

Transparent Plastic Plate Characteristics

Characteristics of PET, Antistatic PVC, Acrylic and Polycarbonate

Provides four types of clear plates with superior transparency. In addition to the standard grade, antistatic grade with antistatic function is available. 4 colors, transparent, smoke brown, smoke gray and orange, are available.

- PET
 - It has approx. 4 times stronger impact resistance than that of acrylic. Moreover it is an environment-friendly material, which generates no poisonous gas when burned. It is also cost effective.
- Antistatic PVC
 - Excels in chemical resistance and flame resistance, and superior in cost-effectiveness among anti-static materials.
- Acrylic
 - Excels in transparency, weather resistance and machinability, and is used widely for indoor and outdoor purposes, such as covers for industrial machinery, art display cases and signboards.
- Polycarbonate
 - The level of impact strength is ranked as the highest among the transparent resin materials (approx. 30 times higher than that of acrylic plates). It excels in resistance against high and low temperatures, and is widely used.

Item	JIS Testing Method	Unit	Representative Products											
			PET		PVC	Acrylic (Cast)		Acrylic Economy (Extrusion)		Polycarbonate				
			Standard	Antistatic	Antistatic	Standard	Antistatic	Standard	Antistatic	Standard	Antistatic	Standard	Antistatic	
			P.957	P.961	P.963	P.967		P.969						
			PYA PYBA PYDA	PYTA PYBTA	ENBT ENBBT	ACA ACBA ACDA	ACTA ACBTA	ACAE ACBAE	ACTAE ACBTAE	PCTA PCTBA PCTGA	PCTTA PCTBTA	PCTSP		
Light Transmittance (Top: Transparent) (Middle: Smoke Brown) (Bottom: Smoke Gray)	-	%	PYA:87 PYBA:28 PYDA:45	PYTA:80 PYBTA:30	ENBT:80 ENBBT:29	ACA:93 ACBA:25 ACDA:43	ACTA:79 ACBTA:32	ACAE:92 ACBAE:34	ACTAE:87 ACBTAE:25	PCTA:90 PCTBA:35 PCTGA:33	PCTTA:86 PCTBTA:35	PCTSP:91		
Tensile Strength	K-7113	MPa {kgf/cm ² }	62 {630}	52 {530}	63 {640}	75 {760}	75 {760}	67 {682}	76 {774}	73 {754}	65 {663}	65 {663}	65 {663}	
Elongation*	K-7113	%	15	-	50	2~7	5	4	5	5	83	83	83	
Bending Strength	K-7203	MPa {kgf/cm ² }	83 {850}	71 {730}	98 {1000}	117 {1200}	106 {1080}	111 {1274}	125 {1244}	122 {918}	90 {918}	90 {948}	93 {948}	
Flexural Modulus	K-7203	MPa	2.4×10 ⁵	2.0×10 ⁵	3.4×10 ⁵	3.2×10 ⁵	3.3×10 ⁵	3400	3500	3300	2300	2300	2300	
Compression Strength	K-7181	MPa	-	60	83	124	-	120	-	-	78	78	-	
Yield Point		{kgf/cm ² }	-	{610}	{850}	{1270}	-	{1200}	-	-	{795}	{795}	-	
Izod Impact Strength	K-7110	kJ/m ²	10	-	2.9	2.7	-	2.5	1.5	2	15	15	-	
Rockwell Hardness	M Scale	-	59	46	-	100	100	100	99	97	67	70	-	
Continuous Use	-	°C	-15~55	-15~55	-30~60	-30~80	-30~80	-30~70	-30~70	-30~60	-30~100	-30~100	-30~100	
Deflection Temp. Under Load	0.45MPa	°C	70	69	-	100	85	90	110	92	135	135	135	
Linear Expansion Coefficient	K-7140	°C ⁻¹	6.8×10 ⁻⁵	7.5×10 ⁻⁵	7.0×10 ⁻⁵	7.0×10 ⁻⁵	5.9×10 ⁻⁵	7.0×10 ⁻⁵	7.0×10 ⁻⁵	7.0×10 ⁻⁵	6.5×10 ⁻⁵	5.2×10 ⁻⁵	6.5×10 ⁻⁵	
Thermal Conductivity	-	W/m·K	-	-	0.16	0.21	-	0.21	0.21	-	0.24	-	-	
Specific Heat	-	J/g·K	1.3	1.35	1.12	1.46	1.46	1.46	1.47	1.5	1.3	1.2	-	
Surface Resistivity	K-6911	Ω	>10 ¹⁰	10 ⁶ ~10 ⁸	10 ⁷ ~10 ⁸	>10 ¹⁵	10 ⁶ ~10 ⁸	>10 ¹⁵	>10 ¹⁶	10 ⁷ ~10 ⁸	>2.0×10 ¹⁶	10 ⁶ ~10 ⁸	>2.0×10 ¹⁶	
Specific Volume Resistivity	K-6911	Ω·cm	>10 ¹¹	>10 ¹⁷	-	>10 ¹⁵	>10 ¹⁷	>10 ¹⁵	>10 ¹⁵	>10 ¹⁵	>10 ¹⁷	>10 ¹⁷	>10 ¹⁷	
Insulation Breakdown Voltage	K-6911	kV/mm	-	-	-	20	-	20	20	-	20	-	20	
Dielectric Constant	10 ⁶ Hz	K-6911	-	3.2	-	3.2	2.9	3.1	4	-	3	3	3	
Dissipation Factor	10 ⁶ Hz	K-6911	-	-	-	0.06	0.032	0.06	0.06	-	0.009	0.06	-	
Specific Gravity	-	-	1.27	1.27	1.4	1.2	1.2	1.2	1.19	1.19	1.2	1.2	1.2	
Water Absorption Ratio	K-7209	%	-	-	0.03	0.4	0.18	0.4	0.3	0.4	0.24	0.15	-	
Flame Resistance	-	-	-	-	Self-extinguishing	×	×	-	-	-	Self-extinguishing	-	-	
Chemical Resistance	Oil	-	-	○	○	○	○	○	○	○	○	×	○	
	Acid	-	-	×	×	○	○	○	○	○	×	×	×	
	Alkali	-	-	×	×	○	○	○	○	○	×	×	×	
	Organic Solvent	-	-	×	×	×	×	×	×	×	×	×	×	

* Listed values are for reference, not guaranteed.

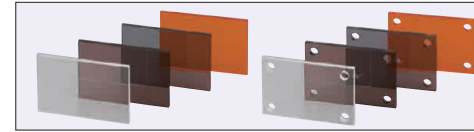
* Values of elongation of polycarbonate and PET are % values measured by JIS K-7162-1B/50.

Characteristics of Acrylic Cast Plates and Extruded Plates

As for Acrylic Plates, cast plates made by cell-cast method and extruded plates are available. Cast plates have better heat resistance and stronger mechanical strength than extruded plates. Extruded plates are more inexpensive than cast plates.

When extruded plates have contact with vaporizing liquid such as methanol and methylene chloride after they are thermal-processed such as laser machining, they may have cracks. Also, extruded plates may have deflection at high temperature.

Transparent Plastic Plates



MISUMI provides clear plate of four materials superior in transparency. In addition to the standard grade, antistatic grade with antistatic function is available. 4 colors, transparent, smoke brown, smoke gray and orange, are available. Often used as a cover, and variety of options for mounting hole alterations are available. Use MISUMI Transparent Plastic Plates.

Material	PET		Vinyl Chloride (Antistatic)	Acrylic (Cast)		Acrylic Economy (Extrusion)	Polycarbonate	
Page	P.973	P.957~	P.961	P.973	P.963~	P.967	P.973	P.969~
Size	Width (B)	20~300	20~1000	100~ 900	20~300	20~1000	300~ 900	20~300
	Length (A)	20~300	20~2000	100~1100	20~300	20~2000	300~1100	20~300
	Plate Thickness (T)	0.5, 1.5	1, 2, 3, 4, 5, 8	3, 5	0.5, 1, 1.5, 2	3, 4, 5, 6, 8, 10, 15, 20, 25	3, 5, 8	0.5, 1, 1.5, 2
Drilling Method	Circular Sawing		Circular Sawing	Circular Sawing - 4-side Milling		Circular Sawing	Circular Sawing	
Drilling Alterations	Through Hole, Countersink, Keyhole, Threaded Insert							
Alterations	See below.							

Alterations

Alterations	Notching for Blind Joints of Aluminum Extrusions	Relief at Four Corners	Corner Radius	Corner Cut
Code	F□□, E□□, J□□, K□□	CN	CRA, CRB, CRC, CRD	CCA, CCB, CCC, CCD
Spec.	Machines relief for blind joints of aluminum extrusions. * Margin against thermal expansion of the plate is not taken into account. * Longitudinal direction of notching is all on A dimension side. * Applicable to T3 and T5 only. Ordering Code: F S 6 Extrusion Type Joint Type Notching Position (See the diagram above). * Applicable to standard sizes only.	CN=1mm Increment Machines relief at four corners. * 5≤CN≤50 Ordering Code: CN=25 → CN25 * Applicable to standard sizes only.	Adds radius to any corner. * Applicable to T3 and T5 only. R = 5mm Increment * 10≤A(B)-R(2R) Ordering Code: (Ex.) Adds R10 at the corner of A and C. CRA10-CRC10 * Applicable to standard sizes only.	Cuts any corners. 5 ≤ Corner Cut ≤ 50 5mm Increment Ordering Code: (Ex.) When the corners of A and D are cut by C5→ CCA5-CCD5 * Applicable to standard sizes only.

See below for details.

Part Number - A - B - T - Corner F - Corner E - Corner J - Corner K
 ACAE - 800 - 600 - 3 - FS6 - ED6 - JS6 - KD6

Notched Shapes for Various Joints	Simple Joint Kits (P.604)	Single Joint Kits (P.609)		Pre-assembly Double Joint Kits (P.611, 663, 709)		Center Joints (P.553, 605, 662, 708)	Post-assembly Double Joints (P.554, 607, 664, 710)	
		Screw Joint Kits (P.552, 603, 660, 706)	Single Joint Kits Standard Type	Single Joint Kits Narrow Type, Screw Joint Kits	Standard Type	Eccentric Nut Type		
(Ex. 1)								
(Ex. 2)								
HFSS Series 5	-	-		-	-			
HFSS Series 6		Portion that fits into slot						
HFSS Series 8	-							
HFSS-45 Series 845	-							

* For how to select panels, refer to P.803, 804.

* Dimensions above include a margin of 1mm at the groove part.

Make the margin larger for engineered plastic plates and etc., because it expands or shrinks largely by the temperature fluctuation.

Ex.) When the temperature rises or falls by 10°C, the Acrylic Plate Economy Type (Extruded) with 1m length expands or shrinks by 0.7mm. The margin of approx. 2mm is necessary in the case of temperature difference of 30°C.

Engineered Plastics Guide

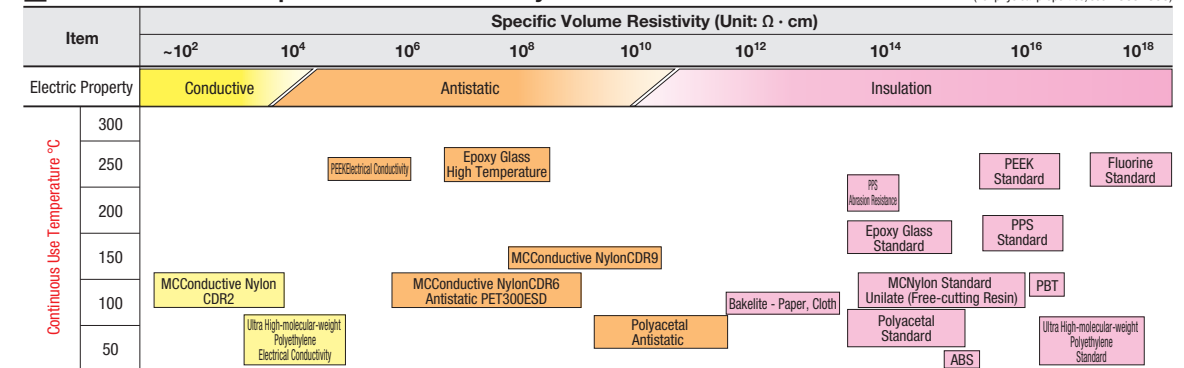
Line-ups and Characteristics of Engineered Plastics

Page	Material	Color Sample	Grade	Color	Generic Name	Properties					Features
						Electric Properties	Continuous Use	Dimension Stability	Abrasion Resistance	Sliding Properties	
P993	MC Nylon®		Standard	Blue	MC901	Insulation	-40°C +120°C	△	○	○	[Features]MC Nylon® of Nippon Polyenco 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	△	○	○	[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.
			Sliding	Purple	MC703HL	Insulation	-40°C +120°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.
			High Strength	Dark Brown	MC602ST	Insulation	Normal Temperature +150°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.
			Weather Resistance	Dark Gray	MC801	Insulation	Normal Temperature +120°C	△	◎	○	[Features]Excels in heat resistance, electrical property, dimension stability and insulation. [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.
			Conductivity CDR6	Black	MC501CDR6	Antistatic	Normal Temperature +120°C	△	△	○	[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.
P997	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	○	△	○	[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.
			Antistatic	Ocher	-	Antistatic	Normal Temperature +80°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.
P1001	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. 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.
			Paper Bakelite	Black	Laminated phenol formaldehyde resin w/paper base	Insulation	-50°C +100°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.
			Cloth Bakelite	Natural Color	Laminated phenol formaldehyde resin w/cloth base	Insulation	-50°C +100°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.
P1007	Epoxy Glass		Standard	Green	Glass Epoxy	Insulation	Normal Temperature +150°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.
			High Temperature	Black	-	Antistatic	Normal Temperature +260°C	○	×	×	[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.
P1009	Ultra High-molecular-weight Polyethylene		Standard	Milky White	UHPPE 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.
			Electrical Conductivity	Black	-	Conductive	-100°C +80°C	△	○	○	[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.
P1011	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					Features
						Electric Properties	Continuous Use	Dimension Stability	Abrasion Resistance	Sliding Properties	
P1013	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.
			Sliding	Black	-	Insulation and Conductive. Meas. Not measurable.	Normal Temperature +250°C	○	○	○	[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.
			Electrical Conductivity	Black	-	Conductive	Normal Temperature +250°C	○	○	○	[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.
P1017	PPS		Standard	Natural Color	PPS	Insulation	Normal Temperature +180°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.
			Abrasion Resistance	Blue	-	Antistatic	Normal Temperature +220°C	◎	◎	○	[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.
P1019	Unilate®	Standard	Natural Brown	Unilate®	Insulation	Normal Temperature +120°C	○	△	△	[Features]Unilate® excels in heat resistance, voltage resistance, strength and machinability. Unilate® of Unilite Ltd., not annealed material, is used. [Appearance]Upper and lower surfaces are very smooth. [Machinability]Laminated plate with relatively good machinability.	
P1019	PET	Standard	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.	
P1021	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.	
P1021	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 P953-955)

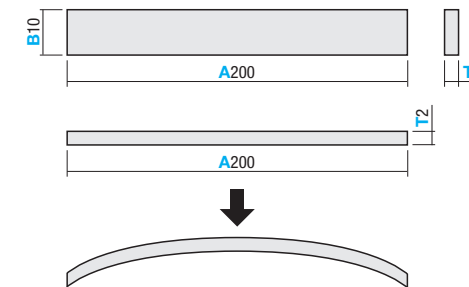


About Shape / Dimension Change of Resin

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

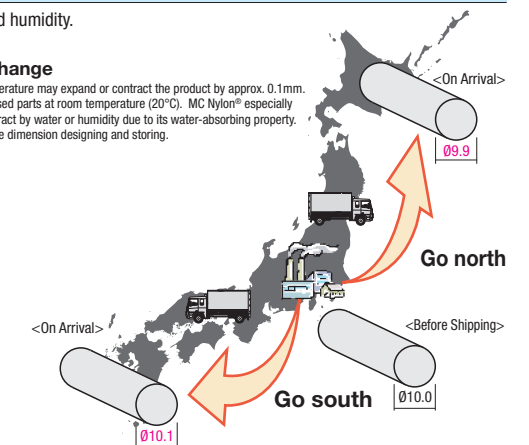
① Shape Distortion

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



② Dimension 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.



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

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

