

### TYPICAL PROPERTIES OF FLUOROPOLYMERS

ASTM or UL Test	Property	PTFE	FEP	PFA	PVDF	Modified ETFE
MECHANICAL						
D638	Tensile strength (psi)	3,350	3,000	4,000	5,200-7,400	6,500
D638	Elongation (%)	300	300	300	100-300	275
D638	Tensile modulus (10 <sup>5</sup> psi)	0.5	—	—	1.6	1.2
D790	Flexural strength (psi)	No break	No break	No break	No break	No break
D790	Flexural modulus (10 <sup>5</sup> psi)	0.5-0.9	0.95	0.95	2.0	2.0
D256	Impact strength, Izod (ft-lb/in of notch)	3.5	No break	No break	3-4	No break
D785	Hardness					
	Rockwell	—	—	—	—	R50
	Shore D	50-65	55	60	80	—
THERMAL						
C177	Thermal conductivity (Btu-in/hr-ft <sup>2</sup> -°F)	1.7	1.4	1.8	0.7-0.9	1.65
D696	Coefficient of thermal expansion (10 <sup>-5</sup> in/in-°F)	5.5-8.4	4.6-5.8	6.7	8.0-8.5	5.2
D648	Deflection temperature (°F)					
	At 264 psi	132	124	118	195	165
	At 66 psi	250	158	164	300	220
UL 94	Flammability rating	V-0	V-0	V-0	V-0	V-0
ELECTRICAL						
D149	Dielectric strength (V/mil) Short time, 1/8-in thk	500-600	500-600	500-600	260	400-500
D150	Dielectric constant At 1 kHz	2.1	2.1	2.1	7.5	2.6
D150	Dissipation factor At 1 kHz	0.00005	0.00005	0.0003	0.019	0.0008
D257	Volume resistivity (ohm-cm) At 73°F, 50% RH	>10 <sup>18</sup>	>10 <sup>18</sup>	>10 <sup>18</sup>	2×10 <sup>14</sup>	10 <sup>16</sup>
D495	Arc resistance (s)	>300	>180	>180	50-70	75
OPTICAL						
D542	Refractive index	1.350	1.344	1.350	1.42	1.403
D1003	Transmittance (%), 1-mil film	—	>95	>95	>90	—
FRICTIONAL						
—	Coefficient of friction Against steel (100 psi, 10 fpm)	0.050	0.330	0.214	0.14	0.400

\*Crystalline compound. †Below and above 135°F.

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ISO or UL Test	Property	PTFE	FEP	PFA	PVDF	Modified ETFE
MECHANICAL						
ISO527	Tensile strength (MPa)	22	21	27	36-51	45
ASTM D638	Elongation (%)	300	300	300	100-300	275
ISO527	Tensile modulus (10 <sup>3</sup> MPa)	0.345	—	—	1.10	0.83
ISO178	Flexural strength (MPa)	No break	No break	No break	No break	No break
ISO178	Flexural modulus (MPa)	344-620	655	655	1,378	1,378
ISO180	Notched Izod impact strength (J/m)	187	No break	No break	160-214	No break
ISO2039 Hardness						
	Rockwell	—	—	—	—	R50
	Shore D	50-65	55	60	80	—
THERMAL						
ISO8302	Thermal conductivity (W/(mK))	0.25	0.25	—	—	0.23
ISO11359	Coefficient of thermal expansion (10 <sup>-4</sup> /°C)	0.99-1.51	0.82-1.04	1.20	1.40-1.50	1.20
ISO75	Deflection temperature (°C)					
	At 1.80 MPa	56	51	48	91	74
	At 0.45 MPa	121	70	73	149	104
UL 94	Flammability rating	V-0	V-0	V-0	V-0	V-0
ELECTRICAL						
IEC243	Dielectric strength (kV/mm) Short time, 3 mm thk	19.7-23.6	19.7-23.6	19.7-23.6	10.24	15.7-19.7
IEC250	Dielectric constant At 1 kHz	2.1	2.1	2.1	7.5	2.6
IEC250	Dissipation factor At 1 kHz	0.00005	0.00005	0.0003	0.019	0.0008
IEC93	Volume resistivity (ohm-cm) At 23°C, 50% RH	>10 <sup>18</sup>	>10 <sup>18</sup>	>10 <sup>18</sup>	2×10 <sup>14</sup>	10 <sup>16</sup>
ASTM D495	Arc resistance (s)	>300	>180	>180	50-70	75
OPTICAL						
ISO489	Refractive index	1.350	1.344	1.350	1.42	1.403
ASTM D1003	Transmittance (%), 0,0254 mm film	—	>95	>95	>90	—

\*Crystalline compound. †Below and above 57°C.