

Resin Washers / Collars - Properties and Features

Properties of Resin Materials

- Polycetal : This material offers excellent mechanical strength, and is used generally and widely. White color or Black color is selectable.
- MC Nylon : Superior to Polyacetal in abrasion resistance. Conductive Grade Model is also available, and is effective against static electricity.
- Bakelite : Serves as insulating part. In addition to Paper Base Type, Cloth Base Type is also offered with higher strength.
- Fluororesin : Excellent at impact resistance, chemical stability and electrical properties. This material also offers excellent sliding properties, and thus, is used for rotating areas.
- PEEK : Excellent at heat / chemical resistance. This material also offers excellent mechanical properties under high temperature.
- Epoxy Glass : Superior to Bakelite in strength and heat / humidity resistance.
- Polycarbonate : Has the top-level impact strength among transparent resin materials, and also offers excellent heat / cold resistance. Thus, this material is capable of wide application.
- Polyslider® : Excellent at sliding properties and abrasion resistance. This material is suitable for sliding / rotating areas.

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Item	Testing Method (ASTM*)	Unit	Material									
			Polycetal	MC Nylon		Bakelite		Fluororesin Polytetra-fluoroethylene	PEEK Polyether Ether Ketone	Epoxy Glass	Polycarbonate	
				Standard	Conductive/antistatic grade CDR2	Antistatic grade CDR6	Paper Base					Cloth Base
Tensile Strength	D638	MPa	61	96	68	74	113	97	13.7~34.3	98	309	59
Elongation	D638	%	40	30	10	7	2.6	2	200~400	20	4	60~120
Bending Strength	Vertical	D790	89	110	117	117	189	144	-	170	431	80.4
	Parallel	D790					182	148				
Flexural Modulus	D790	MPa	2589	3530	4110	4020	9680	8650	550	4021	16300	2200
Compression Strength	Vertical	D695	103	95	98	93	135	116	11.8	119	266	73.5
5% Deformation	Parallel	D695					132	115				
Izod Impact Strength (Notched)	D256	J/m	74	50	35	35	-	-	160	77	-	740~980
Rockwell Hardness	D785	R/M Scale	R119 M78	R120	R119	R117	-	-	-	120	-	M60~70
Deflection Temperature under Load	0.45MPa	D648	158				215	-	-	121	-	145
	1.82MPa	D648	110				200	206	230~	55	155	230~
Ambient Operating Temperature	-	°C	-45~95	-40~120			-50~100		-40~250	-50~250	-150~180	~110
Ref.: Destruction Temperature * Carbonization Start, Collapse, Dissolution Temperature	-	°C	165	222	215	215	-	-	327	340	-	-
Linear Expansion Coefficient	D696	10 ⁻⁵ /°C	9.0	9.0	8.0	7.5	-	-	9.9	5.0	1.55	6.0~7.0
Thermal Conductivity	D177	W/m·k	0.233	0.233	0.512	0.709	0.21	0.38	0.25	0.25	0.47	0.19
Dielectric Constant 10 ⁶ Hz	D150	-	3.7	3.7	-	-	4.24	5.33	18.6	3.3	-	3.0
Dissipation Factor 10 ⁶ Hz	D150	-	0.007	0.02	-	-	0.036	0.056	~2x10 ⁻⁴	3x10 ⁻³	-	0.0012
Specific Volume Resistivity	D257	Ω·cm	-	-	-	-	-	-	>10 ¹⁸	>10 ¹⁶	10 ¹¹ ~10 ¹²	>10 ¹⁷
Surface Resistance	ANSI/ESD STM11.11	Ω	10 ¹²	10 ¹³	10 ⁴ ~10 ⁶	10 ⁵ ~10 ⁷	-	-	-	-	-	-
Dielectric Breakdown Strength (Breakdown Voltage)	D149	kV/mm	20	20	-	-	29.5	18.6	19	19	23	15
Arc Resistance	D495	sec	-	-	-	-	-	-	>300	23	180	-
Specific Gravity	D792	-	1.41	1.16	1.2	1.23	1.4	1.4	2.14~2.2	1.32	1.8~1.85	1.2
Moisture Absorption (At 23°Cx24h)	D570	%	0.22	0.8	-	-	0.5~1.3	1.6~1.8	<0.01	0.14	0.4	0.24
Glass Fiber Content	-	-	-	-	-	-	-	-	-	-	Contain	-
Food Sanitation Laws	-	-	Compliant	Compliant*	-	-	-	-	Compliant	Compliant	-	-
Flame Resistance	[UL94]	-	(HB Equiv.)	(HB Equiv.)	(HB Equiv.)	(HB Equiv.)	-	-	(V-0 Equiv.)	(V-0 Equiv.)	-	-
Chemical Resistance	Oil	-	○	○	○	○	-	-	○	○	-	○
	Acid	-	△~X	X	X	X	-	-	○	○	-	△
	Alkali	-	○	○~△	○~△	○~△	-	-	○	○	-	X
Organic Solvent	-	-	○	○	○	○	-	-	○	○	-	X
Characteristics	Sliding Properties	-	○	○	○	○	△	△	◎	○	△	△
	Heat Resistance	-	△	△	△	△	○	○	○	○	△~○	○
	Insulation	-	○	○	-	-	○	○	○	○	◎	◎
	Abrasion Resistance	-	△	○	△	△	X	X	○	○	X	X
	Dimension Stability	-	○	△	△	△	○	○	X	◎	○	○
	Machinability	-	-	◎	○	○	○	○	○	○	○	△

* In compliance with Food Sanitation Laws (MC Nylon, Standard: After boiling for 1.5hrs) Listed values are for reference, not guaranteed.
 ◎: Excellent
 ○: Good
 △: Questionable
 X: Poor
 * Do not store resin materials for prolonged duration to avoid dimensional deformation due to water absorption (Material with a higher moisture absorption rate will be deformed more.).
 * Property values of Polycarbonate are obtained by JIS test (for reference).
 * Bakelite may be discolored over time, but its properties do not change.
 * For Properties of PolysliderR, see P.145.
 * Surface resistance is tested using the ANSI/ESD STM11.11 method.

Washers / Collars

Shape	Material	Polycetal	Standard	MC Nylon		Bakelite		Fluororesin Polytetra-fluoroethylene	PEEK Polyether Ether Ketone	Epoxy Glass	Polycarbonate	Polyslider®	Ceramic	Thermal Insulation Material	
				Conductive Grade CDR2	CDR6	Paper Base	Cloth Base								
				Black	Black	Natural Color	Natural Color								
Standard	P143 O.D. D 4~60 I.D. V 0~55 Thickness T 2~10	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Flanged Solid	P146 O.D. D 6~60 Nose Dia. V 2~58 Thickness T 3~50	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Flanged	P146 O.D. D 4~60 Flange Dia. H 6~70 I.D. V 0~55 Overall Length L 2~10	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Counterbored	P151 O.D. D 10~60 I.D. P 3~53 Thickness T 3~50	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Square Resin Washer	P156 Length A 6~25 Width B 6~100 Thickness T 2~10	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Standard	P147 O.D. D 4~100 I.D. V 2~55 Overall Length L 10~100	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Flanged	P149 O.D. D 4~100 Flange Dia. H 6~110 I.D. V 0~90 Overall Length L 10~100	•	•	•	•	•	•	•	•	•	•	•	•	•	•
With Guide	P152 O.D. D 8~30 I.D. V 3~20 Overall Length L 2~50	•	•	•	•	•	•	•	•	•	•	•	•	•	•

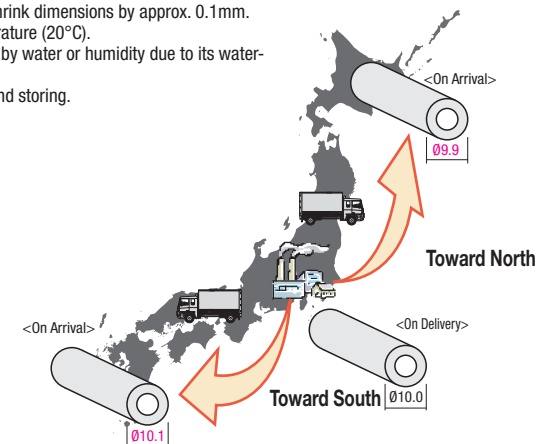
• Product Available - Product Not Available

About Designing of Resin Parts

Unlike metals, resin is the most likely to deform or change in dimensions due to temperature or humidity. Upon designing, pay attention to the following.

Alteration of Dimensions

- 1 °C level temperature change may expand or shrink dimensions 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.



* If dimensions-changed parts are put in room temperature for a while, they may be brought back to their original dimensions state in some degree.