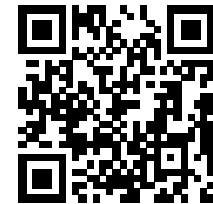


## High Performance Polyamide

***Reny***™



<https://www.gpac.co.jp/>

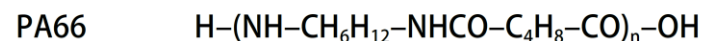
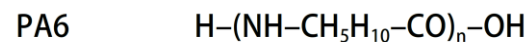
# Features of Reny

Reny is a proprietary molding compound based on mainly polyamide MXD6 that has been reinforced with glass fiber, carbon fiber or special minerals.

Reny generally has superior mechanical strength and modulus compared with other engineering plastics. Thus, Reny is suitable as a metal substitute in many applications, including automobiles, electronics, electrical appliances, machinery, and construction.

## Special features

- Excellent mechanical strength and modulus over a wide range of temperatures
- Superior to commodity polyamides in dimensional stability and mechanical strength due to low water absorption
- Low thermal expansion coefficient, equivalent to that of metal alloys
- Highly resistant to oils and organic solvents
- Low mold shrinkage and low warpage
- Good surface finish even in highly filled grades



## ■ Comparison of Properties of PAMXD6 and Conventional Polyamides

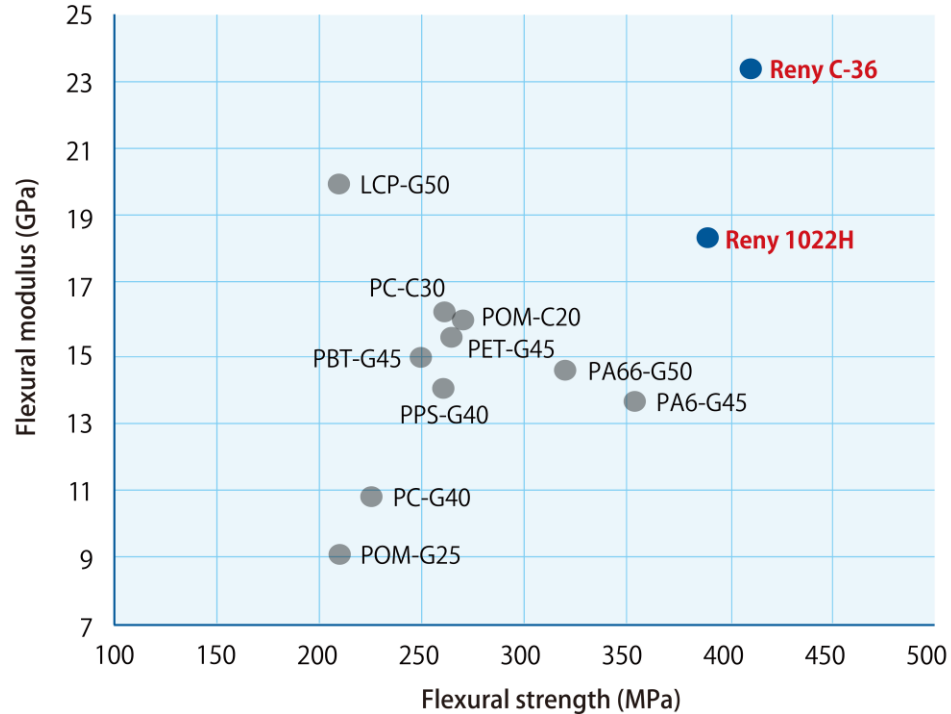
Properties	Units	Condition	PAMXD6	PA6	PA66
Density		20°C	1.21	1.14	1.14
Water Absorption	%	Immersion at 20°C	5.8	11.5	9.9
Moisture Regain	%	65% RH	3.1	6.5	5.7
Deflection Temperature Under Load	°C	1820kPa	96	57	60
Melting point	°C		243	225	268
Glass Transition Temperature	°C	DSC*	75	48	50
Thermal Expansion	10 <sup>-5</sup> cm/cm°C		5.1	8	10
Tensile Strength	MPa		99.0	61.8	76.5
Elongation	%		2.3	200	60
Tensile Modulus	GPa		4.7	2.5	3.1
Flexuel Strength	MPa		157	123	127
Flexuel Modulus	GPa		4.4	2.4	2.9
Izot Impact, Notched	J/m		20	59	39
Rockwell Hardness		M scale	108	85	89

\*DSC : Differential Scanning Calorimeter

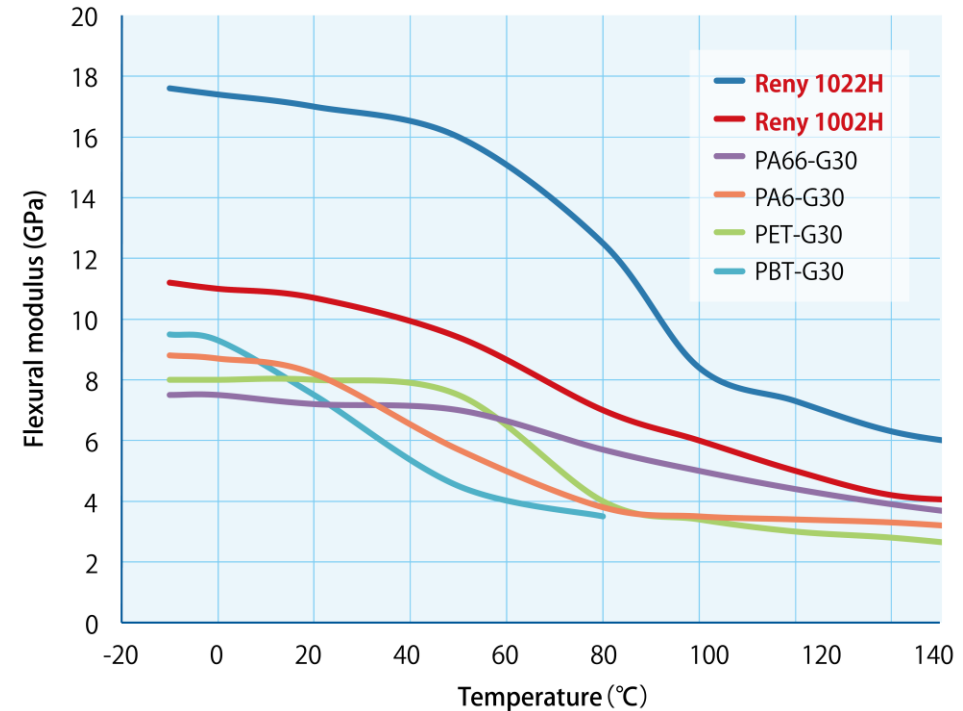
# Reny provides resistance to bending.

Reny has high strength and modulus comparable to some cast metals and alloys. Reny has higher strength and modulus compared to various engineering plastics. Moreover, Reny has excellent flexural modulus over a wide range of temperature.

■ Flexural strength and modulus



■ Temperature dependence of flexural modulus

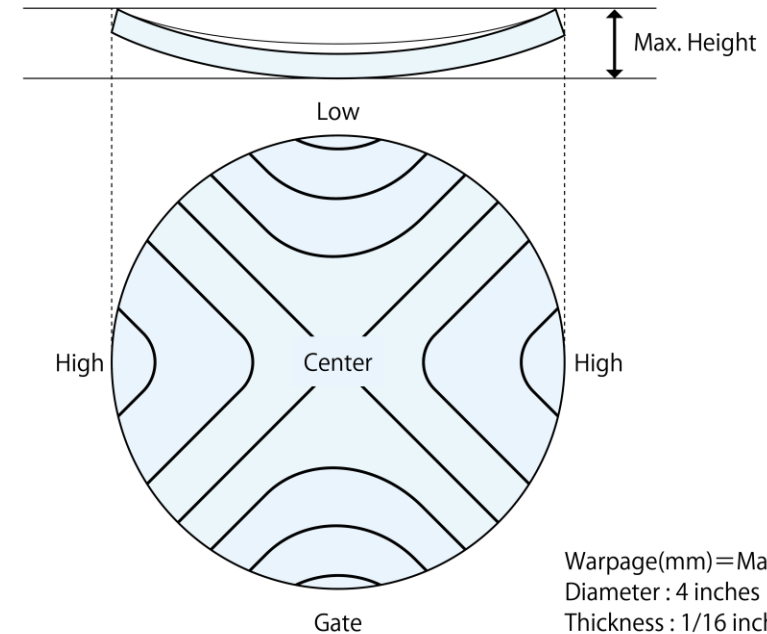


# ReNy provides excellent resistance to warping.

ReNy has lower warpage compared to other crystalline polymer-based FRTPs.

## ■ Warpage

Materials	Warpage (mm) at specific mold temp.	
	75°C	130°C
<b>ReNy 1002H</b>	–	<b>3.98 mm</b>
<b>ReNy 1022H</b>	–	<b>3.74 mm</b>
<b>ReNy 2620</b>	–	<b>0.31 mm</b>
<b>ReNy 2502AH</b>	–	<b>0.26 mm</b>
PA66-G30	5.75 mm	8.31 mm
PET-G30	–	5.65 mm
PBT-G30	8.17 mm	–
PBT Low Warpage Grade	3.11 mm	–
PPS-G40	–	2.60 mm

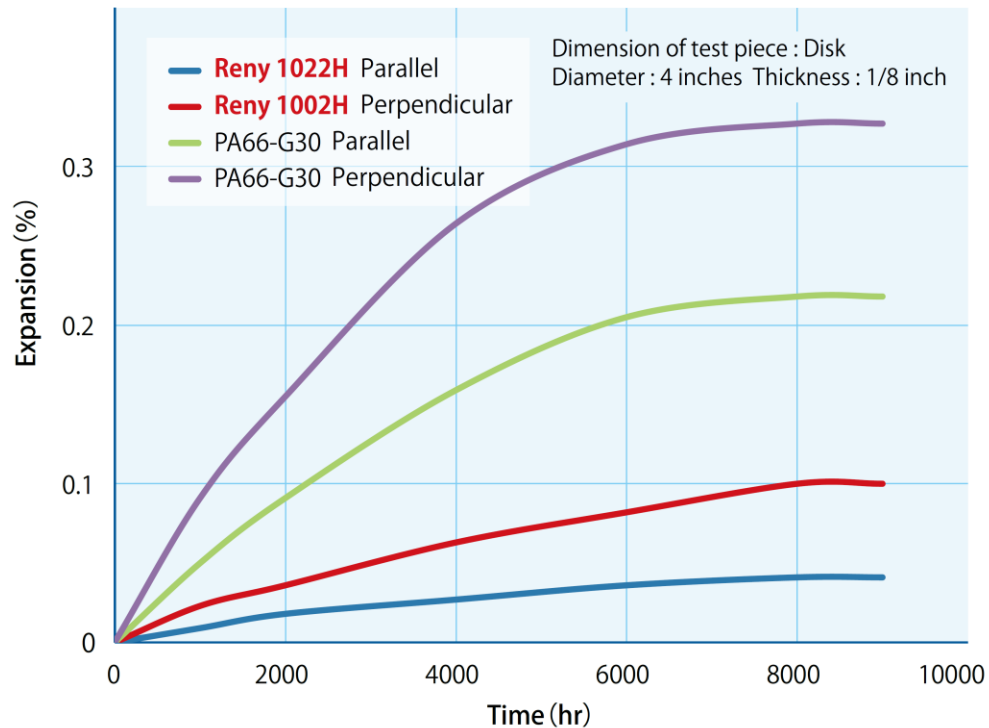


# Reny offers low water absorption. / Reny can be used in high temperature.

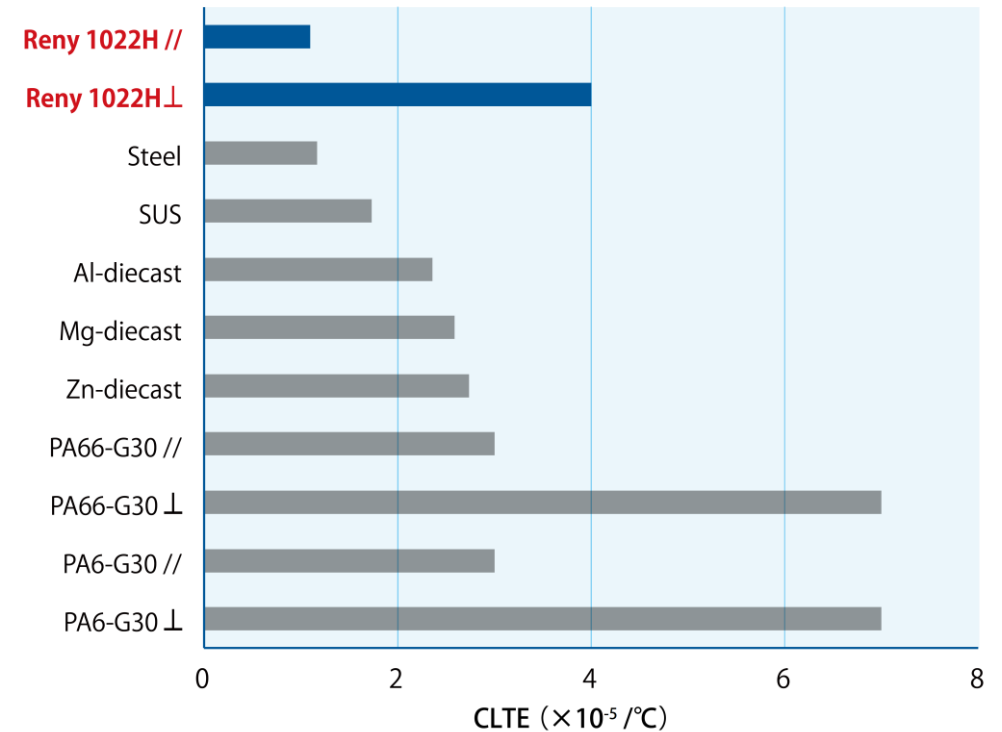
Owing to its low water absorption, Reny has better dimensional stability than typical polyamides.

Reny has low coefficient of linear thermal expansion (CLTE) similar to that of metals or metal alloys.

## ■ Dimensional changes at 20°C, 65%RH



## ■ CLTE comparison



# Reny is highly chemical-resistant.

Reny has superb resistance against gasoline, lubricant, organic chemicals containing chlorine and other chemicals.

## ■ Chemical resistance

Weight increase (%) / Loss of tensile strength (%)

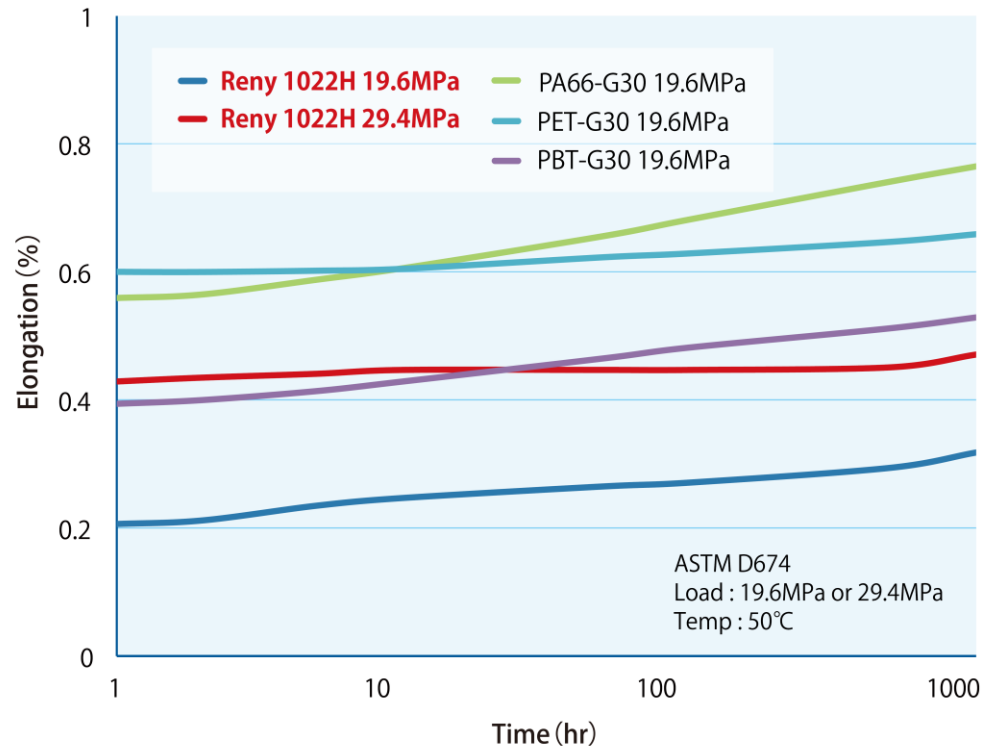
Chemicals	Reny 1002H	PA66-G30	PA6-G30	PET-G30	PBT-G30
water	0/5	2/6	2/27	0/2	0/1
NaOH aq. 10%	0/0	0/0	2/13	-12/100	-1/92
H <sub>2</sub> SO <sub>4</sub> aq. 30%	0/7	7/17	23/65	0/0	0/0
Phenol 5%	9/39	9/38	16/63	0/2	0/4
Acetic acid	0/0	2/0	4/9	0/0	0/0
Methanol	1/6	3/30	4/44	0/0	0/0
Ethylacetate	0/0	0/0	0/0	0/0	0/0
Acetone	0/0	0/0	0/0	0/0	0/0
Toluene	0/0	0/2	0/0	0/1	0/0
Gasoline	0/0	0/0	0/0	0/0	0/0
Engine oil	0/0	0/0	0/0	0/0	0/0
Trichloroethylene	0/0	0/0	0/0	0/0	0/0
Lubricant	0/0	0/0	0/0	0/0	0/0

(Immersed for 7 days at atmospheric temperature)

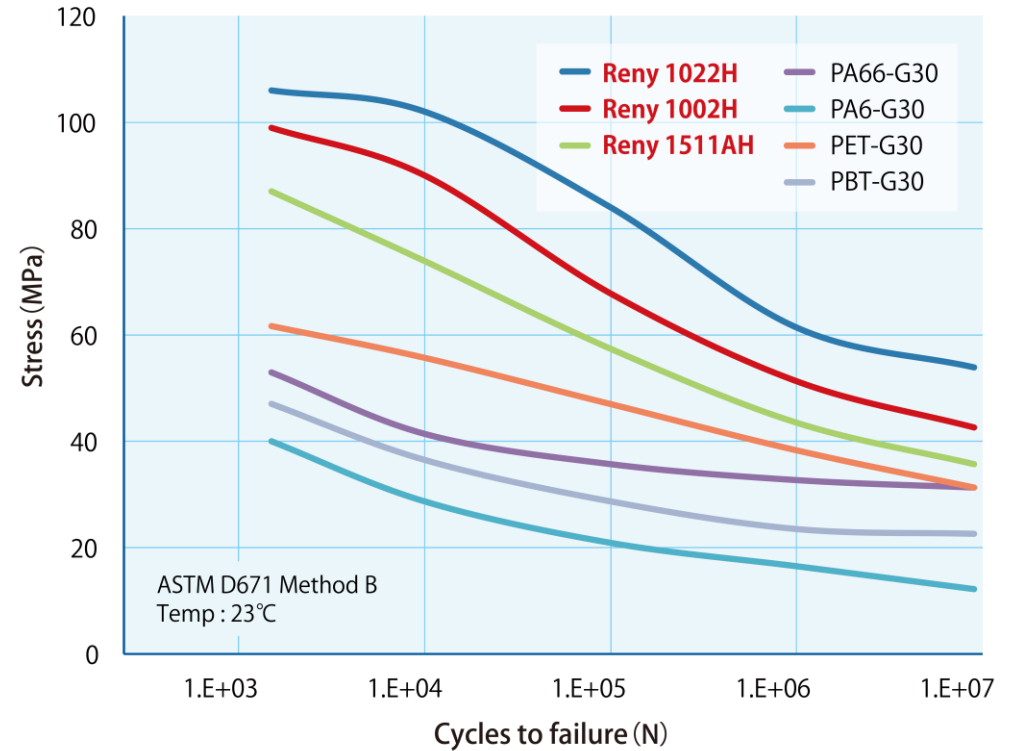
# Reny is extremely resistant to creep and fatigue.

Reny demonstrates superior creep resistance against high loads.

## Tensile creep



## Flexural fatigue



# Reny offers good surface finish.

Even with high glass loadings, molded parts have excellent smooth surface.



▲ Reny 1022H



▲ PA66-G50



# Processing information - Predrying

Reny is supplied in a special bag that prevents moisture absorption during storage and transportation. Basically, predrying is not necessary prior to molding if the bag has just been opened. However, Reny absorbs moisture gradually when exposed to air, so the predrying process should be applied to pellets that have been left unused at least one hour after opening the bag. A hopper-dryer is recommended during the molding process.

■ Typical drying conditions are as follows :

Drying Method	Temperature	Time	Note
Trays in drying ovens	80°C	At least 12 hrs.	30mm maximum depth of pellets

# Processing information - Processing conditions

The standard processing temperature range of Reny is 250 °C to 280 °C . The temperature of the resin must be adjusted to produce proper filling in the mold but should not exceed 300°C to prevent thermal decomposition.

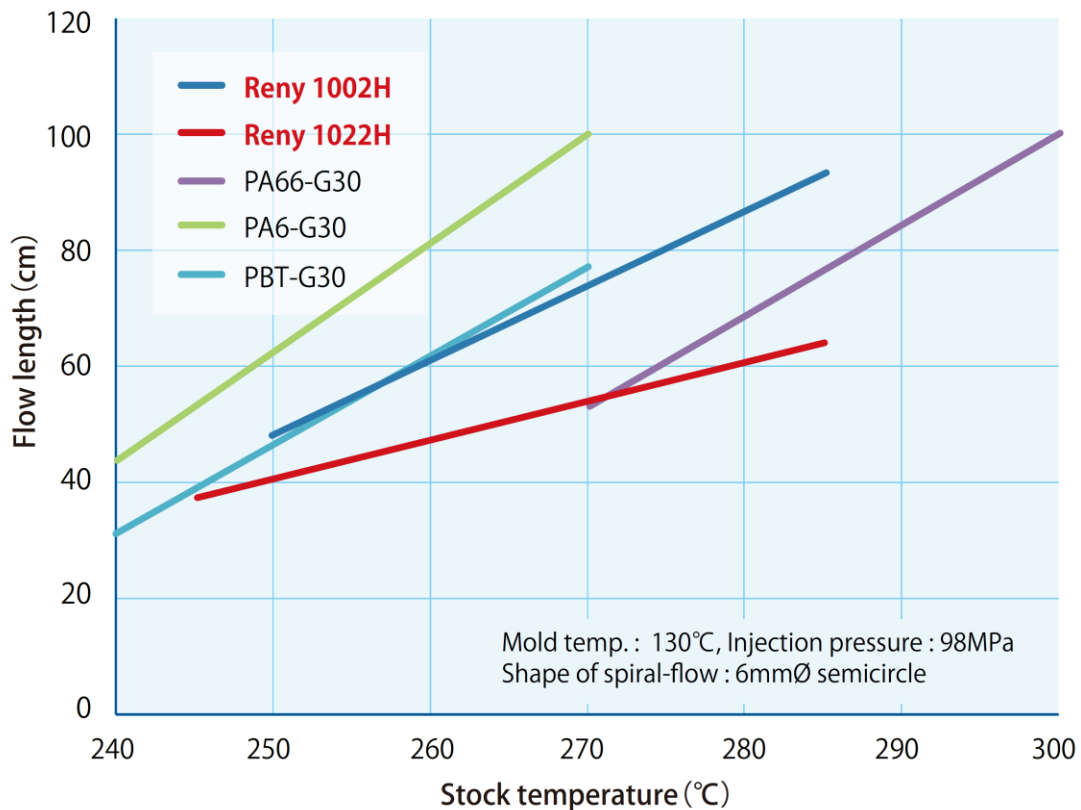
The standard surface temperature of the mold is 120°C to 140°C to achieve sufficient crystallinity. That will assure good surface finish, good dimensional stability, full mechanical properties and low moisture absorption.

However, when the wall thickness of the molded parts is less than 1mm, its crystallinity may be insufficient. In that case, the molded parts should be annealed for at least one hour at 130°C in an air oven. Besides, we prepare special grades for thin-wall or small parts.

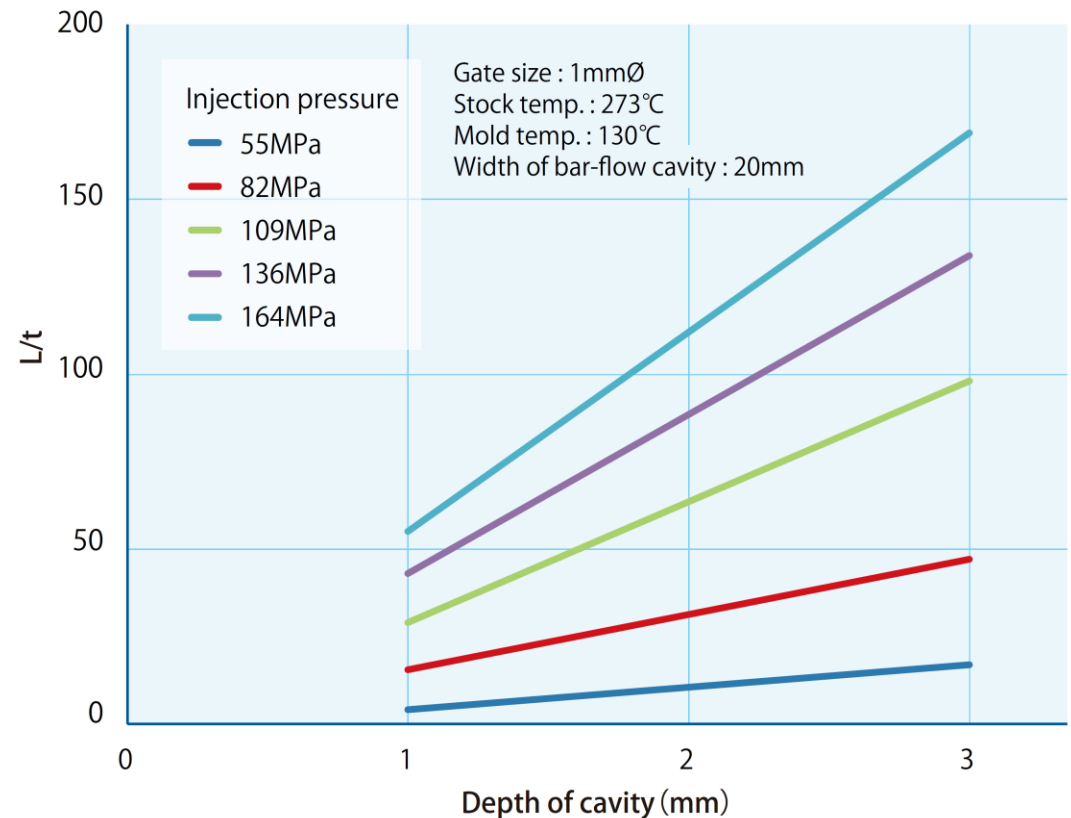
# Flowability

The following graphs show the dependence of spiral-flow length on stock temperature and the relationship between bar-flow length (L/t) and depth of cavity.

■ Temperature dependence of spiral-flow



■ Relationship between bar-flow length (L/t) and depth of cavity of Reny 1022H



# Physical Properties ①

Properties	Test Method	Terms	Units	General						High Strength	Thick Parts	Weather Resistance		UV Resistance	
				1002H	1012H	1022H	1022HS	1032H	2041	1025	1071	1027HU	1002HUS	1021UCS	
				Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Mineral Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced
				G	G	G	G	G	G	G	G	G	G	G	G
				30%	40%	50%	50%	60%	40%	50%	55%	50%	30%	50%	
				dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	
<b>Physical properties</b>															
Density	ISO 1183	-	g/cm <sup>3</sup>	1.46	1.56	1.65	1.66	1.79	1.70	1.67	1.70	1.63	1.49	1.61	
Water absorption		23°C, 50%RH	%	1.5	1.2	1.1	0.9	0.9	1.3	1.0	1.5	0.8	1.1	1.3	
		23°C, Underwater	%	0.2	0.2	0.1	0.1	0.1	0.3	0.1	0.1	0.1	-	0.5	
<b>Rheological properties</b>															
Melt Mass-flow Rate	ISO 1133	Temperature Load	g/10min	41	22	8	6	9	15	8	-	2	7	13	
Melt Volume-flow Rate			cm <sup>3</sup> /10min	31	15	3	3	5	11	5	-	1	5	11	
			°C	275	275	275	275	275	275	275	275	-	275	275	275
			kgf	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	-	2.16	2.16	2.16
Moulding shrinkage (100*100*2mmt)		TD	%	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	
Mold temperature		MD	%	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	
			°C	130	130	130	130	130	130	130	130	130	130	130	
<b>Mechanical properties</b>															
Tensile modulus	ISO 527-1, 527-2	23°C	MPa	12100 (11100)	16600 (13600)	20400 (19300)	21850 (21000)	24700 (22400)	18300 (14100)	19600 (18300)	24900 (23700)	18700 (17200)	15000 (13900)	17800 (14400)	
Stress at break			MPa	181 (148)	218 (177)	260 (214)	236 (233)	249 (204)	187 (136)	275 (229)	264(237)	227 (197)	192 (182)	252 (184)	
Strain at break			%	1.7 (1.8)	1.8 (1.8)	2.0 (2.1)	1.5 (1.6)	1.4 (1.4)	1.4 (1.6)	1.9 (2.0)	1.6(1.6)	1.6 (1.7)	1.4 (1.4)	2.5 (3.4)	
Flexural strength	ISO 178	23°C	MPa	286 (265)	349 (306)	390 (318)	384 (326)	429 (357)	299 (230)	436 (385)	423(384)	329 (292)	308 (271)	392 (305)	
Flexural modulus			MPa	11600 (10700)	14900 (13800)	18400 (15100)	19100 (19000)	23200 (21600)	16200 (12800)	18800 (17600)	20600(20900)	18300 (15900)	13100 (13000)	18300 (13800)	
Charpy impact strength	ISO 179-1, 179-2	23°C	kJ/m <sup>2</sup>	35 (33)	52 (52)	72 (58)	61 (40)	54 (61)	47 (54)	77 (82)	83(66)	45 (45)	48 (35)	87 (101)	
Charpy notched impact strength		23°C	kJ/m <sup>2</sup>	6 (6)	9 (9)	11 (12)	12 (12)	14 (14)	7 (7)	14 (13)	17 (16)	9 (9)	7 (6)	14 (16)	
<b>Thermal properties</b>															
Temperature of deflection under load	ISO 75-1, 75-2	1.80MPa, 0.45MPa	°C	224 (212), 237 (232)	226 (218), 237 (232)	230 (223), 238 (233)	245, -	230 (223), 237 (232)	214 (204), 231 (225)	231 (225), 238 (233)	230, -	221 (215), 233 (231)	237 (231), >250 (>250)	217 (210), 227 (221)	
Coefficient of Linear thermal expansion	ISO 11359-2	MD, TD	1/°C	2E-5, 5E-5	2E-5, 5E-5	1E-5, 4E-5	1E-05, 4E-05	1E-5, 4E-5	2E-5, 5E-5	1E-5, 4E-5	1E-05, 3E-05	-	-	-	
Flammability	UL94	1.5mmt	-	HB	HB	HB	HB	HB	HB	HB	-	-	HB	-	
<b>Electrical properties</b>															
Relative permittivity	IEC 60250	100Hz	-	(5)	-	5 (5)	-	(6)	5 (8)	-	-	-	-	-	
		1MHz	-	(4)	-	5 (5)	4.7	(5)	5 (5)	-	-	-	-	-	
Dissipation factor	IEC 60250	100Hz	-	(0.020)	-	0.007 (0.020)	-	(0.020)	0.008 (0.096)	-	-	-	-	-	
		1MHz	-	(0.016)	-	0.008 (0.017)	0.009	(0.013)	0.009 (0.038)	-	-	-	-	-	
Volume resistivity	IEC 60093	-	Ω·m	1E+14 (2E+13)	-	2E+14 (1E+13)	1.E+14	2E+13 (8E+12)	-	-	-	-	-	-	
Surface resistivity	IEC 60093	-	Ω	7E+14 (2E+14)	-	1E+16 (8E+14)	5.E+15	2E+14 (8E+14)	(5E+12)	-	-	-	-	-	
Electric strength	IEC 60243-1	1mmt	MV/m	31 (29)	-	27 (25)	33	26 (26)	22 (21)	-	-	-	-	-	
		2mmt	MV/m	27 (22)	-	-	24	20 (20)	18 (15)	-	-	-	-	-	
		3mmt	MV/m	-	-	-	-	-	-	-	-	-	-	-	
Comparative tracking index	IEC 60112	-	-	525 (550)	-	575 (550)	-	550 (600<)	500 (500)	-	-	-	-	-	

※The values described are typical values only.

# Physical Properties ②

Properties	Test Method	Terms	Units	Flame Retardant							High Impact			Painting
				1501AH	1511AH	1521AH	2505	2502AH	1507	1527	1313H	1322	1371	1722F
				Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Mineral Reinforced	Glassfiber Mineral Reinforced	Glassfiber Reinforced non-Halogen	Glassfiber Reinforced non-Halogen	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced
				G	G	G	G	G	G	G	G	G	G	G
				30%	40%	50%	15%	20%	30%	50%	40%	50%	55%	50%
				dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)
<b>Physical properties</b>														
Density	ISO 1183	-	g/cm <sup>3</sup>	1.56	1.65	1.73	1.81	1.66	1.51	1.71	1.47	1.60	1.66	1.65
Water absorption		23°C, 50%RH	%	1.2	1.1	1.1	0.7	0.9	-	-	1.2	-	0.9	0.7
		23°C, Underwater	%	0.2	0.2	0.1	0.1	0.2	-	-	0.2	-	0.1	0.1
<b>Rheological properties</b>														
Melt Mass-flow Rate	ISO 1133	Temperature Load	g/10min	20	-	-	11	22	-	-	2	-	-	20
Melt Volume-flow Rate			cm <sup>3</sup> /10min	14	-	-	6	14	-	-	3	-	-	13
			°C	275	-	-	275	275	-	-	280	-	-	275
			kgf	2.16	-	-	2.16	2.16	-	-	2.16	-	-	2.16
Moulding shrinkage (100*100*2mmt)		TD	%	0.6	0.6	0.5	0.5	0.5	0.7	0.6	0.7	0.6	0.6	0.6
		MD	%	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
Mold temperature			°C	130	130	130	130	130	130	130	130	130	130	130
<b>Mechanical properties</b>														
Tensile modulus	ISO 527-1 , 527-2	23°C	MPa	13300 (11700)	16500 (12700)	20600 (19000)	13900 (13600)	18400 (14900)	12500	19000	12000 (11000)	18100	20800	20700 (19100)
Stress at break			MPa	162 (135)	197(171)	215(180)	124 (109)	150 (120)	169	220	162 (136)	245	242	244 (208)
Strain at break			%	1.6 (1.6)	1.8(2.0)	1.5(1.7)	1.2 (1.1)	1.2 (1.3)	1.8	1.6	2.0 (2.4)	2.1	1.9	2.0 (1.7)
Flexural strength	ISO 178	23°C	MPa	251 (222)	302(249)	339(267)	200 (176)	249 (209)	288	360	258 (219)	387	403	381 (319)
Flexural modulus			MPa	12100 (11800)	15000 (12700)	18900 (15700)	13600 (12900)	16500 (14700)	12000	20000	11600 (10900)	16500	19600	18900 (18800)
Charpy impact strength	ISO 179-1 , 179-2	23°C	kJ/m <sup>2</sup>	37 (29)	45 (46)	49 (47)	25 (20)	27 (29)	52	61	66 (55)	94	93	58 (54)
Charpy notched impact strength		23°C	kJ/m <sup>2</sup>	5 (6)	8 (8)	9 (9)	3 (3)	4 (4)	8.0	12.0	12 (13)	17	16	11 (10)
<b>Thermal properties</b>														
Temperature of deflection under load	ISO 75-1 , 75-2	1.80MPa	°C	220 (211)	224(216)	228(222)	215 (205)	217 (206)	222	231	217 (207)	225	227	226 (219)
		0.45MPa	°C	237 (232)	237(233)	238(234)	236 (231)	235 (229)	-	-	235 (231)	-	236	237 (235)
Coefficient of Linear thermal expansion	ISO 11359-2	MD	1/°C	2E-5	-	-	-	2E-5	-	-	2E-5	-	-	-
		TD	1/°C	5E-5	-	-	-	3E-5	-	-	6E-5	-	-	-
Flammability	UL94	1.5mmt	-	V-0	V-0	V-0	V-0	V-0	V-0	V-0	HB	HB	HB	HB
<b>Electrical properties</b>														
Relative permittivity	IEC 60250	100Hz	-	(5)	-	-	-	(5)	-	-	(5)	-	-	-
		1MHz	-	(4)	4.4	-	-	(5)	-	-	(4)	-	-	-
Dissipation factor	IEC 60250	100Hz	-	(0.016)	-	-	-	(0.050)	-	-	(0.020)	-	-	-
		1MHz	-	(0.014)	0.009	-	-	(0.017)	-	-	(0.015)	-	-	-
Volume resistivity	IEC 60093	-	Ω·m	1E+14 (1E+13)	7E+14	-	-	2E+14 (1E+13)	-	-	1E+14 (1E+13)	-	-	-
Surface resistivity	IEC 60093	-	Ω	8E+14 (4E+14)	6E+15	-	-	5E+15 (2E+14)	-	-	1E+15 (3E+14)	-	-	-
Electric strength	IEC 60243-1	1mmt	MV/m	29 (26)	33	-	-	27 (26)	-	-	27 (28)	-	-	-
		2mmt	MV/m	22 (19)	24	20	-	21 (20)	-	-	24 (22)	-	-	-
		3mmt	MV/m	-	-	17	-	-	-	-	-	-	-	-
Comparative tracking index	IEC 60112	-	-	450 (400)	325	350	600<	200 (300)	325	325	600< (600<)	-	-	-

※The values described are typical values only.

# Physical Properties ③

Properties	Test Method	Terms	Units	Loe Warpage			High Rigidity	Electroconductive		Electroconductive & Flame Retardant		
				2620	2686	2051DS	N-252	4001	4011	4501	4511	
				Glassfiber Mineral Reinforced	Glassbead Reinforced	Glassfiber Mineral Reinforced	Glassfiber Mineral Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced
				G	GB	G	G	G	G	G	G	G
				20% dry (50%RH)	65% dry (50%RH)	20% dry (50%RH)	25% dry (50%RH)	30% dry (50%RH)	40% dry (50%RH)	30% dry (50%RH)	40% dry (50%RH)	
<b>Physical properties</b>												
Density	ISO 1183	-	g/cm <sup>3</sup>	1.66	1.80	1.62	1.72	1.50	1.66	1.66	1.77	
Water absorption		23°C, 50%RH	%	1.3	0.7	-	1.1	1.0	0.9	0.8	0.7	
		23°C, Underwater	%	0.1	0.1	-	0.2	0.1	0.1	0.1	0.1	
<b>Rheological properties</b>												
Melt Mass-flow Rate	ISO 1133	Temperature Load	g/10min	18	8	-	3	5	6	10	2	
Melt Volume-flow Rate			cm <sup>3</sup> /10min	12	7	-	2	3	5	8	1	
			°C	275	275	-	275	275	275	275	280	
			kgf	2.16	2.16	-	2.16	2.16	2.16	2.16	2.16	
Moulding shrinkage (100*100*2mmt)		TD	%	0.6	0.7	0.8	0.4	0.6	0.6	0.5	0.5	
Mold temperature		MD	%	0.3	0.7	0.3	0.2	0.3	0.3	0.2	0.2	
			°C	130	130	130	130	130	130	130	130	
<b>Mechanical properties</b>												
Tensile modulus	ISO 527-1 . 527-2	23°C	MPa	17600 (11500)	9800 (7300)	15800	25700 (22200)	17900 (14700)	21600 (18600)	20400 (16200)	20900 (20600)	
Stress at break			MPa	139 (86)	73 (52)	192	174 (138)	124 (126)	152 (143)	107 (113)	130 (125)	
Strain at break			%	1.1 (1.3)	1.7 (1.8)	1.7	1.1 (1.4)	0.9 (1.1)	1.0 (1.1)	0.7 (0.9)	0.6 (0.8)	
Flexural strength	ISO 178	23°C	MPa	236 (151)	147 (103)	312	289 (219)	204 (188)	235 (228)	190 (184)	215 (208)	
Flexural modulus			MPa	16000 (10900)	9600 (6600)	15100	21900 (17000)	16600 (14100)	19800 (19100)	19100 (15500)	22200 (22000)	
Charpy impact strength	ISO 179-1 . 179-2	23°C	kJ/m <sup>2</sup>	27 (35)	32 (40)	64	31 (33)	19 (17)	16 (16)	14 (15)	12 (12)	
Charpy notched impact strength		23°C	kJ/m <sup>2</sup>	4 (5)	2 (2)	8	6 (7)	5 (5)	7 (8)	8 (7)	7 (9)	
<b>Thermal properties</b>												
Temperature of deflection under load	ISO 75-1 . 75-2	1.80MPa 0.45MPa	°C	214 (196)	147 (116)	242	227 (220)	224 (213)	226 (216)	225 (216)	223 (218)	
				234 (231)	213 (207)	-	236 (231)	236 (232)	235 (232)	236 (232)	234 (232)	
Coefficient of Linear thermal expansion	ISO 11359-2	MD	1/°C	1.E-5	-	2.E-05	2.E-5	-	1.E-5	-	8.E-6	
		TD	1/°C	4.E-5	-	5.E-05	4.E-5	-	4.E-5	-	4.E-5	
Flammability	UL94	1.5mmt	-	HB	HB	0.75mmt HB	HB	HB	HB	V-0	V-0	
<b>Electrical properties</b>												
Relative permittivity	IEC 60250	100Hz 1MHz	-	-	-	-	5 (5)	-	-	-	-	
				-	-	-	5 (5)	-	-	-	-	
Dissipation factor	IEC 60250	100Hz	-	-	-	-	0.011 (0.011)	-	-	-	-	
		1MHz	-	-	-	-	0.008 (0.018)	-	-	-	-	
Volume resistivity	IEC 60093	-	Ω·m	-	-	-	6E+13 (7E+12)	-	2E+5	-	8E+4	
Surface resistivity	IEC 60093	-	Ω	-	-	-	4E+15 (2E+14)	-	6E+6	-	1E+6	
Electric strength	IEC 60243-1	1mmt	MV/m	-	-	-	21 (20)	-	-	-	-	
		2mmt	MV/m	-	-	-	-	-	-	-	-	
		3mmt	MV/m	-	-	-	-	-	-	-	-	
Comparative tracking index	IEC 60112	-	-	-	-	-	325 (250)	-	-	-	-	

※The values described are typical values only.

# Physical Properties ④

Properties	Test Method	Terms	Units	Low Friction & Wear Resistance					Carbonfiber	High stiffness	NX series			PG series	
				W-38S2	G-07S	G-09S	G-16S	F-34S	C-36	C-56	NXG5050	NXG5050NF	NXG5945S	PG-1050A	
				Potassium-Titanate Whisker Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Carbonfiber Reinforced	Potassium-Titanate Whisker Reinforced	Carbonfiber Reinforced	Carbonfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	Glassfiber Reinforced	
				W	G	G	C	W	C	C	G	G	G	G	
				30% dry (50%RH)	20% dry (50%RH)	50% dry (50%RH)	20% dry (50%RH)	30% dry (50%RH)	30% dry (50%RH)	50% dry (50%RH)	50% dry (50%RH)	50% dry (50%RH)	45% dry (50%RH)	50% dry (50%RH)	
<b>Physical properties</b>															
Density	ISO 1183	-	g/cm <sup>3</sup>	1.64	1.52	1.71	1.43	1.58	1.35	1.44	1.62	1.67	1.52	1.57	
Water absorption		23°C, 50%RH	%	1.0	1.1	0.9	1.1	-	1.4	-	0.9	-	0.7	0.8	
		23°C, Underwater	%	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2	-	-	0.1	
<b>Rheological properties</b>															
Melt Mass-flow Rate	ISO 1133	Temperature Load	g/10min	49	16	5	9	-	12	10	5	4	13	6	
Melt Volume-flow Rate			cm <sup>3</sup> /10min	31	11	3	6	-	10	7	4	2	8	3	
			°C	275	275	275	275	-	275	280	275	275	280	275	275
			kgf	2.16	2.16	2.16	2.16	-	2.16	5.00	2.16	2.16	5.0	2.16	2.16
Moulding shrinkage (100*100*2mmt)		TD	%	0.7	0.7	0.6	0.5	0.8	0.4	0.3	0.6	0.6	0.5	0.7	
		MD	%	0.3	0.4	0.3	0.2	0.4	0.1	0.1	0.2	0.3	0.2	0.3	
Mold temperature			°C	130	130	130	130	130	130	130	130	130	130	130	
<b>Mechanical properties</b>															
Tensile modulus	ISO 527-1 , 527-2	23°C	MPa	16200 (15900)	9200 (9100)	19700 (19000)	20200 (19900)	12500	27200 (24200)	45000 (43800)	18800 (17400)	21900	16000 (15400)	19100 (18700)	
Stress at break			MPa	121 (111)	155 (136)	250 (220)	230 (205)	120	249 (230)	304 (227)	205 (191)	198	208 (202)	215 (205)	
Strain at break			%	0.9 (0.8)	2.5 (2.5)	1.9 (2.1)	1.6 (1.6)	1.0	1.2 (1.3)	0.6 (0.6)	1.5 (1.7)	1.2	2.0 (2.2)	1.7 (2.0)	
Flexural strength	ISO 178	23°C	MPa	278 (216)	230 (200)	382	338 (294)	205	411 (359)	517 (443)	338 (304)	348	349(315)	363 (326)	
Flexural modulus				15200 (15100)	9000 (8900)	18700	18800 (18200)	12500	23400 (21800)	43000 (41300)	16800 (16400)	18200	14300(14000)	17400 (17100)	
Charpy impact strength	ISO 179-1 , 179-2	23°C	kJ/m <sup>2</sup>	18 (22)	38 (37)	61	50 (39)	33	45 (48)	50 (33)	68 (58)	67	90(77)	59 (55)	
Charpy notched impact strength		23°C	kJ/m <sup>2</sup>	2 (2)	6 (6)	11	4 (5)	2	5 (5)	6 (6)	10 (10)	13	15 (14)	17 (18)	
<b>Thermal properties</b>															
Temperature of deflection under load	ISO 75-1 , 75-2	1.80MPa	°C	210 (206)	236 (227)	246 (240)	240 (234)	206	224 (218)	232 (222)	221 (216)	219	232	224 (220)	
		0.45MPa	°C	239 (239)	255 (251)	255 (253)	-	-	236 (232)	237	235 (231)	-	-	236 (233)	
Coefficient of Linear thermal expansion	ISO 11359-2	MD	1/°C	2E-5	-	-	-	-	5E-6	6E-6	1E-5	1E-5	1.1E-5	1E-5	
		TD	1/°C	4E-5	-	-	-	-	5E-5	5E-5	4E-5	4E-5	5.6E-5	5E-5	
Flammability	UL94	1.5mmt	-	-	HB	HB	-	-	HB	-	HB	V-0	HB	-	
<b>Electrical properties</b>															
Relative permittivity	IEC 60250	100Hz	-	-	-	-	-	-	-	-	(5)	-	4.2(4.6)	(5)	
		1MHz	-	-	-	-	-	-	-	-	(5)	-	4.1(4.2)	(4)	
Dissipation factor	IEC 60250	100Hz	-	-	-	-	-	-	-	-	(0.018)	-	0.006(0.020)	(0.026)	
		1MHz	-	-	-	-	-	-	-	-	(0.013)	-	0.007(0.012)	(0.012)	
Volume resistivity	IEC 60093	-	Ω·m	2E+13	-	-	-	-	6E+03 (2E+05)	2E+4	1E+14 (4E+12)	-	-	2E+14 (8E+12)	
Surface resistivity	IEC 60093	-	Ω	2E+14	-	-	-	-	2E+01 (3E+03)	4E+3	1E+15 (2E+14)	-	-	6E+16 (1E+14)	
Electric strength	IEC 60243-1	1mmt	MV/m	26	-	-	-	-	-	-	26 (23)	-	-	29 (28)	
		2mmt	MV/m	-	-	-	-	-	-	-	21 (18)	25	-	23 (21)	
		3mmt	MV/m	-	-	-	-	-	-	-	-	-	-	-	
Comparative tracking index	IEC 60112	-	-	-	-	-	-	-	-	-	200 (250)	250	-	600 (600)	

※The values described are typical values only.

# Comparison Table

Properties	Test Method	Terms	Units	PolyamideMXD6		PA6-G	PA66-G	PBT-G	PET-G	POM-G	PPS-G
				RENY 1002H	RENY 1022H						
				G	G						
				30%	50%						
				dry (50%RH)	dry (50%RH)	dry (50%RH)	dry (50%RH)	dry	dry	dry	dry
<b>Physical properties</b>											
Density	ISO 1183	-	g/cm <sup>3</sup>	1.46	1.65	1.37	1.37	1.52	1.59	1.59	1.67
Water absorption		23°C, 50%RH	%	1.5	1.1	2.4	2.0	-	-	-	-
		23°C, Underwater	%	0.20	0.14	-	-	0.07	0.08	0.20	0.02
<b>Rheological properties</b>											
Melt Mass-flow Rate	ISO 1133	Temperature Load	g/10min	41	8	10	19	20	13	9	13
Melt Volume-flow Rate			cm <sup>3</sup> /10min	31	3	8	15	15	9	6	8
			°C	275	275	250	280	250	280	190	310
			kgf	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16
<b>Mechanical properties</b>											
Tensile modulus	ISO 527-1 . 527-2	23°C	MPa	12100 (11100)	20400 (19300)	9600 (5700)	9700 (6300)	9500	11300	10000	14000
Stress at break			MPa	181 (148)	260 (214)	170 (110)	170 (120)	130	150	140	150
Strain at break			%	1.7 (1.8)	2.0 (2.1)	3.3 (5.6)	2.6 (4.1)	2.7	2.1	3.0	1.3
Flexural strength	ISO 178	23°C	MPa	286 (265)	390 (318)	262 (167)	267 (199)	210	230	210	220
Flexural modulus				11600 (10700)	18400 (15100)	9200 (5600)	8300 (6500)	8900	11000	9100	15000
Charpy impact strength	ISO 179-1 . 179-2	23°C	kJ/m <sup>2</sup>	35 (33)	72 (58)	81 (92)	110 (84)	59	56	60	37
Charpy notched impact strength		23°C	kJ/m <sup>2</sup>	6 (6)	11 (12)	12 (19)	11 (13)	10	8	9	9
<b>Thermal properties</b>											
Melting point	ISO 11357-3		°C	-	-	-	-	224	254	166	280
Temperature of deflection under load	ISO 75-1 . 75-2	1.80MPa	°C	224 (212)	230 (223)	205	244	202	226	162	260
		0.45MPa		237 (232)	238 (233)	220	260	220	246	164	273
Coefficient of Linear thermal expansion	ISO 11359-2	MD	1/°C	2.E-5	1.E-5	3.E-5	3.E-5	3.E-5	3.E-5	3.E-5	1.E-5
		TD		5.E-5	4.E-5	7.E-5	7.E-5	7.E-5	6.E-5	11E-5	4.E-5
Flammability	UL94	1.5mmt	-	HB	HB	HB	HB	HB	HB	HB	V-0
<b>Electrical properties</b>											
Relative permittivity	IEC 60250	100Hz	-	(5)	5 (5)	4	4	-	-	4.1	-
		1MHz	-	(4)	5 (5)	4	4	3	-	4.1	28
Dissipation factor	IEC 60250	100Hz	-	(0.020)	0.007 (0.020)	0.014	0.009	-	-	0.003	-
		1MHz	-	(0.016)	0.008 (0.017)	0.021	0.019	0.016	-	0.008	0.020
Volume resistivity	IEC 60093	-	Ω·m	1E+14 (2E+13)	2E+14 (1E+13)	2E+13	3E+13	1E+14	-	1E+12	1E+14
Surface resistivity	IEC 60093	-	Ω	7E+14 (2E+14)	1E+16 (8E+14)	2E+14	4E+14	1E+15	-	1E+16	1E+15
Electric strength	IEC 60243-1	1mmt	MV/m	31 (29)	27 (25)	27	26	25	-	25	22
		2mmt		27 (22)	-	-	-	-	-	16	17
Comparative tracking index	IEC 60112	-	-	525 (550)	575 (550)	475	550	-	-	600	-

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# Notes

- The values described are typical values only.
- The usage examples indicated here do not guarantee results applicable to relevant uses of the products.
- It is the users' responsibility to investigate industrial property rights and the terms of use related to the uses and applications indicated here.
- For the handling (transport, storage, forming, disposal, etc.) of the products, it is advisable to refer to technical documents and the Safety Data Sheet (SDS) of the proper materials and grades. Please contact us for consultations when the products are used for the purpose of food containers and packaging, medical parts, safety equipment, and toys for children.
- In Japan, the colored products of each grade may contain chemicals subject to reporting requirements under the applicable law provided in Appendix 9 of Article 18-2 of the Enforcement Order, under Article 57-2 of the Industrial Safety and Health Act. For details, please contact us.
- For the export of our products and products incorporated with our products, please comply with the relevant laws and regulations, such as the Foreign Exchange and Foreign Trade Law.
- Please note that because of the chemical substance management systems in each country, the chemicals used in our products are subject to control, and separate applications might be required or are banned from imports and exports. It is advisable to inquire about the status of regulations in the relevant countries if you are exporting or importing our products.