Engineered Plastics Guide

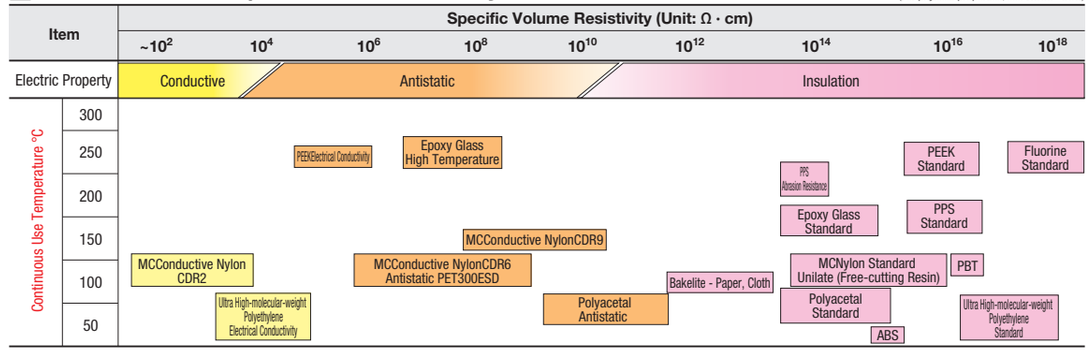
■Line-ups and Characteristics of Engineered Plastics

Page	Material	Color Sample	Grade	Color	Generic Name	Properties: Electric Properties	Continuous Use	Dimension Stability	Abrasion Resistance	Sliding Properties	Features
P.993	MC Nylon®		Standard	Blue	MC901	Insulation	-40°C ~ 120°C	△	○	○	[Features]MC Nylon® of Nippon Polypenco Ltd. is the most general material in engineered plastics and used for various industrial purposes. Excels in mechanical strength and abrasion resistance, but not in dimension stability due to high water absorption. [Appearance]Stripes on upper and lower surfaces of materials are developed from production process. Colors may have lot variations but it does not affect the physical properties. [Machinability]Machinability is good but harder to machine than that of Polyacetal due to special stickiness.
			Standard	Ivory	MC900NC	Insulation	-40°C ~ 120°C	△	○	○	
			Sliding	Purple	MC703HL	Insulation	-40°C ~ 120°C	△	◎	◎	[Features]Dynamic Friction Coefficient is low. Excels in sliding properties, abrasion resistance and mechanical strength. [Appearance]Stripes on upper and lower surfaces of materials are developed from production process. Feel rough due to the special additive. [Machinability]Same as Standard Type. [Caution]Do not use for processing of food oils and fats.
			High Strength	Dark Brown	MC602ST	Insulation	Normal Temperature ~ 150°C	△	○	○	[Features]Upper temperature limit is higher than that of Standard Type and excels in mechanical strength. [Appearance]Stripes on upper and lower surfaces of materials are developed from production process. [Machinability]Same as Standard Type. Material is harder than that of Standard Type.
			Weather Resistance	Dark Gray	MC801	Insulation	Normal Temperature ~ 120°C	△	◎	○	[Features]Excels in weather resistance and abrasion resistance. Can be used outdoors over a long period of time. [Appearance]Stripes on upper and lower surfaces of materials are developed from production process. [Machinability]Same as Standard Type.
			Conductivity CDR2	Black	MC501CDR2	Conductive	Normal Temperature ~ 120°C	△	△	○	[Features]Conductivity CDR2: Has the highest conductivity in the MC Nylon® conductive grades. Suitable where quick conductivity is required. Conductivity CDR6: Electrical property is between conductive and antistatic. The most general and economical in the MC Nylon® conductive grades. Conductivity CDR9: Electric property is antistatic. Has the highest heat resistance in MC Nylon® of conductive grade. [Appearance]Marks are printed with "R2" (white), "R6" (yellow) and "R9" (green) markers on upper and lower surfaces of the material to distinguish the conductive grades. Stripes on upper and lower surfaces of materials are developed from production process. [Machinability]Same as Standard Type. Material contains carbons and is harder than that of Standard Type. [Caution]Do not use as heating elements or electric parts such as contact points or terminals.
			Conductivity CDR6	Black	MC501CDR6	Antistatic	Normal Temperature ~ 120°C	△	△	○	
			Conductivity CDR9	Black	MC501CDR9	Antistatic	Normal Temperature ~ 150°C	△	○	○	
P.997	Polyacetal		Standard	White	POM Duracon	Insulation	-45°C ~ 95°C	○	△	○	[Features]General Engineered Plastics for various industrial purposes. Equal to Duracon®. Has low water absorption and excels in dimension stability. Inferior to MC Nylon® in heat resistance and abrasion resistance. [Appearance]Upper and lower surfaces look and feel smooth. Weld line (resin flow mark) is developed from production process. [Machinability]Good machinability.
			Standard	Black	POM Duracon	Insulation	-45°C ~ 95°C	○	△	○	
			Antistatic	Ocher	-	Antistatic	Normal Temperature ~ 80°C	△	○	○	[Features]No-carbon antistatic material is used and effective for antistatic. [Appearance]Unlike Standard Type, weld line (resin flow mark) is not highly visible. [Machinability]Same as Standard Type.
P.1001	Bakelite		Paper Bakelite	Natural Color	Laminated phenol formaldehyde resin w/paper base	Insulation	-50°C ~ 100°C	○	× ~ △	× ~ △	[Features]General material for various purposes such as insulation and heat resistance. Paper-based materials are more inexpensive than cloth-based materials. [Appearance]Upper and lower surfaces are glossy and smooth. Natural color tone vary per production lot. Color becomes darker due to oxidation over time. However, it does not affect properties. Paper-based black color does not change. [Machinability]Good machinability but dust scatters when machined.
			Paper Bakelite	Black	Laminated phenol formaldehyde resin w/paper base	Insulation	-50°C ~ 100°C	○	× ~ △	× ~ △	
			Cloth Bakelite	Natural Color	Laminated phenol formaldehyde resin w/cloth base	Insulation	-50°C ~ 100°C	○	× ~ △	× ~ △	[Features]General material for various purposes such as insulation and heat resistance. Cloth-based materials have higher strength than paper-based materials. [Appearance]Upper and lower surfaces are smooth and have grains. [Machinability]Good machinability but dust scatters when machined. Cloth-based materials have less machinability than paper-based materials due to lamination.
P.1007	Epoxy Glass		Standard	Green	Glass Epoxy	Insulation	Normal Temperature ~ 155°C	○ ~ ◎	× ~ △	× ~ △	[Features]Excels in heat resistance, heat insulation and electrical insulation. [Appearance]Upper and lower surfaces are glossy and smooth. Cut surfaces appear whitish. [Machinability]Because made of laminated glass fiber and epoxy resin, drilling or cutting in the direction of lamination may cause cracks.
			High Temperature	Black	-	Antistatic	Normal Temperature ~ 260°C	○ ~ ◎	× ~ △	× ~ △	[Features]Excels in heat resistance, heat insulation and antistatic effect. [Appearance]Unlike Standard Type, upper and lower surfaces are not glossy but smooth. [Machinability]Same as Standard Type.
P.1009	Ultra High-Molecular-weight Polyethylene		Standard	Milky White	UHPE UHMWPE New Lite®	Insulation	-100°C ~ 80°C	△	◎	◎	[Features]Standard:Has low specific gravity and is lightweight. Excels in abrasion resistance and sliding properties. New Lite® of Saxin Corporation is used for the standard type of ultra-high-molecular-weight polyethylene. Electrical Conductivity:Excels in sliding property and abrasion resistance at ambient temperature with low load. Also excels in conductivity. [Appearance]Clear white for Standard Type. Pullout marks are left at the extruded direction. Surfaces feel smooth. [Machinability]Hard to machine as they are soft. Be careful of the way to fix. [Caution]Storing them against the wall causes warpage. Be sure to lay them out flat. Do not use Conductive Type as heating elements or electric parts such as contact points or terminals.
			Electrical Conductivity	Black	-	Conductive	-100°C ~ 80°C	△	○	○	
P.1011	Fluorine		Standard	White	Teflon PTFE	Insulation	-40°C ~ 250°C	× ~ △	○	◎	[Features]Excels in heat resistance and chemical resistance. Fluororesin is Polytetrafluoroethylene resin (equal to Teflon®). [Appearance]Upper and lower surfaces look and feel very smooth. [Machinability]Hard to machine as they are soft and become swollen. [Caution]Storing them against the wall causes warpage. Be sure to lay them out flat.

Page	Material	Color Sample	Grade	Color	Generic Name	Properties: Electric Properties	Continuous Use	Dimension Stability	Abrasion Resistance	Sliding Properties	Features
P.1013	PEEK		Standard	Ash Brown	PEEK	Insulation	-50°C ~ 250°C	○	○	○	[Features]Standard:Well balanced in heat resistance, insulation, dimension stability, chemical resistance, abrasion resistance and machinability. Sliding: In addition to the features of Standard Type, it excels in mechanical characteristics and sliding property at high temperature. Conductivity: In addition to the features of Standard Type, has very low Specific Volume Resistivity and excels in conductivity. [Appearance]Upper and lower surfaces of the material are glossy. Weld line (resin flow mark) is developed from production process. It can be removed by milled surface finishing. [Machinability]Machinability is good, however, they may tend to chip in the direction of the milling path because they are harder than MC Nylon®. Beware of the milling speed. When drilling a hole, the reference feeding speed when going through is 0.1mm per rotation. [Caution]Do not use Sliding Type and Conductive Type as heating elements or electric parts such as contact points or terminals.
			Sliding	Black	-	Insulation and Conductive Mixed: Not measurable.	Normal Temperature ~ 250°C	○	○	○	
			Electrical Conductivity	Black	-	Conductive	Normal Temperature ~ 250°C	○	○	○	
P.1017	PPS		Standard	Natural Color	PPS	Insulation	Normal Temperature ~ 190°C	○	△	△	[Features]Standard: Excels in heat resistance, chemical resistance and dimensional stability. More economical than PEEK. Abrasion Resistance: Superior in abrasion resistance and sliding property, especially in dimensional stability to Standard Type. [Appearance]Upper and lower surfaces of the material are glossy. Weld line (resin flow mark) is developed from production process. It can be removed by milled surface finishing. [Machinability]Machinability is good, however, they may tend to chip in the direction of the milling path because they are harder than MC Nylon®. Beware of the milling speed. When drilling a hole, the reference feeding speed when going through is 0.1mm per rotation. [Caution]PPS generates an oxide film on the surface and the color turns to brown when it is exposed to light and heat (direct sunlight, fluorescent light, mercury lamp and high-temperature atmosphere) for long hours. However, it changes little in mechanical properties and physical properties. * Unlike Standard Type, discoloration doesn't occur due to the addition of color.
			Abrasion Resistance	Blue	-	Antistatic	Normal Temperature ~ 220°C	◎	◎	○	
P.1019	Unilate®		Standard	Natural Brown	Unilate®	Insulation	Normal Temperature ~ 120°C	○	△	△	[Features]Unilate® excels in heat resistance, voltage resistance, strength and machinability. Unilate® of Unitica Ltd., not annealed material, is used. [Appearance]Upper and lower surfaces are very smooth. [Machinability]Laminated plate with relatively good machinability.
P.1019	PET		Antistatic	Black	PET300ESD	Antistatic	Normal Temperature ~ 100°C	◎	○	○	[Features]Electric property is antistatic. Uses PET whose Water Absorption Ratio. Linear Expansion Coefficient is at low level, and thus, excels in Dimensional Stability. [Appearance]Stripes on upper and lower surfaces of materials are developed from production process. Frequency of color staining is less than MC Nylon® Conductivity CDR6. [Machinability] Uses PET material, and thus, is superior to MC Nylon, etc. in machinability.
P.1021	PBT		Standard	White	PBT	Insulation	Normal Temperature ~ 120°C	○	△	△ ~ ○	[Features]Excels in heat resistance, electric property, dimension stability and insulation. [Appearance]Marks of machining on upper and lower surfaces are developed from production process. [Machinability]Good machinability.
P.1021	ABS		Standard	Natural Color	ABS	Insulation	Normal Temperature ~ 50°C	◎	△	△	[Features]Excels in machinability and adhesion is possible. The material is often used for prototypes. [Appearance]Upper and lower surfaces are glossy and smooth by the size up to 10mm. [Machinability]Good machinability.

■Reference Values of Specific Volume Resistivity and Heat Resistance

(For physical properties, see P.953~955)

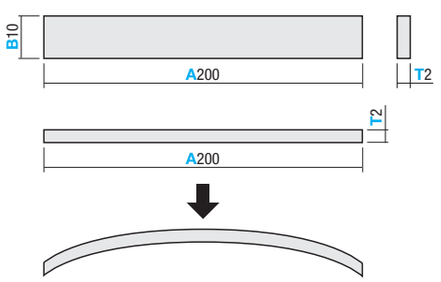


About Shape / Dimension Change of Resin

Resin, unlike metals, can be easily distorted, expanded or contracted due to temperature and humidity.
See note below for designing.

①Shape Distortion

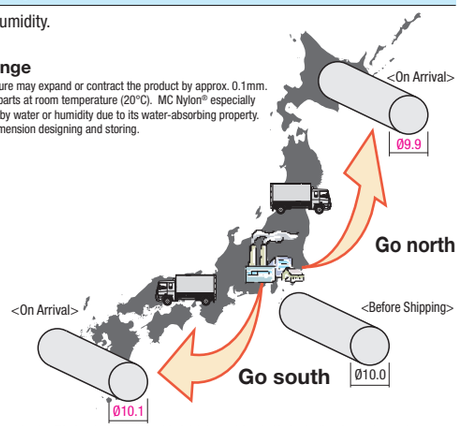
Avoid long and thin shapes when possible. These shapes cause more distortion. It is recommended to split the dimension or place bolts to fasten.



Distorted parts can be fixed to a certain extent by applying weight on them for 24 hours or so.

②Dimension Change

1°C change of the temperature may expand or contract the product by approx. 0.1mm. Be sure to store purchased parts at room temperature (20°C). MC Nylon® especially tends to expand or contract by water or humidity due to its water-absorbing property. Pay extra attention to the dimension designing and storing.



Dimension changed parts will be bought back to their original state to a certain extent by leaving them in room temperature.