

HZO Guardian Series™ Material Properties

HZO Guardian Plus™ (Parylene C), HZO Guardian Zero™ (Parylene N), & HZO Guardian EX™ (Parylene F - VT4)



Physical and Mechanical Properties	Guardian Plus	Guardian Zero	Guardian EX	ASTM Method
Density (g/cm ³)	1.29	1.10	1.65	D1505
Tensile modulus (GPa)	3.2	2.4	3.0	D882
Tensile strength (MPa)	70	45	55	D882
Yield strength (MPa)	55	42	52	D882
Elongation to break (%)	20 to 200	20 to 250	10 to 50	D882
Yield elongation (%)	2.9	2.5	2.4	D882
Coefficient of friction-static	0.29	0.25	0.39	D1894
Coefficient of friction-dynamic	0.29	0.25	0.35	D1894
Water absorption [% (24 hr)]	< 0.1	< 0.1	< 0.1	D570
Index of refraction	1.64	1.66	1.57	D542

Electrical Properties	Guardian Plus	Guardian Zero	Guardian EX	ASTM Method
Dielectric strength (V) @ 25.4 μ m (1 mil)	5,500	7,000	7,000	D149
Dielectric strength (V/ μ m) @ 25.4 μ m (1 mil)	220	276	276	D149
Dielectric constant (60 Hz)	3.15	2.65	2.20	D150
Dielectric constant (1 kHz)	3.10	2.65	2.25	D150
Dielectric constant (1 MHz)	2.95	2.65	2.42	D150
Dissipation factor (60 Hz)	0.020	0.0002	0.0002	D150
Dissipation factor (1 kHz)	0.019	0.0002	0.0002	D150
Dissipation factor (1 MHz)	0.013	0.0006	0.008	D150
Volume resistivity (23 °C, 50% RH, Ω ·cm)	8.8×10^{16}	1.4×10^{17}	1.1×10^{17}	D257
Surface resistivity (23 °C, 50% RH, Ω)	1.0×10^{14}	1.0×10^{13}	4.7×10^{17}	D257

Thermal Properties	Guardian Plus	Guardian Zero	Guardian EX	ASTM Method
Melting point (°C)	290	420	435	D3417
Linear coefficient of expansion ($10^{-5}/^{\circ}\text{C}$)	3.3	6.9	3.5	D696
Thermal conductivity [25 °C, W/(m·K)]	0.084	0.13	0.10	C177
Specific heat [20 °C, cal/(g·°C)]	0.17	0.20	0.25	E1269

Barrier Properties	Guardian Plus	Guardian Zero	Guardian EX	ASTM Method
Water vapor transmission (38 °C 90% RH, g·mil/100 in ² ·day)	0.25	1.74	0.58	F1249
Gas permeability [cm ³ ·mil/100 in ² ·24 h·atm (23 °C)]				
N ₂	0.7	7.7		D3985
O ₂	5.1	30	97	D3985
CO ₂	5.4	214		D3985
SO ₂	11.0	1,890		D3985
Cl	0.35	74		D3985
H ₂ S	13	795		D3985