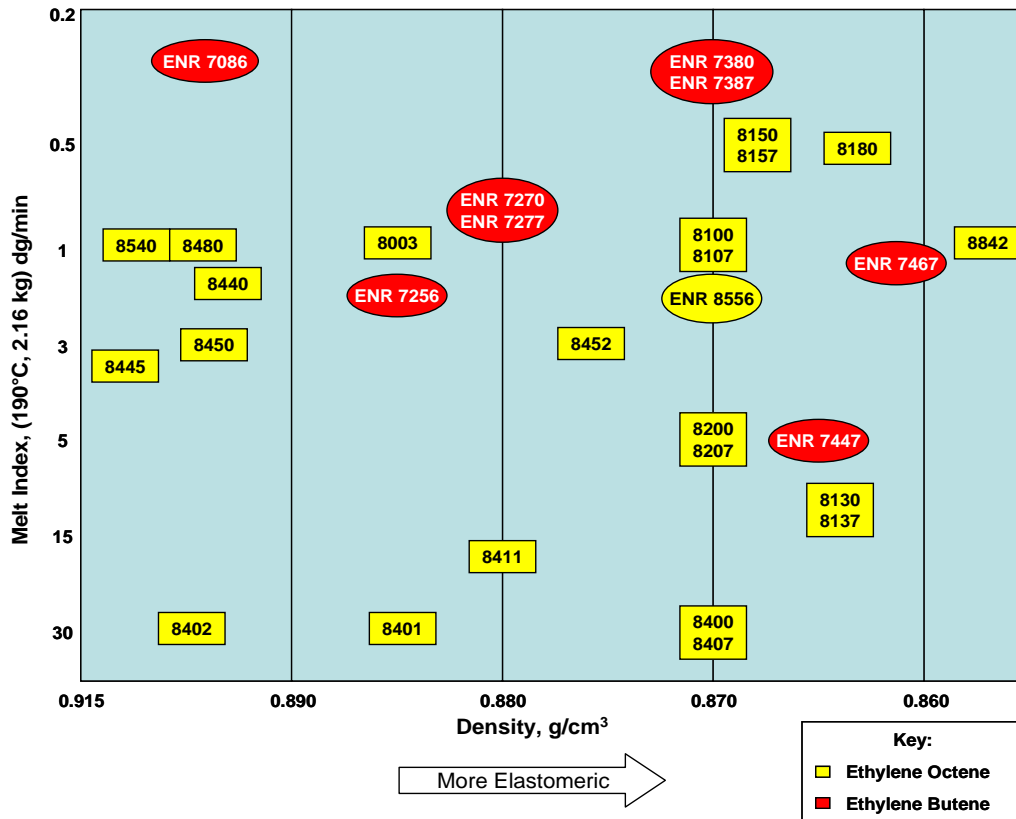


Product Information

ENGAGE™ Polyolefin Elastomer

Product Grade Chart



ENGAGE Polyolefin Elastomers and ENR* developmental products offer customers many options for replacing or modifying materials across a broad spectrum of processes. The next generation ethylene-butene copolymers are an excellent complement to the existing ethylene octene grades and together offer exceptional performance and a unique balance of properties when used alone or in blends and compounds.

Designed to improve impact performance, melt strength, or overall processability, these innovative 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 and your bottom line. Applications include: automotive thermoplastic olefins (TPO); plastics modification; thermoplastic elastomers (TPE); wire and cable; consumer goods; foams; footwear; noise vibration harshness (NVH) applications; and extrusion or injection molded goods.

* Note: ENR designates a developmental grade. When using developmental products, customers are reminded that: quality specifications may not be fully determined; hazards may not be fully known; and Dow reserves the right to change specifications and/or discontinue production of the product at any time.

Typical Properties

Product Grade ¹	Ethylene Butene Grades						Ethylene Octene Grades (continued on next page)			
	ENR 7467 ²	ENR 7447 ²	ENR 7380 ENR 7387 ²	ENR 7270 ENR 7277 ²	ENR 7256	ENR 7086	8842 ²	8180	8130 8137 ²	8150/ 8157 ²
Density, g/cm ASTM D-792	0.862	0.865	0.870	0.880	0.885	0.901	0.857	0.863	0.864	0.868
Melt Index, dg/min ASTM D-1238 190°C, 2.16 kg	1.2	5	<0.5	0.8	2	<0.5	1	0.5	13	0.5
Mooney Viscosity ASTM D-1646 ML 1+4 at 121°C	19	7	54	24	13	28	25	37	4	33
Total Crystallinity % ⁴	12	13	16	19	23	29	13	16	13	16
Durometer Hardness, Shore A ASTM D-2240	52	64	66	80	82	90	54	63	63	70
Durometer Hardness, Shore D ASTM D-2240	12	12	22	26	28	41	11	16	13	20
DSC Melting Peak, °C Rate 10°C/min ⁴	34	35	50	64	75	95	38	47	56	55
Glass Transition Temperature, °C DSC Inflection Point ⁴	-58	-53	-52	-44	-45	-33	-58	-55	-55	-52
Flexural Modulus, MPa ASTM D-790 2% Secant	4	7.6	11.5	22.1	27.2	75.3	4.0	7.7	7.3	14.4
Ultimate Tensile Strength, MPa ASTM D-638 508 mm/min	2.0	2.4	9.1	13.9	11.2	23.3	3.0	6.3	2.4	9.5

¹ Ultimate elongation for all grades exceeds 600%.

² This grade is talc dusted; properties may be measured before the addition of talc.

³ Engage[™] 8400 is available in the European region. Engage 8407 is available globally.

⁴ Dow Method for DSC and Glass Transition Temperature

Typical Properties, continued

Product Grade ¹	Ethylene Octene Grades, (continued)													
	8100/ 8107 ²	ENR 8556	8200/ 8207 ²	8400 8407 ^{2,3}	8452	8411	8003	8401	8440	8480	8450	8402	8540	8445
Density, g/cm ASTM D-792	0.870	0.870	0.870	0.870	0.875	0.888	0.885	0.885	0.897	0.902	0.902	0.902	0.908	0.910
Melt Index, dg/min ASTM D-1238 190°C, 2.16 kg	1	2	5	30	3	18	1	30	1.6	1	3	30	1	3.5
Mooney Viscosity ASTM D-1646 ML 1+4 at 121°C	24	14	8	2	11	3	23	2	13	20	10	2	20	10
Total Crystallinity % ⁴	18	19	19	21	20	24	25	25	27	33	29	34	34	37
Durometer Hardness, Shore A ASTM D-2240	73	68	66	72	74	68	84	84	86	89	80	88	90	87
Durometer Hardness, Shore D ASTM D-2240	22	19	17	20	24	15	31	26	36	42	41	34	47	43
DSC Melting Peak, °C Rate 10°C/min ⁴	60	60	59	65	66	76	77	80	93	99	97	98	104	106
Glass Transition Temperature, °C DSC Inflection Point ⁴	-52	-53	-53	-54	-51	-50	-46	-47	-33	-31	-32	-36	-32	-32
Flexural Modulus, MPa ASTM D-790 2% Secant	13.1	11.7	10.8	10.5	16.8	10.3	32.6	30.6	54.3	81.5	75.6	72.0	107.8	101.1
Ultimate Tensile Strength, MPa ASTM D-638 508 mm/min	9.76	8.3	5.7	2.8	11.2	7.3	18.2	8.5	20.4	24.8	22.4	11.3	27.9	21.7

¹ Ultimate elongation for all grades exceeds 600%.

² This grade is talc dusted; properties may be measured before the addition of talc.

³ Engage™ 8400 is available in the European region. Engage™ 8407 is available globally.

⁴ Dow Method for DSC and Glass Transition Temperature

Property Trends

Property Value	As Density Increases	As Melt Index Increases
Abrasion Resistance	Increases	Decreases
Chemical Resistance	Increases	Decreases
Gloss	Increases	Increases
Hardness	Increases	Decreases
Haze	Increases	No change
Impact Strength	Decreases	Decreases
Low Temperature Ductility	Decreases	Decreases
Melt Strength	No Change	Decreases
Permeability	Decreases	Increases
Processability	No change	Increases
Shrinkage	Increases	Decreases
Softening Point	Increases	Decreases
Stiffness (Flexural Modulus)	Increases	Decreases
Tear Strength	Increases	Decreases
Tensile Strength	Increases	Decreases

Innovative Solutions for Your Processes and Applications

Enhances Performance in Applications

Soft and Hard TPO Compounds

- Excellent physical properties including elasticity, toughness and low temperature ductility
- Excellent impact resistance, balance of properties and long term performance

Wire and Cable

- Enhances physical properties when combined with fillers or when crosslinked

General Purpose

- Improves look and feel of soft and hard goods
- Lighter weight, more flexible parts
- Improves resiliency for foam applications
- Excellent filler acceptance for masterbatch applications
- Improved processing grades

Extrusion Grades

- Tough yet flexible
- Faster extrusion rates for more parts production per cycle
- Improved melt strength grades available

Injection Molding

- Better impact resistance properties and performance
- Excellent thermal stability, UV resistance and heat resistance

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 broad molecular weight materials for improved processing
- 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 responsibility

Standard Packaging Availability

Ethylene Butene Grades	ENR 7086	ENR 7256	ENR 7270	ENR7277*	ENR 7380	ENR 7387	ENR 7447*	ENR 7467*
20 kg Bags	x	x	x		x		x	x
1300 lb Octagonal Boxes	x	x	x		x		x	x
US Railcars (180,000 lb)				x		x		

Ethylene Octene Grades	Engage																	ENR						
	8003	8100	8107*	8130	8137*	8150	8157*	8180	8200	8207*	8400	8401	8402	8407*	8411	8440	8445	8450	8452	8480	8540	8556	8842*	
US 20 kg Bags	x	x		x	x	x		x	x			x	x	x	x	x	x	x	x	x	x	x	x	x
US 1200 lb Octagonal Boxes						x		x																
US 1300 lb Octagonal Boxes	x	x		x	x				x			x	x	x	x	x	x	x	x	x	x	x	x	x
US Railcars (180,000 lb)	x		x		x		x			x				x				x						
Europe 20 kg Bags	x	x				x		x	x		x					x			x	x				
Europe 500 kg Boxes	x	x				x		x	x		x					x			x	x				

*Talc Dusted

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The Dow Chemical Company and its subsidiaries (Dow) has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our Product Stewardship program rests with each and every individual involved with Dow products — from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

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- 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.

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