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HI-ZEX MILLION™

MIPELON™

LUBMER™

UHMW-PE

Ultra-High Molecular Weight Polyethylene

HI-ZEX MILLION™

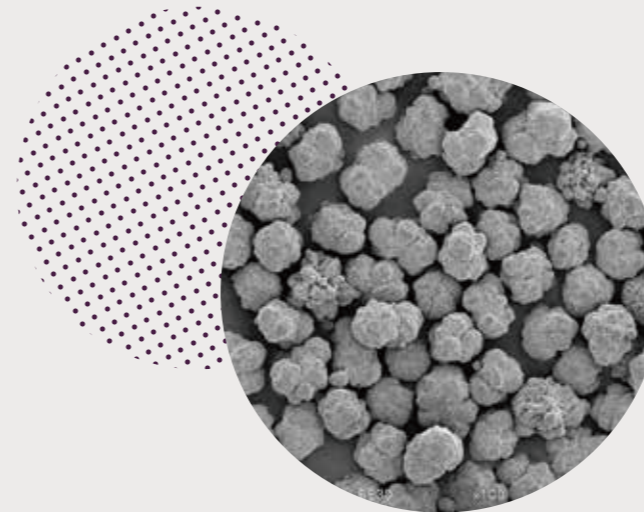
Ultra-High Molecular Weight Polyethylene

Iwakuni-Otake Factory of Mitsui Chemicals is one of the first high-density polyethylene plants in the world to produce HDPE utilizing the Zeigler Method.

HI-ZEX MILLION™ is an ultra-high molecular weight polyethylene powder which has been developed and perfected over time with innovative technologies. It has molecular weights up to six million.

From its outstanding features of lightness and mechanical properties, it can contribute to weight reduction and improved durability in many markets, such as industrial materials and medical devices. From its high quality and robust performance, HI ZEX MILLION™ is used as a raw material in high-strength fiber applications and as separators for Lithium ion batteries.

Furthermore, Mitsui Chemicals has developed two unique products named MIPELON™ and LUBMER™. LUBMER™ helps overcome the process-ability challenges of UHMWPE with the unique formula.



Since 1958

Ultra-High Molecular Weight Polyethylene powder

HI-ZEX MILLION™

Product/Powder 120~260μm

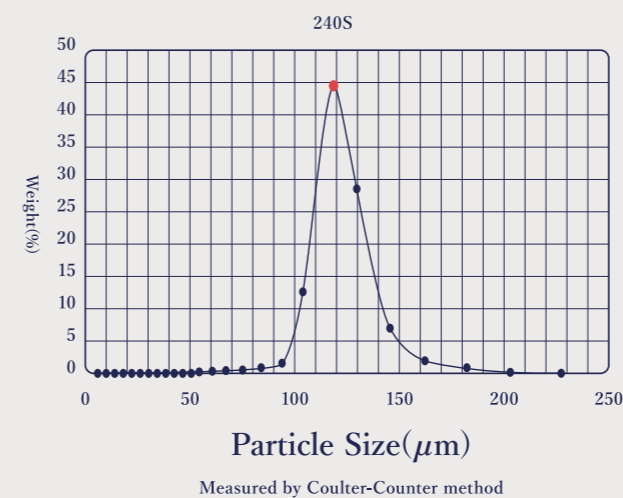
Molecular weight/0.5~6 million

Stable Particle Size, Molecular Weight and Performance

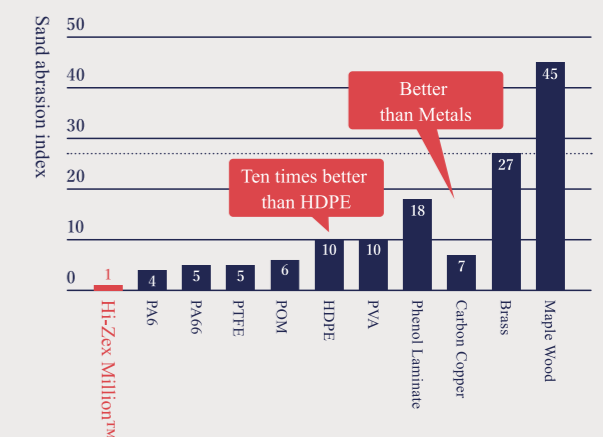
Mitsui Chemicals optimizes our HI-ZEX MILLION™ technology by managing the molecular weight and particle size distribution. This allows HI-ZEX MILLION™ to have ten times the abrasion resistance when compared to general high-density polyethylene. It can also be compared favorably to some metals such as carbon steel and brass.

Sliding properties of HI-ZEX MILLION™ can help prevent seizure without the use of lubricants.

We meet diverse needs with our lineups that include FDA grades.



Sand abrasion index of HI-ZEX MILLION™ with various materials



[Experimental Condition] 25×75×3mm Abrasive grain: JISR6001(A-43)
 Water/Sand=3.0/2.6kg Rotation Angle:45°
 Sample Location:3cm 25°C 1600rpm×3h

* HI-ZEX MILLION™, MIPELON™, LUBMER™ are a registered trademark of Mitsui Chemicals, Inc.
 * The figures are just representative values, but not guaranteed value.

Mitsui Chemicals offers

Innovation in process -ability of UHMWPE

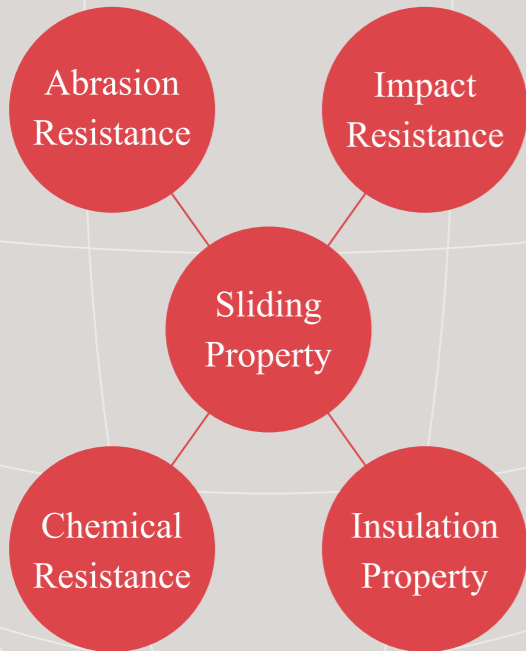
Easy to mold, disperse, or compound while maintaining high functional property.

MIPELON™ can improve functionality such as the abrasion resistance and sliding properties.

HI-ZEX MILLION™

Ultra-High Molecular Weight PE
HI-ZEX MILLION™

Superb Functionality



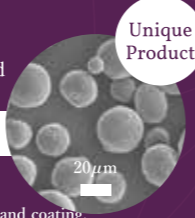
MIPELON™

Innovative Polymer Additive

Add functionality to paint and grease
10~65µm particle size powder,
one of the smallest UHMWPE in the world

Fine Powder (10~65µm)

Molecular weight | 2 million
Application | Additive for rubber/ ink and coating,
press mold or sintered filter



Unique Product

Uniform Dispersion

Abrasion Resistance

High Durability

High functionality of UHMWPE with easy molding feature.

LUBMER™

Innovative Process-ability

Can be injection molded and extruded.
Pellet type UHMWPE

Pellet

Applicable Process | Injection Molding, Extrusion
Molding, Resin Modifier



Unique Product

Noiseless

Superb Process-ability

Engineering Plastic Modification

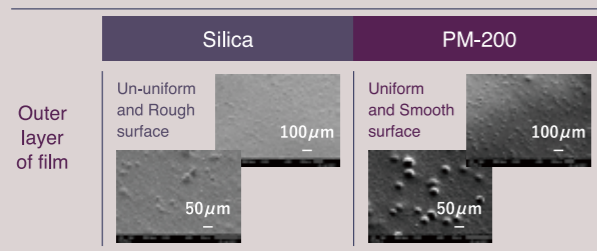
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PM-200(10 μ m)

Application Example

Anti-Blocking Agent for Film Application

- Prevent film blocking
- Does not cause any issue derived from bleed out over time, unlike other slipping agent
- Can be used for food application



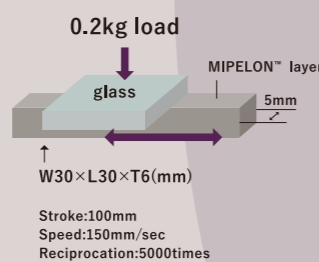
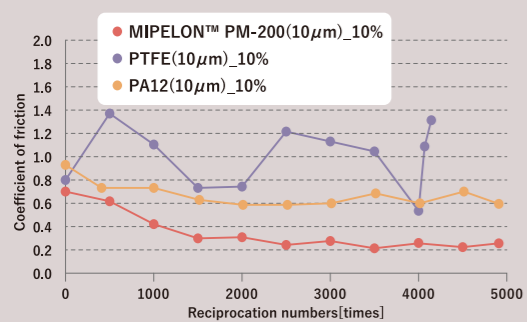
PM-200 has less chance to drop off from the film nor scratch the surface compared to silica.

Application Example

Additive for paint and coating materials

- Improve the abrasion resistance of Acrylic and Urethane based paint and coating materials

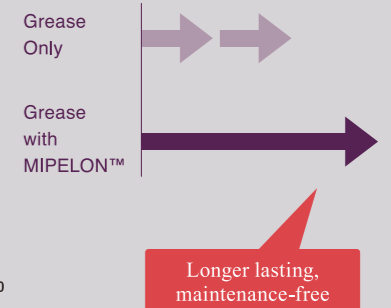
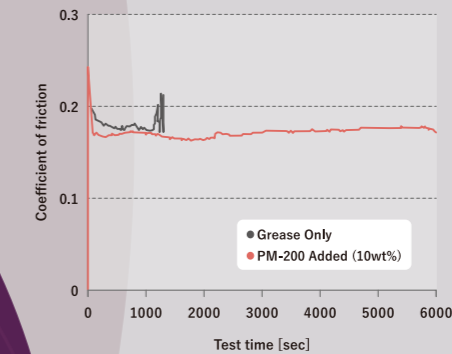
Measurement result of friction coefficient with glass.



Application Example

Long Lasting & High Durability Grease

- MIPELON™ functions as a micro-bearing particle inside the grease
- Decreases the coefficient of friction and sliding property
- Decrease squeaking noise for longer time
- Improved durability can achieve maintenance-free
- Can maintain the quality of grease for longer period of time



MIPELON™

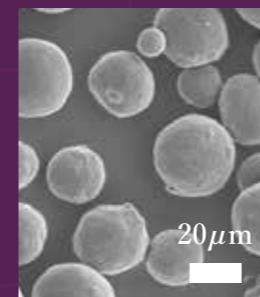
One of the finest UHMWPE powder (10~65 μ m) as a functional additive

Uniform Dispersion

Abrasion Resistance

High Durability

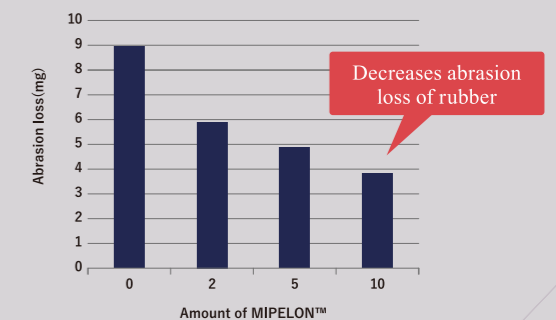
MIPELON™ can be applied to applications such as Films, Coating Material, Grease, and Rubber Additive to improve the abrasion resistance and durability of the product. Thanks to its high mechanical properties and the round spherical shape, it functions as a micro-bearing inside the material.



Application Example

Rubber Additive for sliding properties and high durability

- Improves sliding property of rubber
- Makes the rubber stronger to wear, enhancing the durability of the product



XM-220(30 μ m)

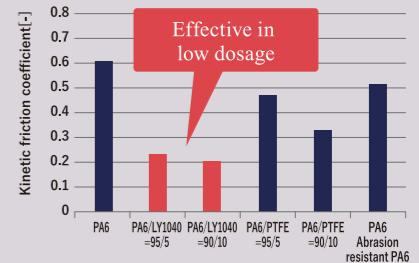
PTFE substitution

Halogen / PFOA Free Polymer Modifier

Modified LUBMER™

Better sliding properties than PTFE

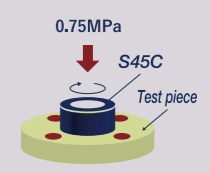
PA6 with Modifier LUBMER™ Co-efficient of Friction



Co-efficient of Friction

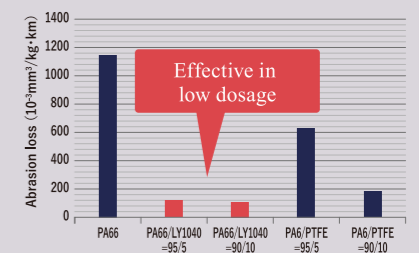
[Evaluation Condition] Test piece condition: Dry, Temp:23°C, Counter material=S45C, Load=15kg(0.75MPa), V=30m/min, distance=3km

- Effectively improves sliding property in low dosage, better than other additives such as PTFE or Molybdenum Disulfide.



Better Abrasion Resistance than PTFE

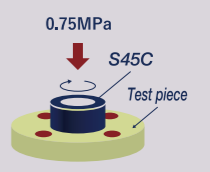
PA66 with Modifier LUBMER™ Performance ~Abrasion Loss~



Abrasion resistance

[Evaluation Condition] Test piece condition: Dry, Temp:23°C, Counter material=S45C, Load=15kg(0.75MPa), V=30m/min, distance=3km

- Improves abrasion resistance for higher durability and robust material



Ring abrasion test compared with LUBMER™ and PTFE



0.75MPa (15kgf) S45C Test piece

[Evaluation Condition] JIS K 7218
 Test piece condition: Dry, Temp:23°C, Counter material=S45C, Load=15kg(0.75MPa), V=30m/min, distance=3km
 Measure time; 100 min
 Specific abrasion amount calculation method : Amount of abrasion/distance

Applicable materials for Modified LUBMER™
 Polyamide(PA6, PA66, Aromatic PA) | POM | PBT | PET | PC | ABS | PPS | etc.

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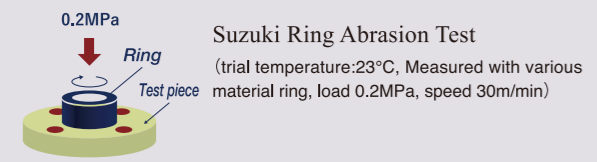
Application Example

Lightweight Gears and Bearing with superb noiseless property

- This material can reduce a squeaking sound with a variety of materials
- Can achieve grease-less gears and bearings
- Improves durability due to high abrasion resistance
- Contributes to light weight of the product

Coefficient of Friction with other materials

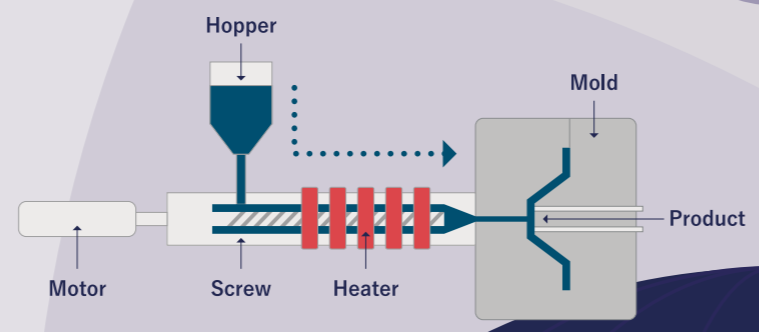
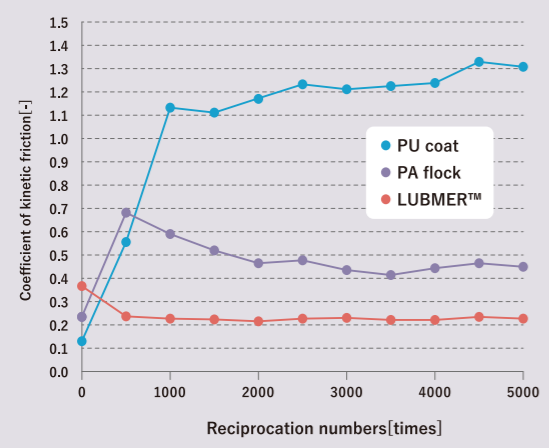
Sample	Ring		
	PA6	POM	S45C (Carbon Copper)
LUBMER™	0.24	0.13	0.17
PA6	2.15 <i>Squeak Noise</i>	1.41 <i>Squeak Noise</i>	0.52 <i>Squeak Noise</i>
POM	1.41 <i>Squeak Noise</i>	0.49 <i>Squeak Noise</i>	0.27 <i>Squeak Noise</i>



Sliding Layer of Rubber

Contributes to increased production efficiency and total cost reduction in a co-extrusion process

- The process-ability of LUBMER™ can realize efficient process of injection, extrusion, or insert mold
- It can contribute to process reduction and total cost downs. An example is the co-extrusion of LUBMER™ in an automotive glass run channel seal to replace additional PA flock and PU weatherstrip coating steps.

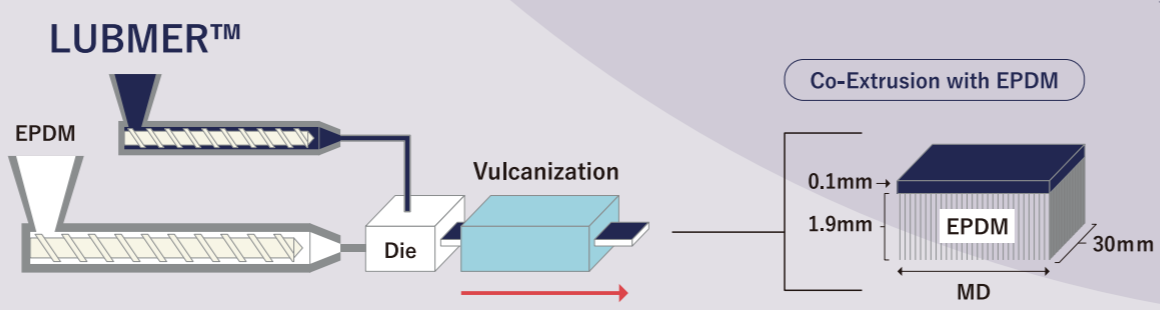


LUBMER™

Can be injection molded and extruded. Pellet type UHMWPE

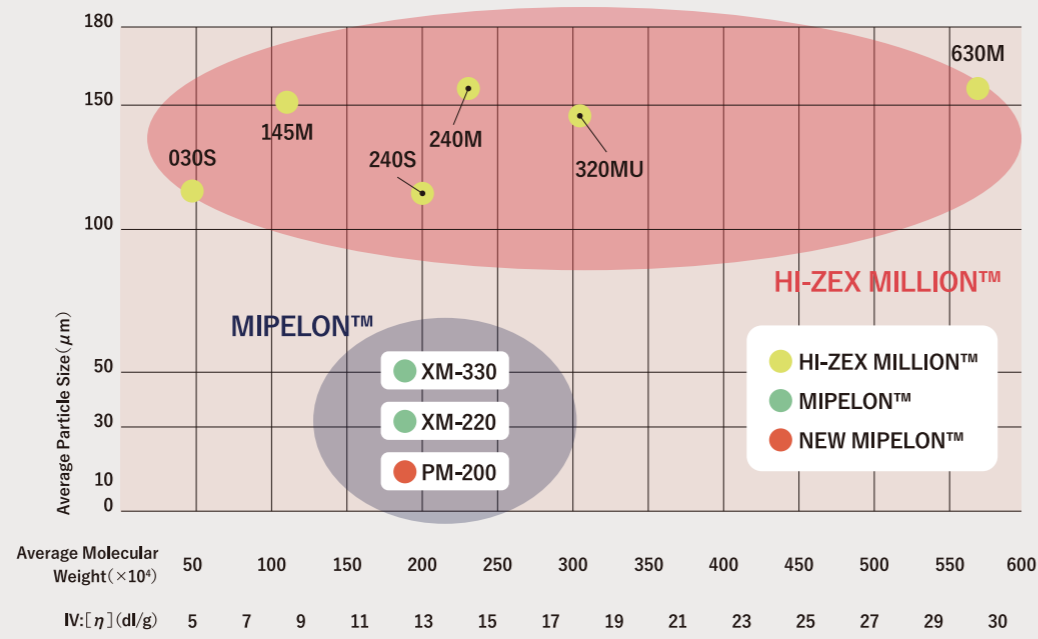
- Low friction
- High Processability
- Modifier of Engineering Plastics

UHMWPE provides high mechanical properties and good abrasion resistance but processability has always been the challenge. LUBMER™ is a very unique material overcomes the processing concerns. It can be utilized for injection molded parts, replacement for PTFE or as a tribology modifier of engineering plastics.



Physical properties

Average molecular weight and particle size



HI-ZEX MILLION™

Properties	Unit	Test Method	030S	145M	240S	320MU	630M
average molecular weight*	×10 ⁴	MCI method	50	110	200	330	580
density	g/cm ³	MCI method	949	940	938	934	929
Tensile strength at yield point	MPa	ISO527-1/2(50mm/min)	25	22	22	22	-
Tensile strength at break	%		7	9	9	11	0
Tensile elongation at break	%		700	450	400	350	300
Flexural Strength	MPa	ISO527-1/2(1mm/min)	950	750	750	750	700
Flexural modulus	MPa	ISO178	1100	950	900	900	800
Shore D Hardness	°	ISO868	63	62	63	64	63
deflection temperature under load(1.8MPa)	°C	ISO75 parts1 and 2	49	48	48	47	47
Vicat Softening Temperature (VST)	°C	ISO306	79	80	80	82	82
linear expansion coefficient(23~80°C)*	×10 ⁻⁴ /°C ⁻¹	ISO 11359 Method A	1.5	1.6	1.8	2.1	2.2

*:Molecular weight=5.37*10⁴[η]^{1.37} *Anneal 90°C×30min

MIPELON™

Properties	Unit	Test Method	PM-200	XM-220	XM-221U	XM-330
average molecular weight*	×10 ⁴	MCI method	180	200	200	200
average particular shape	μm	Coulter counter	10	30	25	65
density	kg/cm ³	MCI method	938	937	937	937
Tensile strength at yield point	MPa	ISO527-1/2(50mm/min)	22	22	22	22
Tensile strength at break	%	ISO527-1/2(50mm/min)	9	9	9	9
Tensile elongation at break	%	ISO527-1/2(50mm/min)	400	400	400	400
Flexural Strength	MPa	ISO527-1/2(1mm/min)	850	850	850	850
Flexural modulus	MPa	ISO178	850	850	850	850
Shore D Hardness	°	ISO868	63	63	63	63
deflection temperature under load(1.8MPa)	°C	ISO75-1/2	48	48	48	48
Vicat Softening Temperature(VST/B/50)	°C	ISO306	81	81	81	81
linear expansion coefficient(23°C-80°C)	×10 ⁻⁴ /°C-1	ISO11359 Method A	1.7	1.7	1.7	1.7

*Average Molecular Weight=5.37×10⁴×[η]^{1.37}

LUBMER™

Properties	Unit	Test Method	Standard Grade			with Filler L4640
			L3000	L4000	L5000	
MFR(190°C,10kgf)	g/10min	MCI method	15	6	2	7
density	kg/cm ³	ASTM D1505	969	967	966	1105
Tensile strength at yield point	MPa	ISO527-1/2(50mm/min)	35	37	48	50
Tensile strength at break	MPa	ISO527-1/2(50mm/min)	25	30	40	40
Tensile elongation at break	%	ISO527-1/2(50mm/min)	10	10	10	10
Flexural Strength	MPa	ISO527-1/2(1mm/min)	1450	1480	1580	1650
Flexural Strength	MPa	ISO178	38	40	45	50
Flexural modulus	MPa	ISO178	1700	1740	1900	2400
Charpy impact strength (V/ notched)	kJ/m ²	ISO179	23	27	29	25
HDT(0.45MPa)	°C	ISO75-1/2	80	80	80	90
HDT(1.8MPa)	°C	ISO75-1/2	50	50	50	60
linear expansion coefficient(-30°C~120°C)	×10 ⁻⁴ /°C	ISO11359-1/2	1.8	1.9	1.9	1.8
kinetic coefficient of friction	-	MCI method *	0.17	0.15	0.12	0.2
abrasion loss	10 ⁻³ mm ³ /kg·km	MCI method *	85	70	50	200
Limit PV value	MPa·m·min	MCI method *	>30	>30	>30	>30

*Counter material: 45SC, load 15kg sliding distance = 3km *Counter material: SUS, V=12m/min, Each load 30 min holding (step width)

Example of conditions for square plate molding(120mm×130mm×3mmt)

Conditions for Injection Molding		L3000·L4000·L4640	L5000	LS4140*
cylinder temperature	C1	210	240	220
	C2	230~240	260	240
	C3	230~240	260	240
	Nozzle	240	260	240
Injection Pressure	MPa	50	95	50
Injection Time	sec	2~4	2~4	2~4
Injection Speed	mm/s	50	80	40
Holding Pressure	MPa	45	65	40
Holding Time	sec	10	20	5~10
Cooling Time	sec	15~20	20~25	15~20
Mold Temperature	°C	24~60(water cooling)		

*LS4140 is hygroscopic material.

It is packaged in a moisture barrier bag and does not require drying, however, please use immediately after opening. If the product is left open and exposed to a moisture, drying process should be needed. The typical drying condition is 80°C heated dry air for few hours up to 9 hours.

Modified LUBMER™

PA66 + Modified LUBMER™

Properties	Test Method	Unit	PA66	PA66/LY1040 =98/2	PA66/LY1040 =95/5	PA66/LY1040 =90/10
MFR(280°C,2.16kgf)	MCI method	g/10min	64	58	47	32
Melting Point	MCI method	°C	262	262	262	262
density	MCI method	kg/cm ³	1137	1126	1120	1117
Tensile strength at yield point	ISO527-1/2	MPa	90	95	90	80
Tensile Strength at Break	ISO527-1/2	MPa	-	-	-	-
Tensile elongation at break	ISO527-1/2	%	15	15	15	20
Flexural strength	ISO178	MPa	130	130	130	125
Flexural modulus	ISO178	MPa	2840	2830	2800	2700
Charpy impact strength (V/ notched)	ISO179	kJ/m ²	4.5	4.5	5.0	6.0
HDT(0.45MPa)	ISO75-1/2	°C	200	200	200	190
Mold shrinkage(MD/TD)	MCI method	%	2.0/2.2	2.0/2.2	2.0/2.2	2.2/2.2
kinetic coefficient of friction	MCI method *	-	0.37	0.27	0.22	0.18
abrasion loss	MCI method*	10 ⁻³ mm ³ /kg·km	1150	170	120	110
Limit PV value	MCI method*	MPa·m·min	8	17	>30	>30

*Counter material: 45SC, load 15kg sliding distance = 3km(JIS K7218) *Counter material: SUS, V=12m/min, Each load 30 min holding (step width)

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