

## Property Comparison and Ranking Guide of Eastman<sup>TM</sup> Clear Medical-Grade Plastics

Committed, Knowledgeable, and Enabling

**EASTMAN**

# Property Comparison of Eastman™ Clear Medical-Grade Plastics

		Injection Molded Properties																			
Physical Comparison	ASTM Test Method	Eastman DuraStar™ Polymers			Eastman Eastar™ Polyester	Eastman Eastar™ Copolyesters				Eastman Eastalloy™ Polymers		Eastman Provista™ Copolymers	Eastman Tenite™ Cellulosics			Eastman Eccler™ Elastomers					
		MN611	MN621	MN631	MN052	MN058	MN021	MN211		MN005	MN006	MB002	DA003	MA510	MP002	350A-14 <sup>a</sup>	360A-7	360A-16	9965	9966	9967
<b>Physical Properties</b>																					
Clarity																					
Haze (%)	D1003	0.3	0.3	0.3	—	<1	1	0.3		1	0.4	1.3	3.6	0.5	1.3	<8.5%	<8.5%	<8.5%	1 <sup>b</sup>	1 <sup>b</sup>	1 <sup>b</sup>
Transmittance (%)	D1003	91	91	91	—	82	84	91		90	89	91	81	87	91	>90	>90	>90	93 <sup>b</sup>	93 <sup>b</sup>	94 <sup>b</sup>
Notched Impact, Notched J/m (ft-lb/in.), 0.125 in.	D256	80 (1.5)	370 (7)	80 (1.5)	51 (1)	51 (1)	40 (0.8)	101 (1.9)		NB <sup>c</sup>	NB <sup>c</sup>	NB <sup>c</sup>	NB <sup>c</sup>	NB <sup>c</sup>	NB <sup>c</sup>	416 (7.8)	203 (3.8)	>533 (>10)	NB <sup>c</sup>	NB <sup>c</sup>	NB <sup>c</sup>
Flex Modulus MPa (10 <sup>5</sup> psi)	D790	2,000 (2.9)	1,900 (2.8)	1,900 (2.7)	2,500 (3.6)	2,400 (3.5)	2,500 (3.6)	2,100 (3.0)		1,900 (2.7)	1,800 (2.6)	1,900 (2.7)	2,140 (3.1)	2,100 (3.1)	1,900 (2.7)	1,500 (2.2)	1,900 (2.7)	1,200 (1.8)	150 (2.2)	150 (2.2)	150 (2.2)
Elongation @ Break (%)	D638	300	310	300	—	90	120	110		260	330	300	150	195	300	40	50	45	300	400	400
Tensile Strength @ Break MPa (psi)	D638	51 (7,400)	53 (7,700)	43 (6,300)	26 (3,800)	24 (3,500)	25 (3,600)	28 (4,100)		38 (5,600)	54 (7,800)	48 (7,000)	60 (8,700)	56 (8,175)	48 (7,000)	37 (5,300)	41 (5,900)	30 (4,400)	20 (2,900)	22 (3,200)	23 (3,300)
Tensile Strength @ Yield MPa (psi)	D638	47 (6,900)	46 (6,700)	50 (7,200)	57 (8,300)	58 (8,400)	58 (8,400)	51 (7,300)		47 (6,800)	45 (6,500)	47 (6,900)	56 (8,100)	50 (7,230)	47 (6,900)	32 (4,600)	41 (6,000)	27 (3,900)	14 (2,030)	14 (2,030)	13 (1,900)
Heat Deflection Temperature @ 66 psi °C (°F)	D648	75 (165)	73 (164)	70 (163)	66 (151)	69 (156)	69 (156)	70 (158)		70 (158)	73 (163)	73 (163)	103 (218)	90 (195)	73 (163)	84 (183)	92 (198)	80 (176)	58 (136)	58 (136)	58 (136)
Heat Deflection Temperature @ 264 psi °C (°F)	D648	65 (149)	65 (149)	65 (149)	62 (144)	63 (145)	65 (149)	63 (145)		67 (152)	64 (147)	63 (145)	90 (194)	77 (170)	63 (145)	76 (169)	82 (180)	72 (162)	46 (115)	44 (111)	42 (108)
Specific Gravity	D792	1.2	1.19	1.19	1.32	1.33	1.33	1.27		1.23	1.23	1.25	1.2	1.2	1.25	1.2	1.21	1.19	1.13	1.13	1.13
Vicat Softening Point °C (°F)	D1525	—	—	—	79 (174)	80 (176)	—	85 (185)		84 (183)	88 (190)	85 (185)	118 (244)	—	85 (185)	100 (212)	107 (225)	92 (198)	170 (338)	170 (338)	170 (338)
T <sub>g</sub> °C (°F)	—	87 (189)	87 (189)	87 (189)	80 (176)	80 (176)	80 (176)	81 (178)		84 (183)	85 (185)	85 (185)	117 (243)	110 (230)	85 (185)	110 (230)	118 (244)	97 (207)	-3 (27)	-3 (27)	-3 (27)
<b>Barrier</b>																					
Oxygen	—	●	●	●	●	●	●	●		●	●	●	●	●	●	○	○	○	●	●	●
Water	—	●	●	●	●	●	●	●		●	●	●	●	●	●	○	○	○	○	○	○
<b>Processing</b>																					
Drying Temperature	—	160°F 70°C	160°F 70°C	160°F 70°C	300–320°F 150–160°C	300–320°F 150–160°C	300–320°F 150–160°C	160°F 70°C		160°F 70°C	160°F 70°C	160°F 70°C	200°F 93°C	190°F 88°C	160°F 70°C	160°F 70°C	160°F 70°C	160°F 70°C	150°F 65°C	150°F 65°C	150°F 65°C
Drying Time	—	3–4 hrs	3 hrs	4 hrs	4–6 hrs	4–6 hrs	4–6 hrs	4–6 hrs		6 hrs	6 hrs	4–6 hrs	4–6 hrs	4–6 hrs	4–6 hrs	4 hrs	4 hrs	4 hrs	4 hrs	4 hrs	4 hrs
Melt Temperature	—	450–530°F 230–280°C	480–550°F 250–290°C	450–530°F 230–280°C	530–565°F 275–295°C	530–565°F 275–295°C	530–565°F 275–295°C	480–520°F 250–270°C		480–520°F 250–270°C	480–520°F 250–270°C	430–450°F 220–235°C	520–550°F 270–290°C	520–550°F 270–290°C	415–440°F 210–225°C	390–430°F 200–225°C	390–430°F 200–225°C	390–430°F 200–225°C	435–500°F 225–260°C	435–500°F 225–260°C	435–500°F 225–260°C
Mold Temperature	—	60–80°F 15–30°C	60–80°F 15–30°C	60–80°F 15–30°C	50–90°F 10–30°C	60–80°F 15–30°C	50–90°F 10–30°C	60–100°F 15–40°C		60–80°F 15–30°C	60–100°F 15–40°C	40–90°F 5–32°C	90–150°F 30–65°C	90–140°F 30–60°C	60–100°F 15–40°C	130–140°F 55–60°C	130–140°F 55–60°C	130–140°F 55–60°C	120–180°F 50–80°C	120–180°F 50–80°C	120–180°F 50–80°C
Injection Speeds	—	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate		slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate	slow to moderate
<b>Product Summary</b>																					
Sterilization																					
Gamma	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Eto	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
E-Beam	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Gas Plasma	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Autoclave	—	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	●	●	●
Joining																					
Solvent Bonding	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Ultrasonic Bonding	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	○	○	○
Laser Welding	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	● <sup>d</sup>	● <sup>d</sup>	● <sup>d</sup>
Adhesives	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Swaging (Cold Bending)	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	○	○	○
Radio Frequency Welding	—	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	●	●	●
Thermal Bonding	—	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	●	●	●
Process																					
Injection Molded	—	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Extrusion Blow Molded	—	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	○	○	○
Injection Blow Molded	—	●	●	●	●	○	●	●		○	○	○	○	○	○	○	○	○	○	○	○

<sup>a</sup>Not medical-grade <sup>b</sup>Film properties <sup>c</sup>No break <sup>d</sup>With special additives

● Excellent ● Good ● Average ● Fair ○ Poor



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Material Safety Data Sheets providing safety precautions, that should be observed when handling and storing Eastman products, are available online or by request. You should obtain and review the available material safety information before handling any of these products. If any materials mentioned are not Eastman products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

*It is the responsibility of the medical device manufacturer ("Manufacturer") to determine the suitability of all component parts and raw materials, including any Eastman product, used in its final product in order to ensure safety and compliance with requirements of the United States Food and Drug Administration (FDA) or other international regulatory agencies.*

*Eastman products have not been designed for nor are they promoted for end uses that would be categorized either by the United States FDA or by the International Standards Organization (ISO) as implant devices. Eastman products are not intended for use in the following applications: (1) in any bodily implant applications for greater than 30 days, based on FDA-Modified ISO-10993, Part 1, "Biological Evaluation of Medical Devices" tests (including any cosmetic, reconstructive, or reproductive implant applications); (2) in any cardiac prosthetic device application, regardless of the length of time involved, including, without limitation, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems, and ventricular bypass assisted devices; or (3) as any critical component in any medical device that supports or sustains human life.*

*For manufacturers of medical devices, biological evaluation of medical devices is performed to determine the potential toxicity resulting from contact of the component materials of the device with the body. The ranges of tests under FDA-Modified ISO-10993, Part 1, "Biological Evaluation of Medical Devices" include cytotoxicity, sensitization, irritation or intracutaneous reactivity, systemic toxicity (acute), subchronic toxicity (sub-acute), implantation, and hemocompatibility. For Eastman products offered for the medical market, limited testing information is available upon request. The Manufacturer of the medical device is responsible for the biological evaluation of the finished medical device.*

*The suitability of an Eastman product in a given end-use environment is dependent upon various conditions including, without limitation, chemical compatibility, temperature, part design, sterilization method, residual stresses, and external loads. It is the responsibility of the Manufacturer to evaluate its final product under actual end-use requirements and to adequately advise and warn purchasers and users thereof.*

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