

More About Plastics

Tensile Strength—The amount of stretching a material can withstand before breaking. It is usually measured in pounds per square inch (psi). A larger number indicates a stronger material.

Impact Strength—The ability to withstand shock loading. Determined by the notched Izod test, which measures the effect on a material when it is struck by a swinging pendulum. A larger number signifies greater impact resistance. “No Break” means the material was not broken during testing.

Coefficient of Friction—The ratio of the frictional force between two surfaces and the force that keeps those surfaces in contact. A lower value indicates a material that moves more easily, or with less friction, than a material with a higher value.

Short-Term Dielectric Strength—The maximum voltage a material can withstand without rupture, measured as volts per mil of thickness. This is an indication of how effective the material is as an electrical insulator. A higher value signifies a better insulator.

Coefficient of Thermal Expansion—The amount a material increases in volume as the temperature rises. A smaller coefficient is an indicator of less thermal expansion.

Machine With—High-Speed Steel Tooling (HSS); Tungsten Carbide Tooling (Carbide).

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Material	Product	Tensile Strength, psi	Rockwell Hardness	Impact Strength, ft.-lbs./in.	Coefficient of Friction	Dielectric Strength, volts/0.001"	Water Absorption, %	Density, lbs./in. ³	Thermal Expansion, in./in./° F	Machine With
ABS	ABS	5,100-6,100	R102-109	5.2-7.7	Not Rated	450-1,220	0.3-1.0	0.032-0.038	5.2 × 10 ⁻⁵	HSS
ABS/PVC	Electrically Conductive ABS/PVC	4,500	R87	2	Not Rated	Not Rated	Not Rated	0.04	4.6 to 5.5 × 10 ⁻⁵	Carbide
Acetal	Acetal	6,400-9,500	M51-M88	1-1.8	0.11-0.35	420-500	0.2-0.8	0.048-0.051	5.4 to 12 × 10 ⁻⁵	HSS
	Delrin® Acetal Resin	9,000-11,000	M89-M94	1-2.4	0.2	435-500	0.2-0.4	0.051	4.7 to 12.2 × 10 ⁻⁵	HSS
	Glass-Filled Delrin® Acetal Resin	8,700	M81	0.8	Not Rated	450	Not Rated	0.054	3.33 × 10 ⁻⁵	Carbide
	PTFE-Filled Delrin® Acetal Resin	6,800-12,490	M77-M78	0.7-1.2	0.07-0.14	400-500	0.25	0.054	5.1 × 10 ⁻⁵	HSS
	Turcite Acetal	5,900-7,600	M63-M81	0.54-0.57	0.22-0.3	Not Rated	0.2	0.053	5.0 × 10 ⁻⁵	HSS
Acrylic	Cast Acrylic	8,000-11,250	M94-M103	0.04-0.5	Not Rated	400-430	0.2-0.8	0.043	3.5 to 4.2 × 10 ⁻⁵	Carbide
	Extruded Acrylic	8,100-11,030	M68-M95	0.3-0.7	Not Rated	430-760	0.2-0.4	0.043	3.0 to 4.0 × 10 ⁻⁵	Carbide
Acrylic/PVC	Kydex Acrylic/PVC	6,100	R94	15	Not Rated	Not Rated	0.05	0.049	3.8 × 10 ⁻⁵	HSS
Cellulose	Acetate	4,500-8,000	R78-R120	2.0-8.5	Not Rated	250-600	2.0-7.0	0.048	5.6 to 8.3 × 10 ⁻⁵	Cut with knife
	Butyrate	4,800	R78	4.5	Not Rated	300-475	1.4	0.027	6.0 to 9.0 × 10 ⁻⁵	HSS
CPVC	CPVC	7,100-7,300	R116-119	8-9	Not Rated	1,250	0.03	0.053-0.056	3.9 × 10 ⁻⁵	Carbide
CTFE	CTFE	4,860-5,710	Shore D85-D95	2.5-3.5	0.08	500	0	0.034-0.08	3.9 to 5.1 × 10 ⁻⁵	HSS
FEP	FEP	3,000	R25	No Break	0.25	1,800	<0.01	0.078	4.6 to 5.8 × 10 ⁻⁵	Carbide
HDPE	HDPE Polyethylene	4,000-4,100	Shore D60-D68	1.1	0.22-0.62	450-1,800	0	0.034	5.3 to 10 × 10 ⁻⁵	HSS
LDPE	LDPE Polyethylene	3,100-6,100	Shore D42-D56	Not Rated	Not Rated	Not Rated	Not Rated	0.033	Not Rated	HSS

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Nylon	Cast Nylon	10,000-13,500	R100-R125	0.4-1.8	0.22	500-600	0.6	0.042	5×10^{-5}	HSS
	Glass-Filled Nylon	13,000	M88	1.8	Not Rated	530	0.30	0.048	2.7×10^{-5}	Carbide
	Kevlar-Filled Nylon	17,200	R121	2.7	0.32	350	0.8	0.042	1.6×10^{-5}	HSS
	MDS-Filled Cast Nylon	10,000-13,500	R115-R125	0.7-0.9	0.22	500-600	0.5-0.6	0.042	5.0×10^{-5}	HSS
	MDS-Filled Nylon 6/6	11,000-12,400	R108-R120	0.08-1.2	0.2-0.28	300-350	1.2-2.5	0.041	4×10^{-5}	HSS
	Nylon 6/6	11,200-12,400	R108-R121	0.6-1.4	0.25-0.28	300-400	1.2-1.5	0.041	$4 \text{ to } 5.5 \times 10^{-5}$	HSS
	Nylon 6/12	8,000	R114	0.9	0.31	Not Rated	0.25	0.038	5×10^{-5}	HSS
	Oil-Filled Cast Nylon	9,500-11,000	R100-R120	1.2-1.8	0.12-0.15	500-600	0.5-2.0	0.042	5×10^{-5}	HSS
PAI	Torlon PAI	15,000-20,000	E70-E87	0.08-2.0	0.35	Not Rated	0.4	0.052	$1.4 \text{ to } 1.7 \times 10^{-5}$	Carbide
PEEK	PEEK	14,000-17,400	R126	0.8-1.57	0.18-0.40	190-500	0.1-0.5	0.047	$1.2 \text{ to } 2.6 \times 10^{-5}$	Carbide
	Carbon-Filled PEEK	11,000	M85	0.7	0.21	Not Rated	0.05	0.052	1.7×10^{-5}	Carbide
PEI	Ultem PEI	14,200-17,000	M109-M112	0.05-1.0	0.17-0.42	830	0.25	0.046	3.1×10^{-5}	Carbide
PETG	PETG	7,100-10,250	R106-R115	1.8	Not Rated	410	0.13-0.2	0.046	3.8×10^{-5}	HSS
PFA	PFA	3,600-4,000	Shore D60	No Break	0.21	2,000	0.03	0.077	$5.5 \text{ to } 7.6 \times 10^{-5}$	Cut with Scissors
Polycarbonate	Polycarbonate	8,000-16,000	R118-R126	1.5-18	Not Rated	380-490	0.15-0.34	0.043-0.048	$1.5 \text{ to } 3.8 \times 10^{-5}$	Carbide
	Glass-Filled Polycarbonate	16,000	Not Rated	2.06	Not Rated	490	0.16	0.048	1.5×10^{-5}	Carbide
	Thermally Conductive Polycarbonate	6,235	Not Rated	5	Not Rated	Not Rated	Not Rated	0.046	Not Rated	Not Rated
Polyester	Polyester	6,100-28,000	Not Rated	Sheet 0.7; Rod/Film Not Rated	Sheet 0.11-0.45; Rod/Film Not Rated	400	Sheet/Rod 0.07-0.1; Film Not Rated	0.038	Sheet/Rod 3.9×10^{-5} ; Film 1.7×10^{-5}	HSS
Polyimide	Kapton® Polyimide	16,000-33,000	Not Rated	0.58	0.63	2,000	3.0	Not Rated	Not Rated	HSS
	Vespel® Polyimide	12,500	E45-E60	0.8	0.29	560	0.24	0.048	3×10^{-5}	Carbide
Polypropylene	Polypropylene	2,500-5,400	R55-R102	0.9-10.1	Not Rated	500-660	0.01-1.0	0.033-0.050	$4.3 \text{ to } 8.1 \times 10^{-5}$	Carbide
Polystyrene	Polystyrene	2,560-3,700	R97	2.2-3.3	Not Rated	550	0.05	0.038	$3.7 \text{ to } 5 \times 10^{-5}$	HSS
	Rexolite Polystyrene	8,000-10,500	R130	1.2	Not Rated	2,000	0.08	0.038	3.8×10^{-5}	HSS
Polysulfone	Polysulfone	10,200	R120	1.3	0.37	425	0.3	0.045	3.1×10^{-5}	HSS

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PPO	Noryl PPO	9,200	R119	3.5	0.39	500	0.07	0.038	3.3×10^{-5}	HSS
PPS	PPS	13,500	R125	0.6	0.4	540	0.01	0.049	2.8×10^{-5}	Carbide
PPSU	Radel PPSU	10,100	R122	13.0	0.4	380	0.37	Not Rated	3.1×10^{-5}	HSS
PTFE	PTFE	1,500-4,500	Shore D50-D65	2.3-3.5	0.05-0.1	600-2,000	0.01	0.08	$5.5 \text{ to } 10 \times 10^{-5}$	HSS
	Shapes Made with Teflon® PTFE	4,500	R58	2.0-3.49	0.05-0.08	600-2,000	0.01	0.013-0.079	$5.5 \text{ to } 7 \times 10^{-5}$	HSS
	Antistatic PTFE	4,500	R58	2.0	0.05-0.08	Not Rated	0.01	Not Rated	7×10^{-5}	HSS
	Glass-Filled PTFE	2,100-4,500	R58	2.0-2.3	0.05-0.15	330-600	0.02	0.011-0.083	7×10^{-5}	Carbide
	Reprocessed PTFE	1,500-1,885	R58	Not Rated	0.05-0.08	Not Rated	0.01	0.08	7×10^{-5}	HSS
	Rulon PTFE	1,500-4,500	Shore D60-D65	2.0-6.0	0.01-0.15	100-1,100	0.02	Not Rated	$4.9 \text{ to } 7 \times 10^{-5}$	Carbide
	Weldable PTFE	4,000	Shore D52	2.9	0.05-0.08	Not Rated	0.01	0.078	5.5×10^{-5}	HSS
PVC	PVC	6,000-10,300; Film 1,900-3,750	Shore D80	0.65-1.0	Not Rated	985-1,410	0.05-0.2	0.044-0.053	$2.9 \text{ to } 3.7 \times 10^{-5}$	Carbide
	Foam PVC	1,600-2,300	Shore D79-D85	0.32-0.54	Not Rated	280	0.5-0.8	0.020-0.022	3.7×10^{-5}	HSS
	Strengthened PVC	5,600-6,200	R111	10-17	Not Rated	335-690	0.056-0.2	0.05	$3.2 \text{ to } 3.7 \times 10^{-5}$	Carbide
PVDF	PVDF	7,550-7,800	R100	2.5-3.0	0.2-0.4	280	0.02-1.0	0.064	7.1×10^{-5}	HSS
UHMW	UHMW Polyethylene	2,470-7,740	Shore D61-D77	16.8-No Break	0.12-0.25	450-2,300	0.01	0.034	$0.83 \text{ to } 2 \times 10^{-4}$	HSS
	Abrasion-Resistant UHMW	5,600	Shore D69	No Break	0.12	2,300	0.01	0.034	1×10^{-4}	HSS
	Electrically Conductive UHMW	2,600-3,200	Shore D63-D68	No Break	0.1-0.2	Not Rated	<0.01	0.034	Not Rated	HSS
	High-Temperature UHMW	5,800	Shore D68	No Break	0.12	2,300	0.01	0.034	1.1×10^{-4}	HSS
VHMW	VHMW Polyethylene	>3,800	Shore D65	No Break	Not Rated	Not Rated	0	0.034	6×10^{-5}	HSS