

Engineered Plastic Characteristics I

General-purpose Engineered Plastic Plates

Characteristics of MC Nylon®, Polyacetal, Ultra High-Molecular-weight Polyethylene, Fluororesin, PEEK, PPS, Free-cutting Resin, PET, PBT and ABS

MISUMI's general-purpose Engineered Plastic Plates have superior properties of lightweight, noise reduction and corrosion resistance and can be used as a replacement for metal plates.

Selectable from nine types of materials and several grades for various purposes.

- MC Nylon® : Having better abrasion resistance than that of polyacetal plates, MC nylon is generally used for slide guide plates. The product lineup are as follows: Sliding Grade with highly-improved sliding performance; High Strength Grade with excellent strength; three types of Conductive Grade effective for antistatic purposes; and Weather Resistance Grade superior in strength deterioration resistance.
- Polyacetal : Widely used in wheels, rollers and gears, because of its excellent mechanical strength. Antistatic Grade is also available.
- Ultra High-Molecular-weight Polyethylene : It excels in abrasion resistance and sliding properties, and is used for carrier rollers and guide rails. In addition to Standard Type, Conductive Grade for antistatic is also available.

* For material colors or features, see P.951.

Item	Testing Method ASTM	Representative Products													
		MC Nylon®								Polyacetal		Ultra High-Molecular-weight Polyethylene			
		Standard	Sliding	High Strength	Weather Resistance	Conductivity CDR2	Conductivity CDR6	Conductivity CDR9	Standard	Antistatic	Standard	Electrical Conductivity			
		Plate	P.993 P.1023	P.993	P.993	P.993	P.993	P.993	P.993	P.997	P.997	P.1009	P.1009		
		Circular Plate	P.1023	P.1023	-	P.1023	P.1023	P.1023	P.1023	P.1023	P.1023	P.1023			
		Unit	MCA MCAW MCAB	MCAS	MCAY	MCAPS	MCCA	MCDA MCDB	MCEA	PAA PABA PAAB	PACA	UPA UPACA			
Mechanical Properties	Tensile Strength	Ambient Temperature	D-638	MPa (kgf/cm²)	96 (980)	66 (670)	98 (1000)	83 (850)	68 (700)	74 (760)	88 (900)	61 (620)	42 (430)	45 (460)	35 (360)
		Continuous Use at High Temperature	D-638	MPa (kgf/cm²)	39(20°C) (400(120°C))	-	-	-	-	-	-	29(95°C) (300(95°C))	-	-	-
	Elongation	D-638	%	30	19	20	40	10	7	7	40	30	400	300	
	Bending Strength	D-790	MPa (kgf/cm²)	110 (1120)	92 (940)	152 (1550)	110 (1120)	117 (1200)	117 (1200)	132 (1350)	89 (910)	49 (500)	25 (250)	25 (250)	
	Flexural Modulus	D-790	MPa	3530	2599	4609	-	4110	4020	4160	2589	1370	900	1103	
	Compression Strength	Yield Point	D-695	MPa (kgf/cm²)	103 (1050)	-	-	101 (1030)	-	-	-	-	20 (200)	-	
		5% Deformation	D-695	MPa (kgf/cm²)	95 (970)	75 (760)	118 (1200)	93 (948)	98 (1000)	93 (950)	-	103 (1050)	44 (450)	-	25 (250)
	Izod Impact Strength	D-256	J/m	50	39	50	50	35	35	35	74	77	Does not break	Does not break	
	Rockwell Hardness	R Scale	D-785	-	120	110	120	120	119	117	119	111	56	52	
		M Scale	D-785	-	-	-	-	-	-	-	78	-	-	-	
Thermal Characteristics	Continuous Use	-	°C	-40~120	-40~120	Ambient Temp. -150	Ambient Temp. -120	Ambient Temp. -120	Ambient Temp. -120	Ambient Temp. -150	-45~95	Ambient Temp. -80	-100~80	-100~80	
	Melting Point	-	°C	222	221	222	222	215	215	218	165	-	136	-	
	Deflection Temp. Under Load	0.45Mpa	D-648	°C	215	215	215	215	215	215	-	158	-	80	108
		1.82Mpa	D-648	°C	200	115	200	200	200	200	110	106	-	55	-
Linear Expansion Coefficient	D-696	°C ⁻¹	9.0x10 ⁻⁵	9.0x10 ⁻⁵	6.5x10 ⁻⁵	9.0x10 ⁻⁵	8.0x10 ⁻⁵	7.5x10 ⁻⁵	8.6x10 ⁻⁵	9.0x10 ⁻⁵	16.7x10 ⁻⁵	1.7x10 ⁻⁴	19x10 ⁻⁵		
Thermal Conductivity	D-177	W/m·K	0.233	0.233	-	0.23	0.512	0.709	-	0.233	-	0.42	-		
Surface Resistivity	D-257	-	-	-	-	-	-	-	-	-	-	10 ¹³	-		
Specific Volume Resistivity	D-257	Ω·cm	4.2x10 ¹⁵	-	-	-	10 ² ~10 ⁴	10 ⁶ ~10 ⁸	10 ⁸ ~10 ¹⁰	>10 ¹⁴	10 ¹⁰ ~10 ¹²	10 ¹⁷	10 ⁴		
Insulation Breakdown Voltage	D-149	kV/mm	20	-	-	18	-	-	-	20	-	68	-		
Dielectric Constant	10 ⁶ Hz	D-150	-	3.7	-	-	3.7	-	-	3.7	-	2.3	-		
Dissipation Factor	10 ⁶ Hz	D-150	-	0.02	-	-	0.02	-	-	0.007	-	-	-		
Specific Gravity	D-792	-	1.16	1.11	1.27	1.16	1.2	1.23	1.19	1.41	1.33	0.94	0.95		
Water Absorption Ratio	In water, Level	D-570	%	6	-	-	6.0	-	-	0.7	-	<0.01	-		
	In water, 24hrs	D-570	%	0.8	0.5	-	0.8	-	-	0.22	2	0.8	-		
Abrasion Resistance	-	-	○	○	○	○	○	○	○	○	○	○	○		
Sliding Properties	-	-	○	○	○	○	○	○	○	○	○	○	○		
Dynamic Friction Coefficient	-	-	-	0.05~0.1	-	-	-	-	-	0.18	0.07~0.22	0.17~0.19	-		
Dimension Stability	-	-	△	△	△	△	△	△	△	△	△	△	△		
Impact Resistance	-	-	○	○	○	○	○	○	○	○	○	○	○		
Flame Resistance	[UL94]	-	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)	(HB Equivalent)		
Food Sanitation Laws	-	-	Suitable*	Suitable*	Suitable*	Suitable (After Boiling)	Suitable*	Suitable*	Suitable*	Suitable	Suitable	Suitable	Suitable		
FDA Registration	-	-	-	-	-	-	-	-	-	-	-	Finished	-		
Chemical Resistance	Oil	-	○	○	○	○	○	○	○	○	○	○	○		
	Acid	-	×	×	×	×	×	×	×	△~×	△~×	○	○		
	Alkali	-	○~△	○~△	○~△	○~△	○~△	○~△	○~△	○	○	○	○		
	Organic Solvent	-	○	○	○	○	○	○	○	○	○	○	○		

* Comply with Food Sanitation Laws (MC Nylon, Standard, Sliding Grade and High Strength Grade: After boiling for 1.5hrs; Conductive CDR2, CDR6 and CDR9: After boiling for 2hrs)

○ Listed values are for reference, not guaranteed.

- Fluororesin : It can be used for sheet packing and electric insulator since it has excellent impact strength as well as chemical stability and electric property.
- PEEK : Super Engineered Plastic with high heat and chemical resistance. It excels in mechanical characteristics under high temperature. In addition to Standard Type, Conductive Grade for antistatic is also available.
- PPS : It excels in heat resistance, rigidity, flame resistance and dimension stability. It also excels in chemical resistance at ambient temperature and is used for parts of semiconductor and liquid crystal manufacturing equipment and inspection device.
- Free-cutting Resin (Unilate®) : It excels in insulation, low water absorption and rigidity, and is easy to machine and cut.
- Antistatic PET : Excellent in workability and dimensional stability, and is used as fixtures for semiconductor components / electronic components. Various options of thick plate are offered.
- PBT : It excels in insulation, machinability, low water absorption and long term heat stability, and is used for auto electric parts.
- ABS : Excels in machinability and coating. Widely used as a material with which coating on plastic body is enabled.

* For material colors or features, see P.951.

Item	Testing Method ASTM	Representative Products												
		Fluororesin				PEEK		PPS		Free-cutting Resin (Unilate®)	PET Antistatic	PBT	ABS	
		Standard	Standard	Sliding	Electrical Conductivity	Standard	Abrasion Resistance	Standard	Abrasion Resistance	Standard	Antistatic	Standard	Standard	
		Plate	P.1011	P.1011	P.1013	P.1013	P.1017	P.1017	P.1019	P.1019	P.1021	P.1021		
		Circular Plate	P.1023	P.1023	-	P.1023	P.1023	P.1023	P.1023	-	-	P.1023	P.1023	
		Unit	PTFE	PKA	PKAH	PKCA	NPSS	NPMS	YCA	PYCA	NPBT	NABS		
Mechanical Properties	Tensile Strength	Ambient Temperature	D-638	MPa (kgf/cm²)	13.7~34.3 (140~350)	98 (1000)	75 (765)	130 (1330)	85 (870)	75	110 (Vertical), 65 (Horizontal) (1120 (Vertical), 660 (Horizontal))	82 (836)	49 (500)	39 (400)
		Continuous Use at High Temperature	D-638	MPa (kgf/cm²)	-	20(250°C) (200(250°C))	-	-	-	220	-	-	-	-
	Elongation	D-638	%	200~400	20	5	5	27	5	5	2.4	10	200	-
	Bending Strength	D-790	MPa (kgf/cm²)	-	170 (1730)	97 (990)	227 (2320)	142 (1450)	72	220 (Vertical), 125 (Horizontal) (2240 (Vertical), 1270 (Horizontal))	127 (1295)	93 (950)	64 (650)	
	Flexural Modulus	D-790	MPa	550	4021	5001	-	3900	3689	110 (Vertical), 7000 (Horizontal)	3294	2550	2500	
	Compression Strength	Yield Point	D-695	MPa (kgf/cm²)	-	-	-	-	-	-	135 (1370)	-	100 (1020)	-
		5% Deformation	D-695	MPa (kgf/cm²)	11.8 (120)	119 (1210)	107 (1090)	144 (1470)	-	100 (1020)	-	-	80 (820)	-
	Izod Impact Strength	D-256	J/m	160	77	35	55	18	75	64	29	49	314	
	Rockwell Hardness	R Scale	D-785	-	-	120	120	-	100	-	120	125	75	105
		M Scale	D-785	-	-	105	-	-	-	84	-	-	-	-
Thermal Characteristics	Continuous Use	-	°C	-40~250	-50~250	Ambient Temp. -250	Ambient Temp. -250	Ambient Temp. -190	Ambient Temp. -220	Ambient Temp. -120	Ambient Temp. -100	Ambient Temp. -120	Ambient Temp. -50	
	Melting Point	-	°C	327	340	340	340	275	280	252	-	225	-	
	Deflection Temp. Under Load	0.45Mpa	D-648	°C	121	-	-	-	-	-	235	195	-	-
		1.82Mpa	D-648	°C	55	155	195	230	108	116	-	-	68	85
Linear Expansion Coefficient	D-696	°C ⁻¹	1.0x10 ⁻⁴	5.0x10 ⁻⁵	5.0x10 ⁻⁵	2.5x10 ⁻⁵	2.6x10 ⁻⁵	5x10 ⁻⁵	4.0x10 ⁻⁵ (Vertical), 7.4x10 ⁻⁵ (Horizontal)	5.5x10 ⁻⁵	10.0x10 ⁻⁵	9.5x10 ⁻⁵		
Thermal Conductivity	D-177	W/m·K	0.25	0.25	0.92	0.24	-	-	-	0.51	-	-	-	
Surface Resistivity	D-257	-	>10 ¹⁸	-	-	-	-	-	-	10 ¹⁵	-	-	-	
Specific Volume Resistivity	D-257	Ω·cm	>10 ¹⁸	10 ¹⁶	-	10 ⁵ ~10 ⁶	2.0x10 ¹⁶	10 ¹⁴	10 ¹⁵	10 ⁸ ~10 ⁹	5.0x10 ¹⁶	9.0x10 ¹⁵		
Insulation Breakdown Voltage	D-149	kV/mm	19	19	-	-	15	-	-	-	14	24		
Dielectric Constant	10 ⁶ Hz	D-150	-	2.1	3.3	-	-	3.6	-	3.8	-	3.3	-	
Dissipation Factor	10 ⁶ Hz	D-150	-	<2x10 ⁻⁴	3x10 ⁻³	-	-	1.1x10 ⁻³	-	0.025	-	-	-	
Specific Gravity	D-792	-	2.14~2.2	1.32	1.45	1.41	1.35	1.43	1.63	1.39	1.31	1.05		
Water Absorption Ratio	In water, Level	D-570	%	<0.01	0.5	-	-	-	-	-	-	-	0.3	
	In water, 24hrs	D-570	%	<0.01	0.14	0.06	-	0.02	0.01	0.1	0.03	0.09	-	
Abrasion Resistance	-	-	○	○	○	○	○	○	○	○	○	○		
Sliding Properties	-	-	○	○	○	○	○	○	○	○	○	○		
Dynamic Friction Coefficient	-	-	0.04~0.25	-	0.24	0.21	-	-	-	-	-	-		
Dimension Stability	-	-	×~△	○	○	○	○	○	○	○	○	○		
Impact Resistance	-	-	○	○	○	○	○	○	○	○	○	○		
Flame Resistance	[UL94]	-	(V-0 Equivalent)	(V-0 Equivalent)	(V-0 Equivalent)	(V-0 Equivalent)	(V-0 Equivalent)	(V-0 Equivalent)	(V-0 Equivalent)	HB	(HB Equivalent)	(HB Equivalent)		
Food Sanitation Laws	-	-	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable		
FDA Registration	-	-	Finished	Finished	-	-	-	-	-	-	-	-		
Chemical Resistance	Oil	-	○	○	○	○	○	○	○	○	○	○		
	Acid	-	○	○	○	○	○	○	○	○	○	○		
	Alkali	-	○	○	○	○	○	○	○	○	○	○		
	Organic Solvent	-	○	○	○	○	○	○	○	○	○	○		

○ Listed values are for reference, not guaranteed.