EASTMAN

# Property comparison and ranking guide

## Eastman clear medical grade plastics

# Property comparison and ranking guide—Eastman clear medical grade plastics

| Physical comparison | ASTM test method | DuraStar™ polymers | | | Eastar™ copolyeste | | |
|---|---|---|---|---|---|---|---|
| | | MN611 | MN621 | MN631 | MN058 | MN021 | MN211 |
| **Physical properties** | | | | | | | |
| Clarity | | | | | | | |
| Haze (%) | D1003 | 0.3 | 0.3 | <1 | <1 | 1 | 0.3 |
| Transmittance (%) | D1003 | 91 | 91 | 92 | 82 | 84 | 91 |
| Izod impact strength, notched @ 23°C (73°F), J/m (ft-lbf/in.) | D256 | 80 (1.5) | 370 (7.0) | 80 (1.5) | 51 (1.0) | 40 (0.8) | 101 (1.9) |
| Flexural modulus, MPa ($10^5$ psi) | D790 | 2000 (2.9) | 1900 (2.8) | 1900 (2.7) | 2400 (3.5) | 2500 (3.6) | 2100 (3.0) |
| Elongation @ break (%) | D638 | 300 | 310 | 270 | 90 | 120 | 110 |
| Tensile stress @ break, MPa (psi) | D638 | 51 (7400) | 53 (7700) | 43 (6300) | 24 (3500) | 25 (3600) | 28 (4100) |
| Tensile stress @ yield, MPa (psi) | D638 | 47 (6900) | 46 (6700) | 50 (7200) | 58 (8400) | 58 (8400) | 50 (7300) |
| Heat deflection temperature @ 0.455 MPa (66 psi), °C (°F) | D648 | 74 (165) | 73 (164) | 70 (163) | 69 (156) | 69 (156) | 70 (158) |
| Heat deflection temperature @ 1.82 MPa (264 psi), °C (°F) | D648 | 65 (149) | 65 (149) | 66 (150) | 63 (145) | 65 (149) | 63 (145) |
| Specific gravity | D792 | 1.20 | 1.20 | 1.19 | 1.33 | 1.33 | 1.27 |
| Vicat softening point, °C (°F) | D1525 | — | — | 86 (186) | 80 (176) | — | 85 (185) |
| Thermal glass transition temperature, $T_g$, °C (°F) | — | 87 (189) | 87 (189) | 87 (189) | 80 (176) | 80 (176) | 81 (178) |
| **Barrier** | | | | | | | |
| Oxgen | — | ◕ | ◕ | ◕ | ● | ● | ● |
| Water | — | ◑ | ◑ | ◑ | ◑ | ◑ | ◑ |
| **Processing** | | | | | | | |
| Drying temperature, °C (°F) | — | 71 (160) | 70 (160) | 70 (160) | 160 (320) | 150–160 (300–320) | 71 (160) |
| Drying time, hrs | — | 3–4 | 3 | 4 | 4–6 | 4–6 | 4–6 |
| Melt temperature, °C (°F) | — | 232–277 (450–530) | 250–290 (480–550) | 230–280 (450–530) | 277–293 (530–560) | 275–295 (530–565) | 249–271 (480–520) |
| Mold temperature, °C (°F) | — | 16–38 (60–100) | 15–30 (60–80) | 15–30 (60–80) | 16–32 (60–90) | 10–30 (50–90) | 16–38 (60–100) |
| Injection speeds | — | slow to moderate | slow to moderate | slow to moderate | slow to moderate | slow to moderate | slow to moderate |
| **Product summary** | | | | | | | |
| Sterilization | | | | | | | |
| Gamma | — | ◕ | ◕ | ◕ | ● | ● | ● |
| EtO | — | ● | ● | ● | ● | ● | ● |
| E-beam | — | ◕ | ◕ | ◕ | ● | ● | ● |
| Gas plasma | — | ● | ● | ● | ● | ● | ● |
| Autoclave | — | ○ | ○ | ○ | ○ | ○ | ○ |
| Joining | | | | | | | |
| Solvent bonding | — | ◕ | ◕ | ◕ | ◑ | ◑ | ● |
| Ultrasonic bonding | — | ◕ | ◕ | ◕ | ◑ | ◑ | ● |
| Laser welding | — | ◕ | ◕ | ◕ | ◑ | ◑ | ● |
| Adhesives | — | ◕ | ◕ | ◕ | ◑ | ◑ | ● |
| Swaging (cold bending) | — | ◕ | ◕ | ● | ◔ | ◑ | ● |
| Radio frequency welding | — | ○ | ○ | ○ | ○ | ○ | ○ |
| Thermal bonding | — | ○ | ○ | ○ | ○ | ○ | ○ |
| Process | | | | | | | |
| Injection molded | — | ● | ● | ● | ● | ● | ● |
| Extrusion blow molded | — | ○ | ○ | ○ | ○ | ○ | ● |
| Injection blow molded | — | ● | ● | ● | ○ | ● | ● |

[a]Not medical grade [b]Film properties [c]No break [d]With special additives

○ = Poor ◔ = Fair ◑ = Average ◕ = Good ● = Excellent

| Injection molded properties | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| rs | | Eastman Tritan™ copolyester | | | Eastman Provista™ copolymer | Tenite™ cellulosics | | | Ecdel™ elastomers | | |
| MN006 | MB002 | MX711 | MX731 | MX811 | MP002 | 350A-14[a] | 360A-7 | 360A-16 | 9965 | 9966 | 9967 |
| | | | | | | | | | | | |
| <1.0 | 1.3 | <1 | <1 | <1 | 1.3 | <8.5 | <8.5 | <8.5 | 1[b] | 1[b] | 1[b] |
| 92 | 91 | 90 | 91 | 92 | 91 | >90 | >90 | >90 | 93[b] | 93[b] | 94[b] |
| NB[c] | NB[c] | 980 (18.4) | 860 (16.1) | 650 (12.2) | NB[c] | 416 (7.8) | 203 (3.8) | >533 (>10) | NB[c] | NB[c] | NB[c] |
| 1800 (2.6) | 1900 (2.7) | 1550 (2.25) | 1575 (2.28) | 1585 (2.28) | 1900 (2.7) | 1517 (2.2) | 1862 (2.7) | 1241 (1.8) | 150 (2.2) | 150 (2.2) | 150 (2.2) |
| 330 | 300 | 210 | 210 | 140 | 300 | 40 | 50 | 45 | 300 | 400 | 400 |
| 54 (7800) | 48 (7000) | 53 (7700) | 52 (7500) | 53 (7700) | 48 (7000) | 37 (5300) | 41 (5900) | 30 (4400) | 20 (2900) | 22 (3200) | 23 (3300) |
| 44 (6300) | 47 (6900) | 43 (6200) | 43 (6200) | 44 (6400) | 47 (6900) | 32 (4600) | 41 (6000) | 27 (3900) | 14 (2030) | 14 (2030) | 13 (1900) |
| 73 (163) | 73 (163) | 99 (210) | 94 (201) | 109 (228) | 73 (163) | 84 (183) | 92 (198) | 80 (176) | 58 (136) | 58 (136) | 58 (136) |
| 64 (147) | 63 (145) | 85 (185) | 81 (178) | 92 (198) | 63 (145) | 76 (169) | 82 (180) | 72 (162) | 46 (115) | 44 (111) | 42 (108) |
| 1.23 | 1.25 | 1.18 | 1.18 | 1.17 | 1.25 | 1.20 | 1.21 | 1.19 | 1.13 | 1.13 | 1.13 |
| 88 (190) | 85 (185) | — | — | — | 85 (185) | 100 (212) | 107 (225) | 92 (198) | 170 (338) | 170 (338) | 170 (338) |
| 85 (185) | 85 (185) | 110 (212) | 110 (212) | 120 (248) | 85 (185) | 110 (230) | 118 (244) | 97 (207) | –3 (27) | –3 (27) | –3 (27) |
| | | | | | | | | | | | |
| ◕ | ◕ | ◕ | ◕ | ◕ | ◕ | ○ | ○ | ○ | ◑ | ◑ | ◑ |
| ◑ | ◑ | ◑ | ◑ | ◑ | ◑ | ○ | ○ | ○ | ○ | ○ | ○ |
| | | | | | | | | | | | |
| 71 (160) | 70 (160) | 88 (190) | 88 (190) | 88 (190) | 70 (160) | 70 (160) | 70 (160) | 70 (160) | 65 (150) | 65 (150) | 65 (150) |
| 6 | 4–6 | 4–6 | 4–6 | 4–6 | 4–6 | 4 | 4 | 4 | 4 | 4 | 4 |
| 249–271 (480–520) | 220–235 (430–450) | 260–282 (500–540) | 260–282 (500–540) | 260–282 (500–540) | 210–225 (415–440) | 200–225 (390–430) | 200–225 (390–430) | 200–225 (390–430) | 225–260 (435–500) | 225–260 (435–500) | 225–260 (435–500) |
| 16–38 (60–100) | 5–32 (40–90) | 38–66 (100–150) | 38–66 (100–150) | 38–66 (100–150) | 15–40 (60–100) | 55–60 (130–140) | 55–60 (130–140) | 55–60 (130–140) | 50–80 (120–180) | 50–80 (120–180) | 50–80 (120–180) |
| 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 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● | ● | ● |
| | | | | | | | | | | | |
| ◔ | ● | ● | ● | ● | ● | ◕ | ◕ | ◕ | ● | ● | ● |
| ◔ | ◔ | ◑ | ◑ | ◔ | ◔ | ◔ | ◔ | ◔ | ○ | ○ | ○ |
| ◔ | ◔ | ◑ | ◑ | ◔ | ◔ | ◔ | ◔ | ◔ | ◑[d] | ◑[d] | ◑[d] |
| ◔ | ● | ◕ | ◕ | ● | ● | ◕ | ◕ | ◕ | ● | ● | ● |
| ● | ● | ◔ | ◔ | ● | ● | ◔ | ◔ | ◔ | ○ | ○ | ○ |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● | ● | ● |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ◑ | ◑ | ◑ |
| | | | | | | | | | | | |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ◑ | ◑ | ◑ |
| ○ | ● | ○ | ○ | ● | ● | ○ | ○ | ○ | ◔ | ◔ | ◔ |
| ○ | ◑ | ◔ | ◔ | ◑ | ◑ | ○ | ○ | ○ | ◔ | ◔ | ◔ |

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