



HYOSUNG CHEMICAL

POKETONE In Glove Conveyor Application

Global Warming Potential

* PA6	6.70	
* PA66	6.40	
* PC	3.40	
* POM	3.20	
* ABS	3.10	
** PK	3.08	(kg CO ₂ eq)

* Other ETP data is based upon the Eco-profiles data from www.plasticseurope.org

** PK Data is based upon Korea LCI database and Ecoinvent database.



Non Toxic High Efficiency

- Acrylate Free
- Melamine Free
- Bisphenol A Free
- Formaldehyde Free
- Lead/ Chrome/ Free
- Phthalate Free

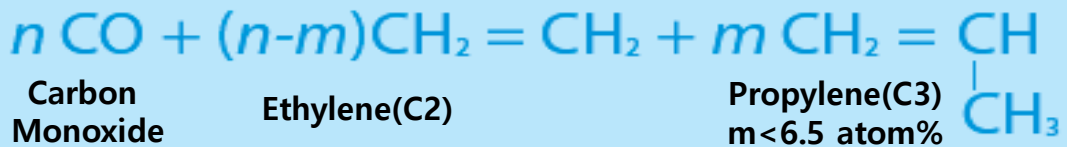
POKETONE
HYOSUNG POLYKETONE

Further Information
www.poketone.com

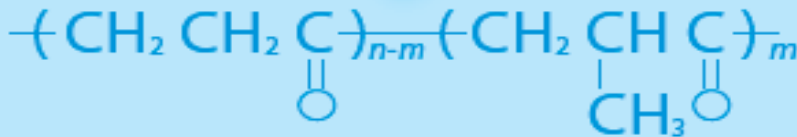
POKETONE
HYOSUNG POLYKETONE

Overview

HYOSUNG POKETONE is a Semi-crystalline aliphatic polyketone resin, polymerized with carbon monoxide(CO) and C2, C3 olefins. This POKETONE is categorized as engineering plastics, and used in a broad range of application with wear resistance, chemical protective, eco-friendly and low VOCs and balanced stiffness and toughness required resin.



Catalyst, pressure



Poketone (Aliphatic Polyketone)
Melting point 220°C, density 1.24g/cm³

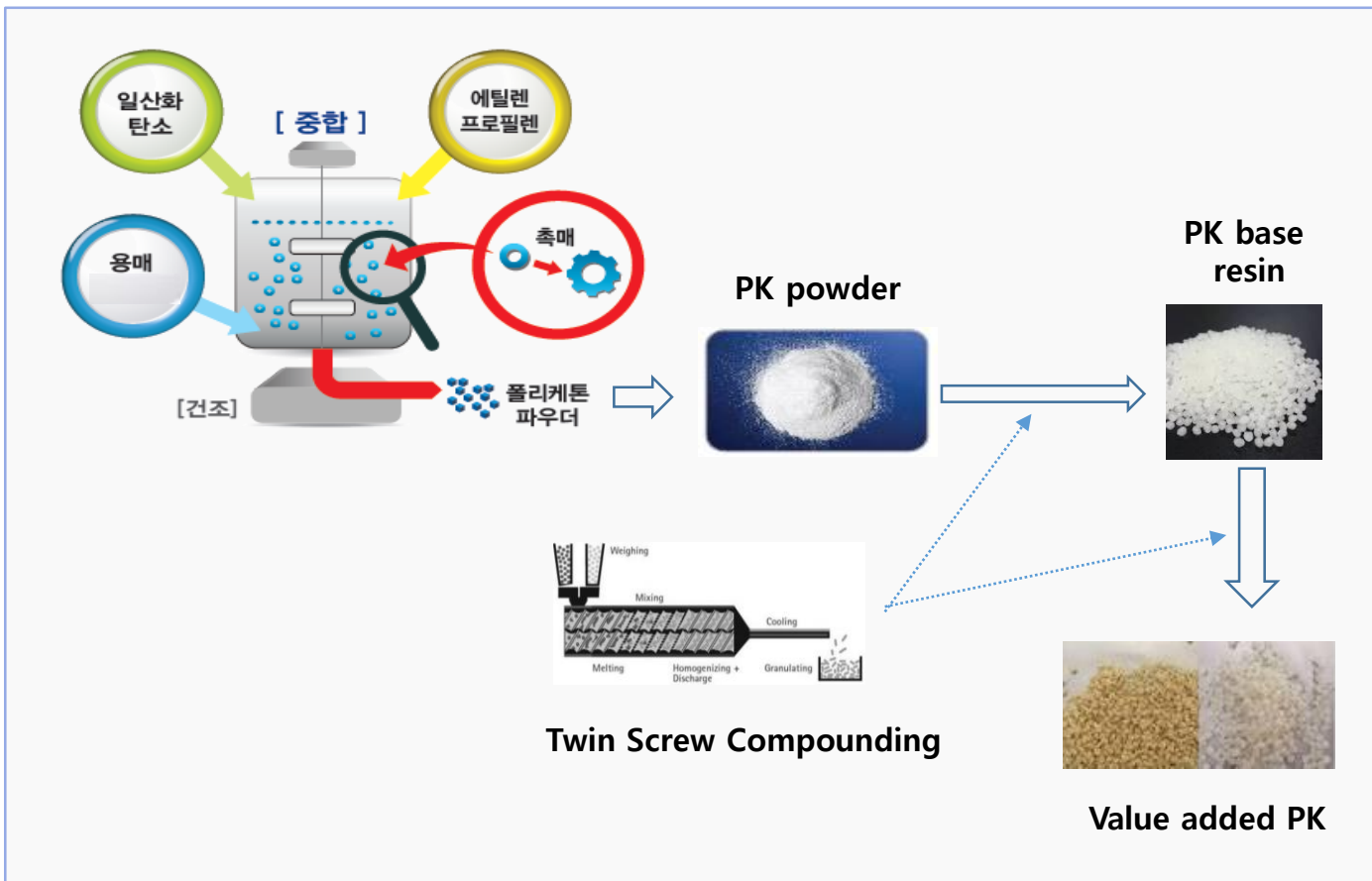
Table of contents

1. Introduction
2. Eco-Friendliness and Harmlessness of PK Base Resin
3. Key Mechanical Properties of PK Base Resin
4. Wear Resistant PK Portfolio
5. When to USE WEAR RESISTANT PK
6. Wear Performance Comparison

1. Introduction – Production of PK pellet

Polymerized PK resin has the form of powder. PK base resin pellet is made through twin screw compounding using optimized process conditions.

For value adding such as wear resistant, filler reinforcing, flame retardant an additional compounding process is applied at the PK base resin with an appropriate additives/fillers under optimized process conditions



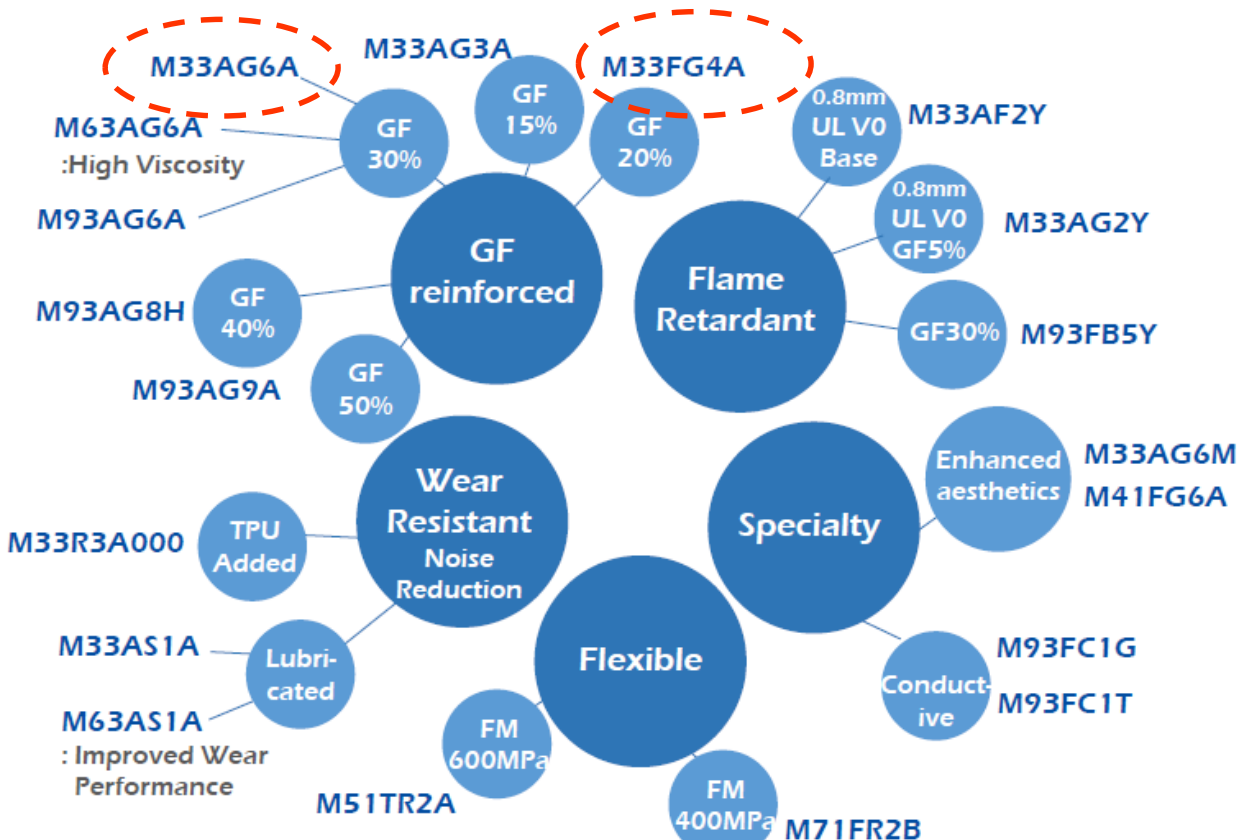
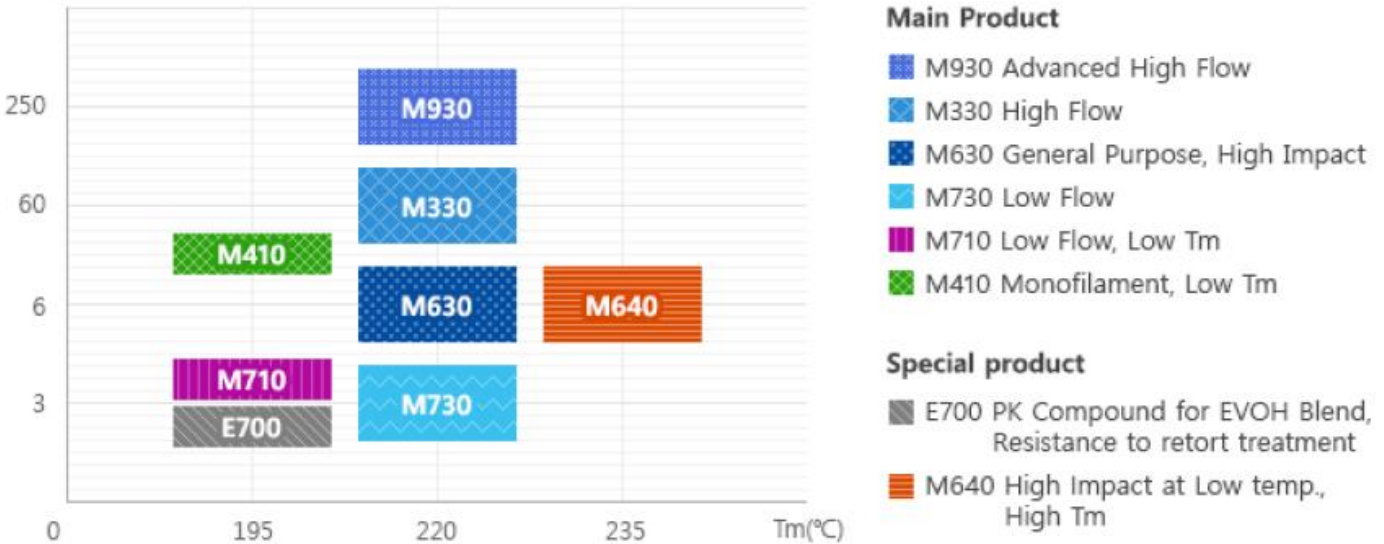
Basically POKETONE is provided as four major colors: NP, BK, GY, WH. But we support RED, BLUE, YELLOW, GREEN and ORANGE coloring according to customer's requirements.

1. Introduction – Base and Compound Portfolio

We have 7 portfolio of Poketone neat resin

For rubber glove manufacturing line, glass filled PK M330 is recommended in general.

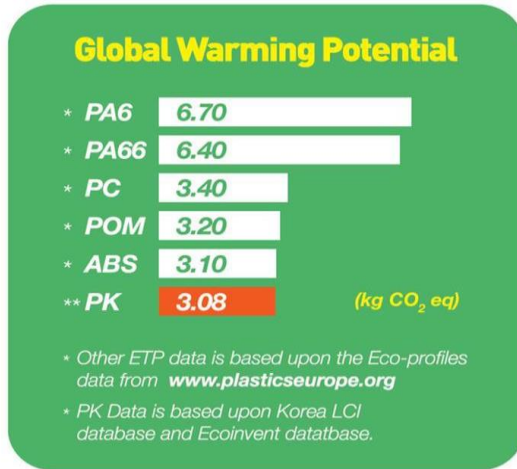
MI (g/10min)



Glass filled Poketone for rubber glove conveyor line

2. Eco-Friendliness and Harmlessness of PK Base Resin

HYOSUNG POKETONE has inherently lower CO₂ emission compared with other engineering plastics

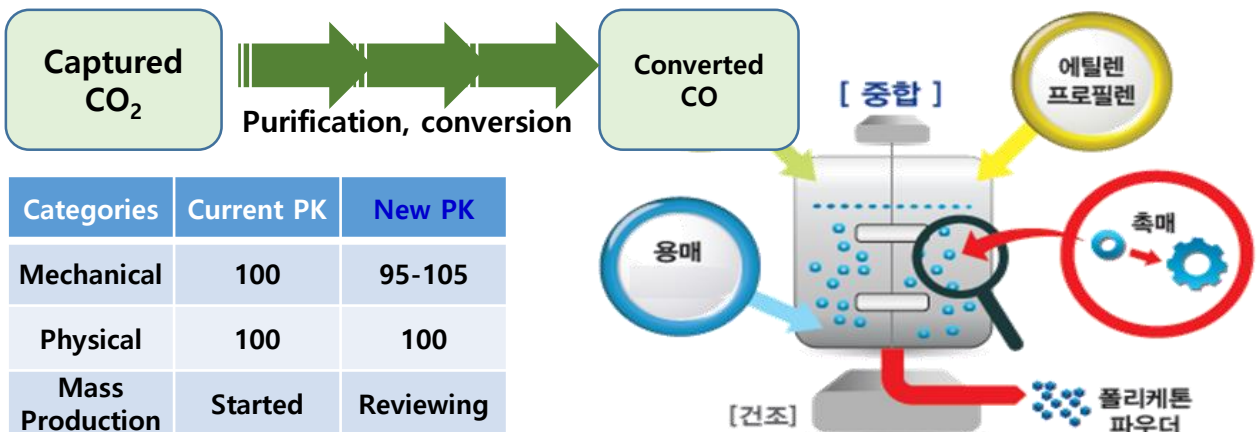


kg CO₂ eq = amount of emitted CO₂ per production of given resin 1kg

HYOSUNG POKETONE has many eco-related and health-related Certificates as NSF, KTW, EU 10/2011, USP 65 and ISO10993.



Hyosung Chemical has a future plan to produce Poketone using recycled CO₂ gas. Named as **NEW PK**, its mechanical & physical properties is verified the same as that for current PK.

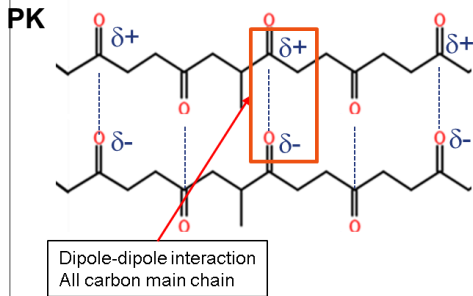


3. Chemical Structure Comparison

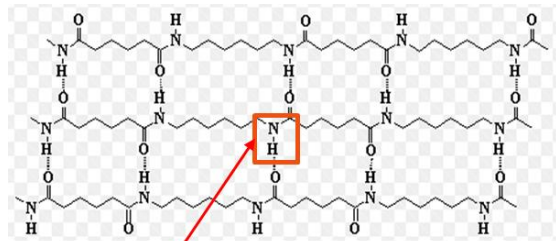
Poketone shows high elongation, impact resistance and good chemical resistances over wide range chemicals compared with other engineering plastics.

It is related to its unique chemical structures: all carbon main chain + dipole interaction

	POKETONE	Other Engineering Plastics
Main chain	All Carbon atom	O, N is periodically inserted
Secondary bonding	Dipole-dipole moment	PA: hydrogen bonding PBT, POM: Van Der Waals
Characteristics	High elongation & impact Generally good chemical resistance	High stiffness Vulnerable to humidity and several chemicals (humidity, steam, CaCl ₂ , chloramine etc)

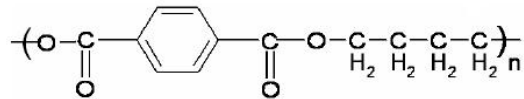


PA



Hydrogen bond
Carbon-Nitrogen main chain

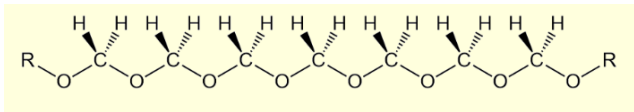
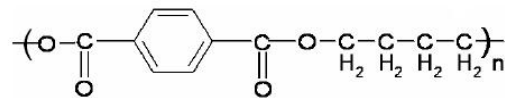
Greatly absorbs humidity
Weak at CaCl₂



PBT

Van Der Waals forces
-COO- main chain

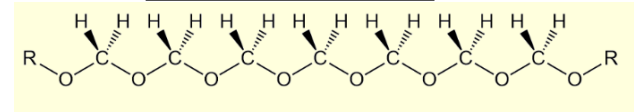
Hydrolysis can occur
at steam exposure



POM

Van Der Waals forces
-C-O- main chain

Weak at chloramine
(Br+Cl detergent)



3. Chemical Resistance: PK vs. other Engineering Plastics

PK is the only engineering plastic with all carbon main-chained back-bone . It gives generally good chemical resistances compared with other engineering plastics which contain O, N atoms in their back bone.

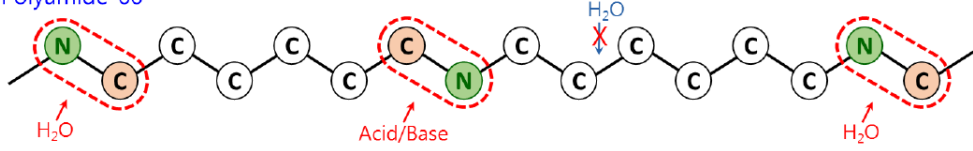
C
Chemical Resistance

against POM

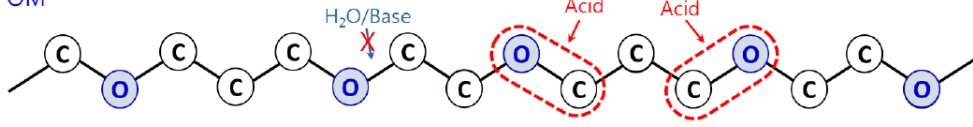
against PA

- PA : Amide Group (-NH-CO-) is weak to Water/Acid/Alkaline
- POM : Ester (R-O-R') group is degraded by acid
- PK : Main Chain is composed with only C-C, so stable to Water/Acid/Alkaline

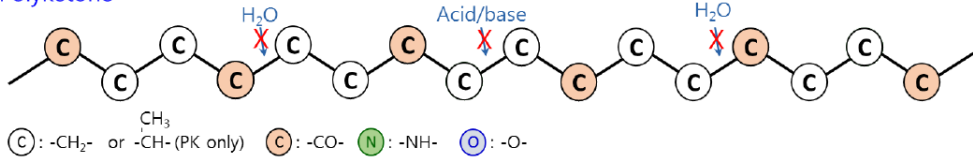
Polyamide 66



POM



Polyketone



	Semi-Crystalline							Amorphous		
	PK	PA66	PA12	POM	PBT	PPS	PVDF	PPO	PSU	PC
Hydrocarbons										
Aliphatic	○	○	○	○	○	○	○	●	●	●
Aromatic	○	○	○	○	○	○	○	●	●	●
Halogenated	○	○		○		○	○	●	●	●
Ketones	○	○	○	○	○	○		●	●	●
Esters/Ethers	○	○	○	○	○	○	○	●	●	●
Aldehydes	○	●	●	○	○	○	○	●	●	●
Aqueous										
Water	○	●	○	○	●	○	○	○	○	○
Weak Acids	○	●	●	●	●	○	○	○	○	○
Weak Bases	○	●	●	○	●	○	●	○	●	○
Strong Acids	●	●	●	●	●	●	○	○	●	○
Strong Bases	●	●	●	○	●	●	●	●	●	●

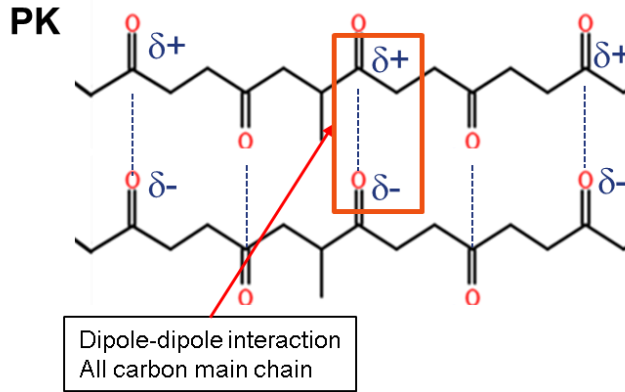
○ : Resistant

● : Not Resistant

3. Key Mechanical Properties Comparison: PK vs. other Enpla.

PK's secondary bonding is dipole-dipole interaction. This gives balanced mechanical properties between stiffness and toughness.

Compared with other engineering plastics, PK's position lies in toughness orientated properties.

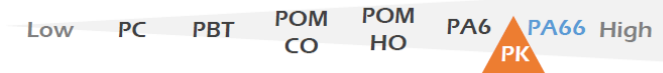


Items	Unit	PK M330	PA6	PA66	PBT	POM
Density	g/cm ³	1.24	1.14	1.14	1.30	1.41
Melting Point	°C	222	220	260	220	160
Notched Charpy	kJ/m ²	9.0	5.2	4.6	5.0	6.5
Tensile Strength	MPa	60	80	80	55	65
Elongation at Break	%	>250	<100	<80	16	35
Flexural Modulus	MPa	1,550	2,600	2,900	2,400	2,500

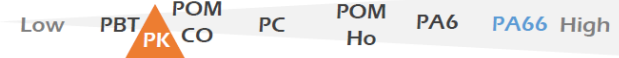
Density



Heat distortion resistance(HDT)



Tensile Strength(Yield)



Toughness



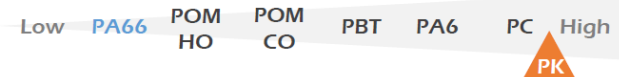
Elongation(Yield)



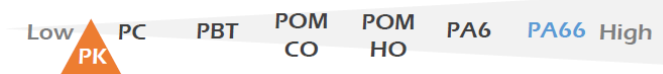
Hardness



Flexibility



Young's Modulus

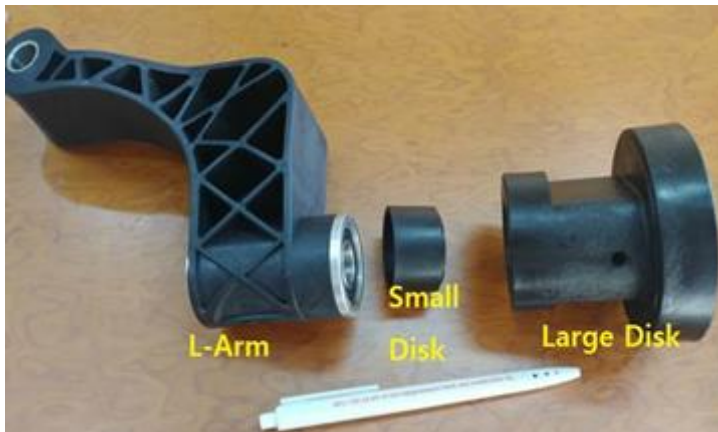


4. PK portfolio for Rubber Glove Manufacturing Line

Hyosung POKETONE provides 4 glass and mineral filled compounding grades. They are applied at L-Arm, disk and holder in glove manufacturing line. By balancing both wear resistance and mechanical strength, Poketone grades give best balance of wear properties with good chemical resistances and long term reliability.

Grade name			M33AG4A	M33AG5A	M33AG6M	M33AG6A
Physical Properties	Test Method	Unit				
Density	ASTM D792	g/cm ³	1.39	1.43	1.47	1.47
Filler content(GF, MF)	ASTM D5630	wt%	20	25	30(mixed)	30
Mechanical Properties	Test Method	Unit				
Tensile Strength	ISO 527	MPa	107	120	112	140
Elongation at Break	ISO 527	%	4.0	3.9	3.9	3.8
Flexural Strength	ISO 178	MPa	150	170	173	185
Flexural Modulus	ISO 178	MPa	4700	5500	6300	6150
Notched Charpy	ISO 179e1	kJ/m ²	9	11	10	13
Thermal Properties	Test Method	Unit				
Melting Temperature	ASTM D3418	°C	222	222	222	222
MFR 240°C, 2.16kg	ASTM D1238	g/10min	22	17	17	14

HCl 1% Aquatation	Tensile Strength			Flexural Modulus			Notched Charpy		
	MPa		%	MPa		%	kJ/m ²		%
	0d	42day	retention	0d	42day	retention	0d	42day	retention
M33AG6A	140	120	85%	7341	6230	85%	12.6	13.0	103%
PPA GF30	179	89	52%	8971	4684	52%	7.4	9.1	124%





· Excellent Wear Resistance · Low Noise · Low abrasion loss (no particle) · Excellent chemical resistance

CONTACT US

Republic of Korea

+82 2 2146 5583, jdm@hyosung.com / +82 2 2146 5589, issooho@hyosung.com

China

+86 021 62250312 (ext.8030), yikim77@hyosung.com / +82 2 2146 5571, shin611@hyosung.com

Europe

+82 2 2146 5591, lovetoken@hyosung.com / +82 2 2146 5574, lhkim13@hyosung.com

America

+82 2 2146 5572, mkjung@hyosung.com

Asia

+82 2 2146 5551, jaejung@Hyosung.com

Further Information
www.poketone.com

POKETONETM
HYOSUNG POLYKETONE

+Note : The data contained in this publication are based on our current internal knowledge and experience, these do not imply any guarantee of certain properties. Most images are from googling image researching, which is considered as public open information.