Mitsui UHMW-PE series

HI-ZEX MILLION™, MIPELON™, LUBMER™

MITSUI CHEMICALS,INC.

Materials Development Group3

Polymeric Materials Laboratory

Mitsui UHMW-PE series

(Ultra-High-Molecular-Weight Polyethylene)

Mitsui Chemicals

Name	HI-ZEX MILLION™	MIPELON™	LUBMER™
Type	**UHMW-PE**	**UHMW-PE (Fine-Particle)**	**Specialty PE (Superb Lubrication)**
Form	**Powder (120-160μm)**	**Fine-Particle Powder (25-30μm)**	**Pellet**
M.W.	**0.5 ～ 6 million**	**2 million**	**<1 million**
Usage	**・Press Molding ・Extrusion Molding (Injection Molding ×)**	**・Modifier/Additives (Rubber, Resin , Grease) ・Sintering Molding**	**・ Injection Molding ・ Extrusion Molding**
Characteristics	**Abrasion Resistance Impact Strength Self-Lubrication Spherical shape Narrow PSD**	**Abrasion Resistance Impact Strength Self-Lubrication Spherical shape Narrow PSD**	**Superb Lubrication Abrasion Resistance Noiseless Properties Chemical Resistance**

LUBMER™

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1. What is LUBMER™?

Specialty polyethylene; **"Super Lubrication & Abrasion Resistance" and "Processability" go together.**

2. Characteristics of LUBMER™

- Superb Lubrication
- Noiseless Properties
- Abrasion Resistance
- Chemical Resistance

3. Molding Method

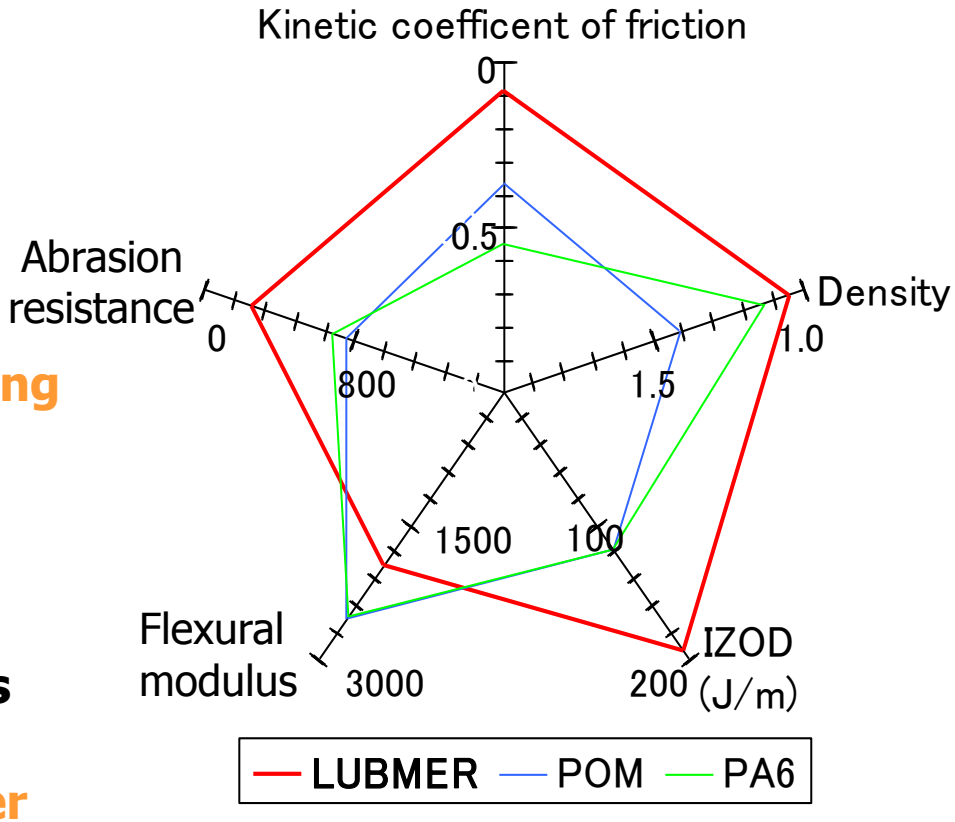
- Injection Molding
- Extruding Molding

4. Applications

- Electronic/Electrical/Office Automation Equipment Parts
- Glass-run channel

Characteristic of LUBMER™

- **Abrasion resistance**
  By far better than that of polyacetal and polyamide
- **Sliding properties**
  Coefficient of friction compar -able to that of fluoropalstics
- **Noiseless properties**
  A contribution to soundproofing gears and rollers
- **Chemical resistance**
  Stability to various chemicals
- **Electrical insulating properties**
  Excellent electrical insulating properties comparable to other polyolefin resin



Friction Properties of LUBMER™

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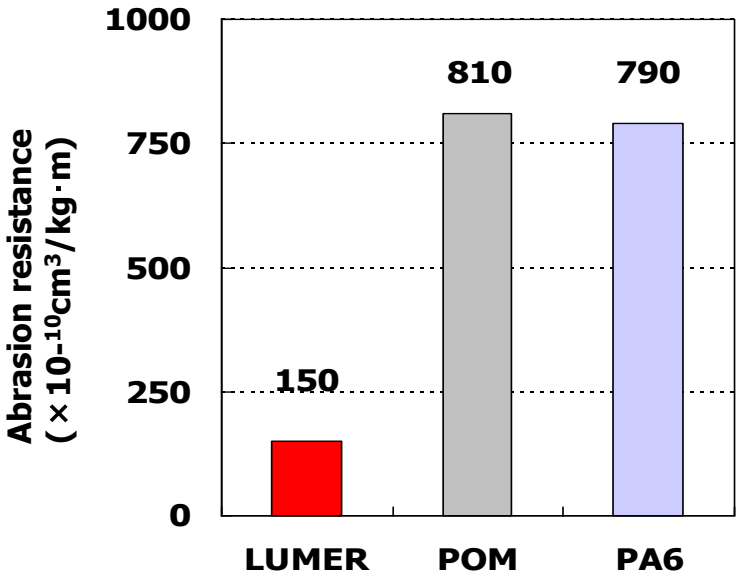
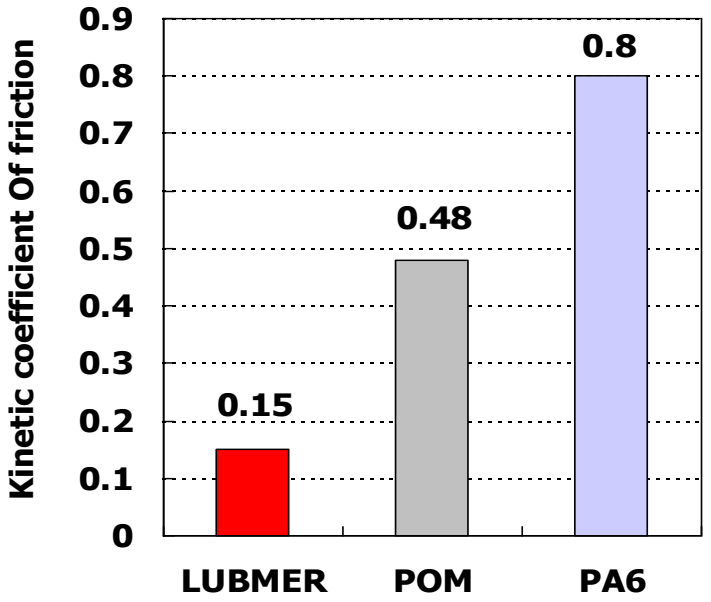
■Abrasion resistance



PV value: 100kg/cm²·m/min
P (pressure) (surface press): 3kg/cm²
(6 kg pressure / 2 cm² area)
V (velocity) (circumferential speed): 33.3/min
LUBMER-contact material : SUS304
Test period : 168 hrs Ambience: Dry

■Coefficient of friction



LUBMER-contact material : SUS304
Velocity : 12 m/min
Pressure : 10 kg
Contact area: 2 cm²

Competition with other resins ; Abrasion Resistance

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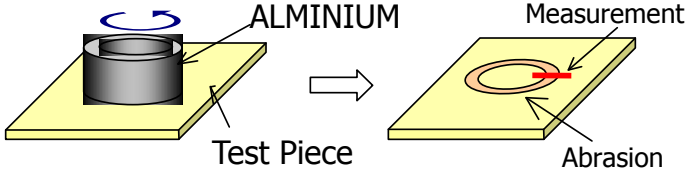
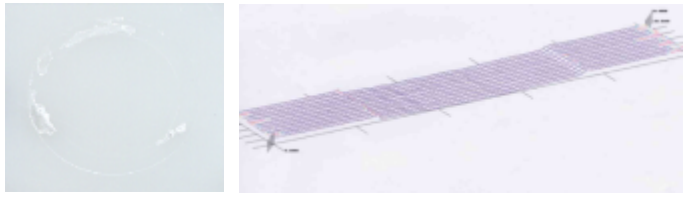
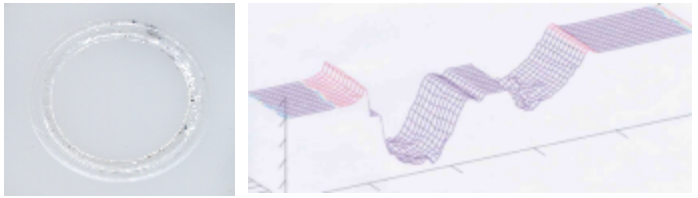
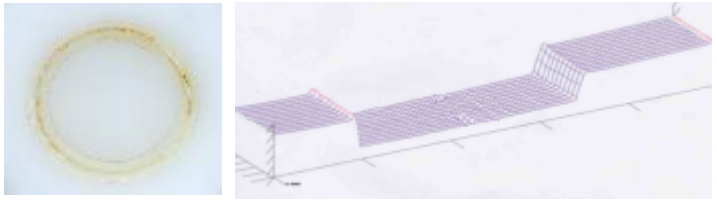
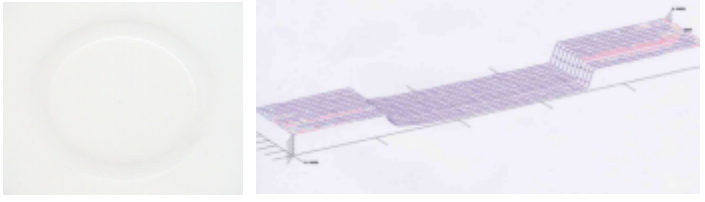
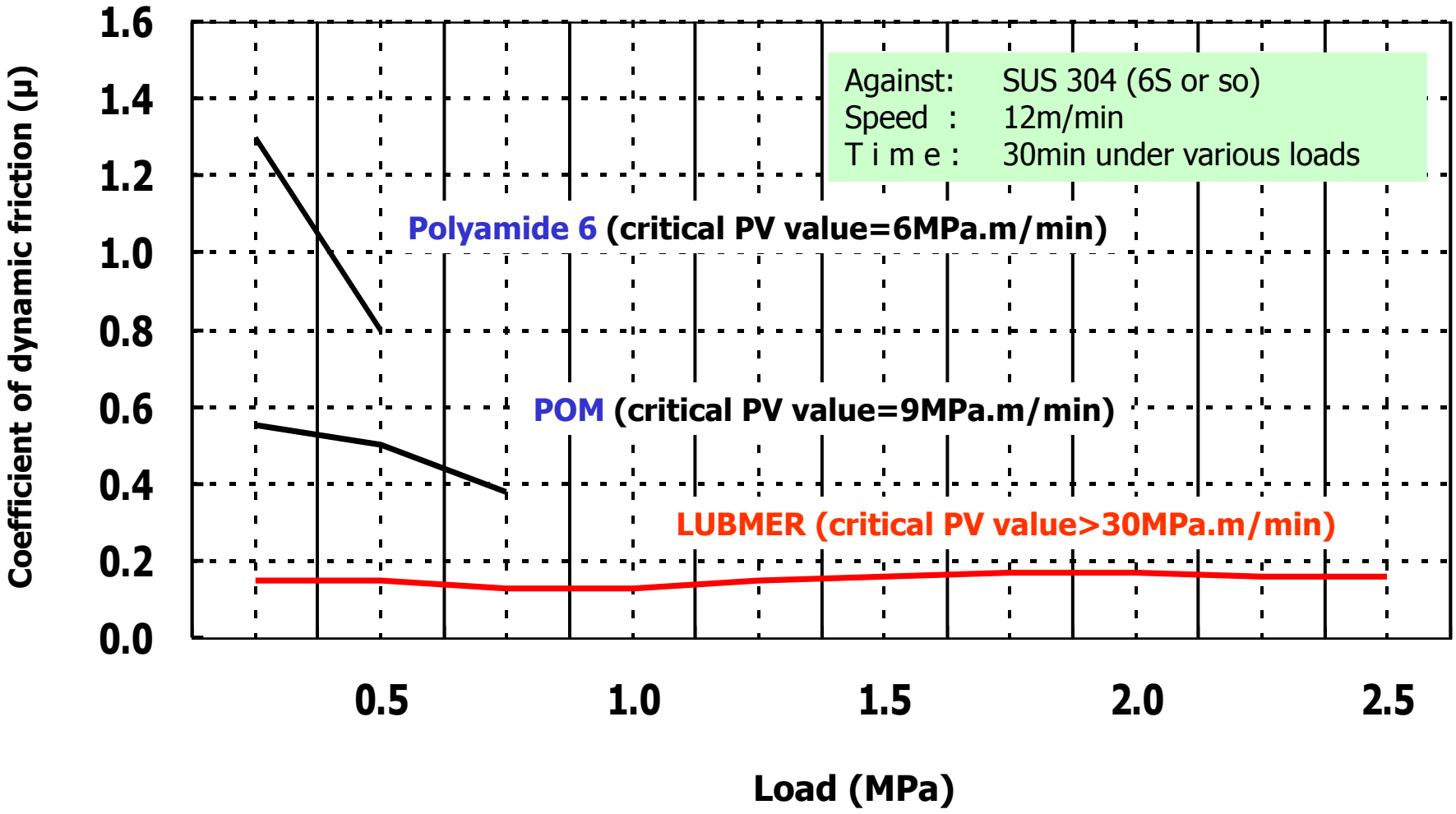
	Measurement Method	LUBMER™ L5000
Abrasion Parts	 0.74 MPa, 50cm/sec, 3km	
Sectional Area ($\times 10^{-3}$ mm^2)		**65**
	POM (HOMO)	**HDPE**
Abrasion Parts	 (Over Measurement Limit)	
Sectional Area ($\times 10^{-3}$ mm^2)	(Over Measurement Limit)	**620**
	PA6	**POM (including OIL)**
Abrasion Parts		
Sectional Area ($\times 10^{-3}$ mm^2)	**410**	**250**

Sliding Properties of LUBMER™



Characteristic of LUBMER™ (Various molding methods)

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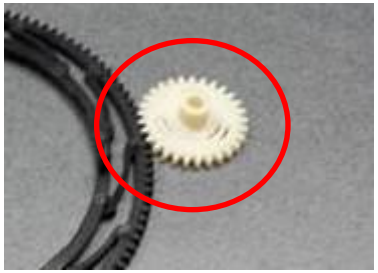
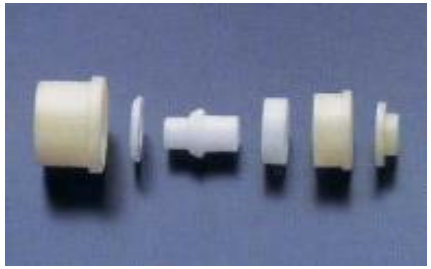
Injection molding

▼gear



▼ seat belt

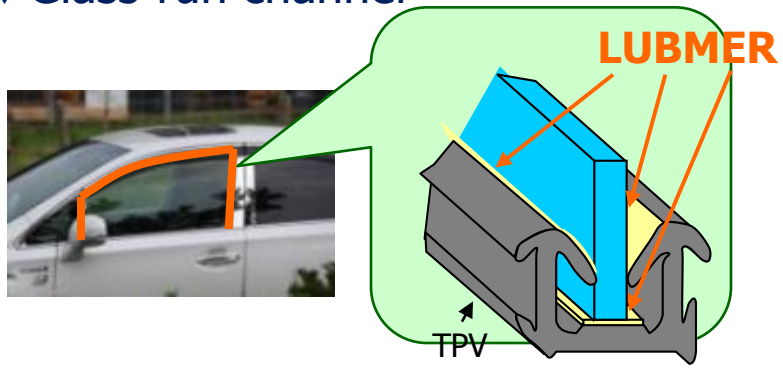
▼bearing



▼Parts for OA

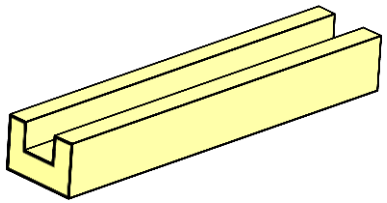
Extrusion molding

▼Glass-run channel



▼Slide seat

▼Slide rail



LUBMER™ can be formed by injection, extrusion and co-extrusion with Polyolefin resins.

Characteristic of LUBMER™ (Noiseless)

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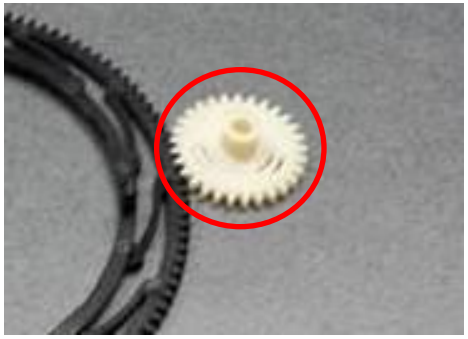
LUBMER™ is Noiseless sliding material

gear



LUBMER+**Polyester**
⇒**Greaseless**

Actuator

LUBMER+**POM**
⇒**Greaseless**

Slide ring of the cylinder

LUBMER+**Metal**
⇒**Noiseless**

Noiseless and greaseless make cost down and prevent processing problems.
(coating too much/ less grease)

Application of LUBMER™

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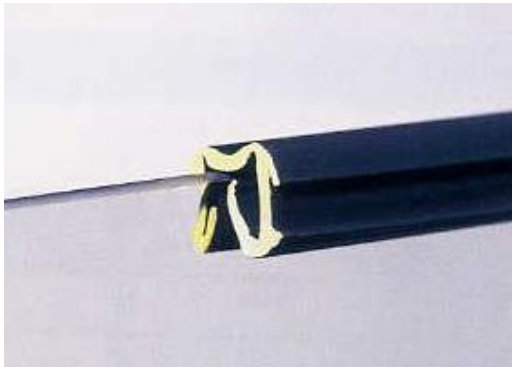
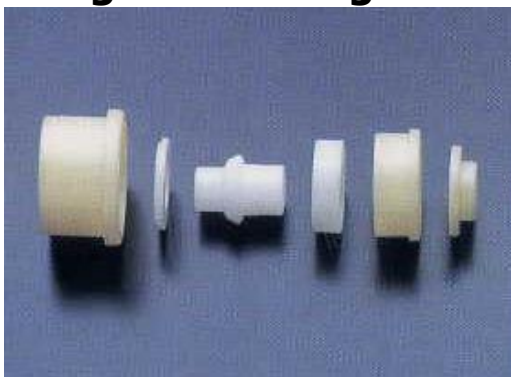
▼Parts for facsimile

▼Glass-run channel

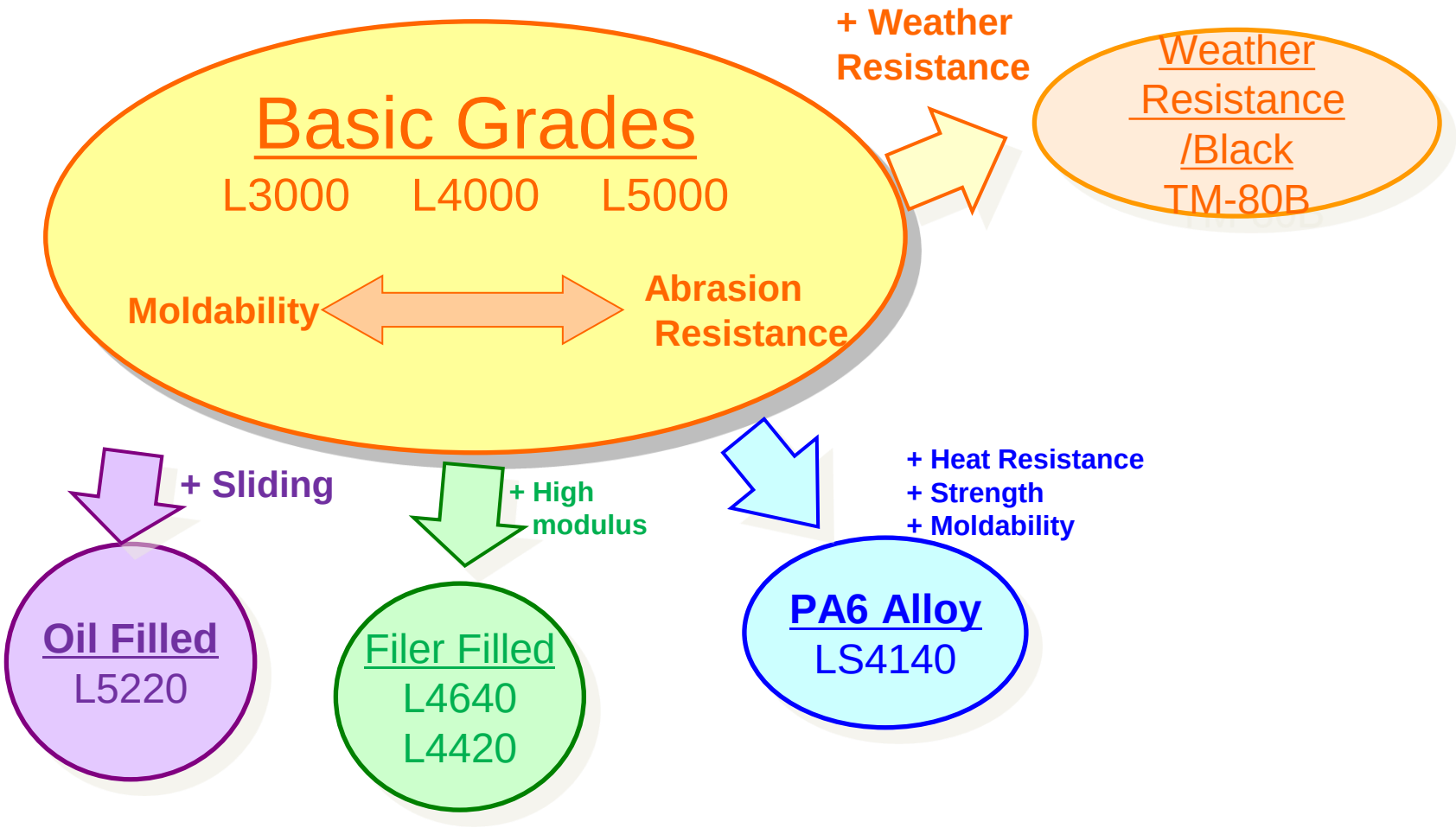


▼Bering for vending machines



Field	Applications	Required properties	Competitive
Electrical/Office	Facsimile rollers	Abrasion resistance to paper, non-adhesion of printing ink	POM
	PPC paper sorting claws	Abrasion resistance to paper, sliding	POM
	Noiseless gears for printer	Noiseless, sliding	POM, PA12, TPE
Automotive	Glass-run chanel	Abrasion resistance, sliding	Urethane
	Seat belts parts	Abrasion resistance, sliding	PA6
	Shock spacers for trucks	Abrasion resistance, sliding	UHMW-PE
General Equip.	Bearing for vending machines	Chemical resistance, sliding, hygienic quality	PTFE
	Housing building materials	Noiseless, sliding	PE, POM, TPE

Existing Grades



LUBMER™ L3000,L4000,L5000 Physical Properties

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Property	Unit	Testing Method	Condition	L3000	L4000	L5000
MFR	g/10min	JIS K7210	190°C Load 10kgf	15	6	2
Density	kg/m^3	ASTM D1505	-	969	967	966
Tensile Strength at Break	MPa	ASTM D638	50mm/min, Type4 dumbbell	37	41	47
Elongation at Break	%	ASTM D638	50mm/min, Type4 dumbbell	20	12	10
Flexural Strength	MPa	ASTM D790	5mm/min, thickness 3mm	35	37	38
Initial flexural modulus	MPa	ASTM D790	5mm/min, thickness 3mm	1530	1590	1620
Izod Impact Strength	J/m	ASTM D256	2mm thick, notched	162	185	194
Rockwell Hardness	-	ASTM D785	R scale	55	53	51
Kinetic Coefficient of Friction	–	MCI Method P=0.74MPa, V=12m/min	contact material, SUS 304 Surface roughness: 6S	0.11	0.10	0.09
Abrasion Loss	10^{-10}cm^3/kg • m	MCI Method P=0.3MPa, 168h	contact material, SUS 304 Surface roughness: 6S	180	160	150
Vicat Softening Point	℃	ASTM D1525	Press.=1kg	130	130	130
Heat Distortion Temp.	℃	ASTM D648	0.45MPa	80	80	80
Spiral Flow	cm	MCI Method	4.8 mm φ radius, 270 deg.C	42	36	30
Water Absorption	%	ASTM D570	24hr, immersion	0.01	0.01	0.01

Molding Conditions of LUBMER™

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LUBMER™ can be injection-molded by conventional molding machines, which are used for general-purpose plastics.

Molding Conditions		L3000	L5000	LS4140
Molding temp. (℃)	C1	210	240	220
	C2	230～240	260	240
	C3	230～240	260	240
	Nozzle	240	260	240
Molding time(sec)	Injection	2～4	2～5	2～4
	Pressure dwell	10	20	5～10
	Cooling	15	20	15
Mold temp.(℃)		24～60(water cooling)		

Trouble(EX.)	A cause	Take measures
Sink marks	**-Filling insufficiency of resin -Ejection pressure is low -Ejection speed is high -Cooling is short**	**-Increase measurements of the resin -To raise ejection pressure -To raise pressure dwell -To lower the ejection speed -To lengthen cooling time**