

# Mitsui EPT™



Mitsui Chemicals

# What is Mitsui EPT™?

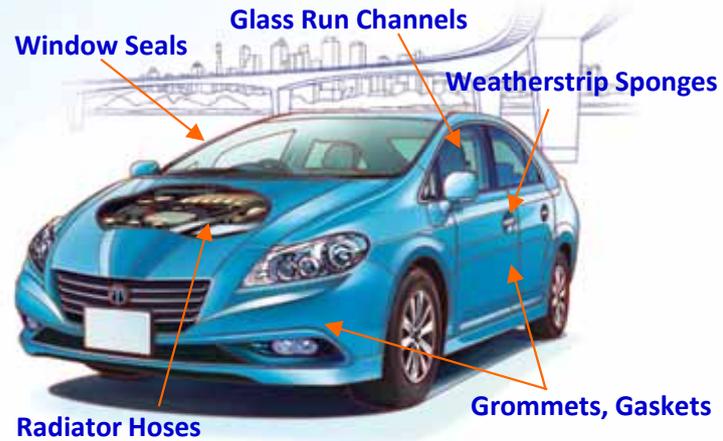
**Mitsui EPT™** (Ethylene-Propylene-Terpolymer) is an EPT(EPDM) brand that is produced by Mitsui Chemicals through its state of the art olefinic polymerization technology. With Mitsui Chemicals' advanced technology, we constantly develop new grades which allow us to meet customer demand.

**Mitsui EPT™** is a material which excels in processability, weather resistance, heat aging resistance, electrical insulation properties, cold resistance, and chemical resistance. These properties are ideal in applications such as (but not limited to) automotive weatherstrips and hoses, building materials, and electrical cables.

**Mitsui EPT™** specializes in specially designed polymers which competitors cannot match, allowing Mitsui Chemicals to develop not only high performance products but quality products which exceed customer expectations.

**Mitsui EPT™** is backed by experts who provide excellent technical support to each and every customer and adjust to their every demand, whether it is a general grade selection for a certain application, formulation adjustments for improved properties, or cost reduction methods using **Mitsui EPT™**.

## Automotive Industry



Glass Run Channels, Weatherstrip Sponges



Grommets, Hoses

## Electrical and Construction Industries



Cables / Wires



O-Rings / Gaskets



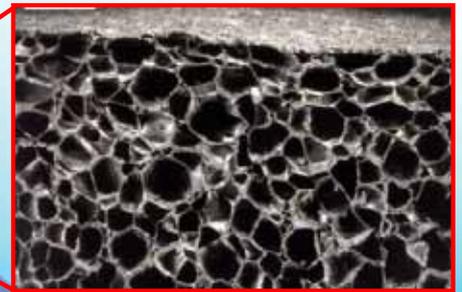
Heat Insulator Sponges



Various Tubes / Hoses

# Contents

<b>Introduction of EPT</b>	<b>Page</b>
- Technical Properties	4-5
- General Characteristics	6
<b>Introduction of Mitsui EPT™</b>	
- Mitsui EPT™ Group	7
- Features of Mitsui Chemicals' R & D	8
- Advantages of Mitsui EPT™	9
- Grade List and Packaging	10-11
- Selection Guide	12
<b>Contact Information</b>	<b>13</b>



# Basic Introduction of EPT and Comparison to Other Rubbers

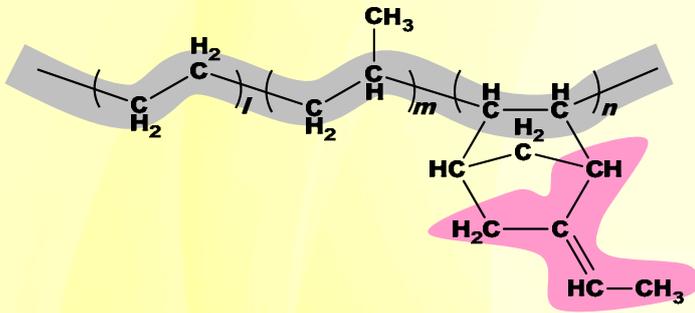
## 1. Weather and Ozone Resistance Properties

The weather and ozone resistance of EPT is excellent and surpasses most rubbers due to its chemical structure.

The main chain of EPT consists of a very stable saturated hydrocarbon preventing the main chain from degrading even after being exposed to sunlight and/or high concentrations of ozone for long periods of time.

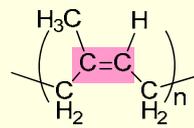
### EPT Polymer Structure

Polymer Backbone; Saturated Hydrocarbon

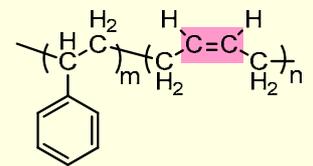


### Diene Rubber Polymer Structure

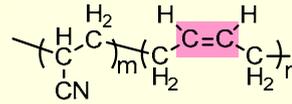
Natural Rubber (NR)



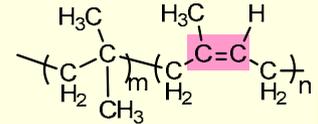
Styrene-Butadiene Rubber (SBR)



Nitrile Rubber (NBR)



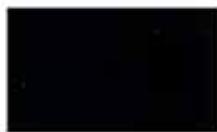
Butyl Rubber (IIR)



Unsaturated Moiety in Polymer Backbone

EPT can be blended with other diene rubbers such as SBR and NR which have poor weather and ozone resistance, in order to significantly improve these characteristics.

### Appearance Change Under Ozone Atmosphere



EPT



CR



BR



IIR



SBR



NR

EPT Blend Effect on Ozone Resistance



EPT:SBR=30:70



EPT:SBR=0:100

Ozone Condition : (EPT/IIR/CR 100pphm x 40°C x 600hr), (SBR/BR/NR 100pphm x 40°C x 300hr), (EPT:SBR 50 pphm x 40°C x 300hr)

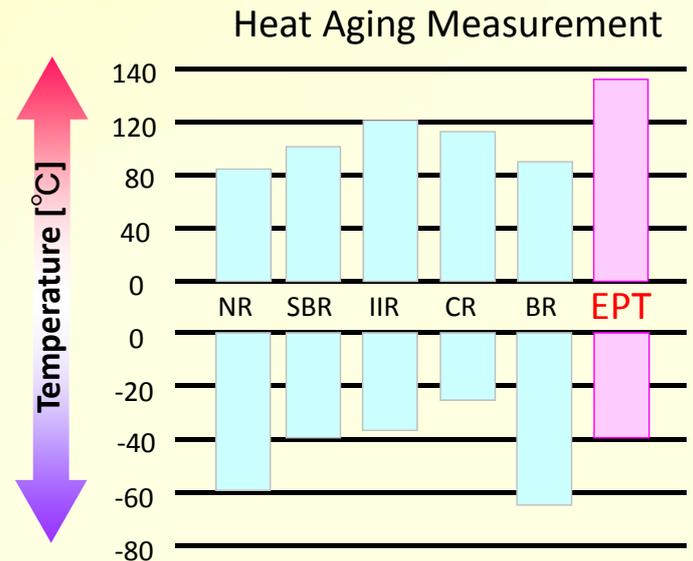
# Basic Introduction of EPT and Comparison to Other Rubbers

## 2. Heat and Cold Resistance Properties

The heat and cold resistance limits for EPT are broader than any other type of rubber due to its chemical structure.

The main chain of EPT consists of a very stable saturated hydrocarbon allowing it to have excellent heat aging resistance.

It can be used for longer periods of time and in higher temperatures compared CR (Chloroprene Rubber) and other diene rubbers such as SBR and NR.



## 3. Electrical Insulation Properties

EPT has excellent characteristics as an insulation material. The corona resistance is better than that of SBR, NR and IIR, and the tracking resistance is also excellent.

Electrical Insulation Properties (General tendency of base polymer)

	EPT	NR	SBR	IIR	CR	Crosslinked Polyethylene
Dielectric constant (23°C)	3~4	3~4	3~7	3~4	6~8	2.5
Dielectric breakdown voltage (kV/mm)	30~60	20~30	20~50	20~30	10~20	50~70
Volume resistivity value (23°C, Ω·cm)	10 <sup>13</sup> ~10 <sup>16</sup>	~10 <sup>15</sup>	10 <sup>14</sup> ~10 <sup>15</sup>	10 <sup>15</sup> ~10 <sup>16</sup>	10 <sup>10</sup> ~10 <sup>12</sup>	~10 <sup>17</sup>
Tracking resistance	★★★	★★	★★	★★★	★	★★★
Arc resistance	★★★	★★	★★	★★★	★	
Corona resistance	★★★	★★	★★	★★★	★	★★

★★★ Excellent, ★★ Fair, ★ Poor

## 4. Chemical Resistance Properties

EPT has good chemical resistance against organic solvents with relatively higher polarity (alcohol, ketone, glycol, etc.), water solution of inorganic salt, acid and alkali.

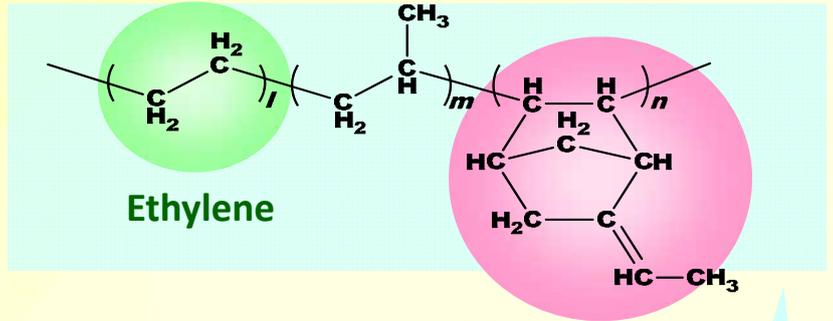
Chemical Resistance Properties (Room Temperature)

Acetone	★★★	Ethyl Alcohol	★★★	Freon® 11	★
Ammonia Water 25%	★★★	Glycol	★★★	Freon® 12	★★
Phosphate Ester	★★★	Nitric Acid 30%	★	Freon® 13	★★★
Methyl Ethyl Ketone	★★★	Hydrogen Peroxide 10%	★★★	Silicon Oil	★★★
Detergent	★★★	Hydrochloric Acid 30%	★★★	Paraffinic Oil	★
Sodium Hydroxide	★★★	Sulfuric Acid 50%	★★★		

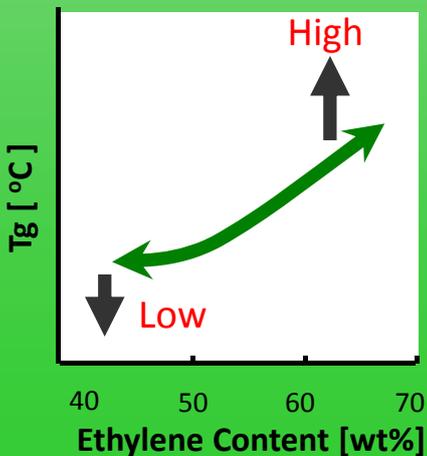
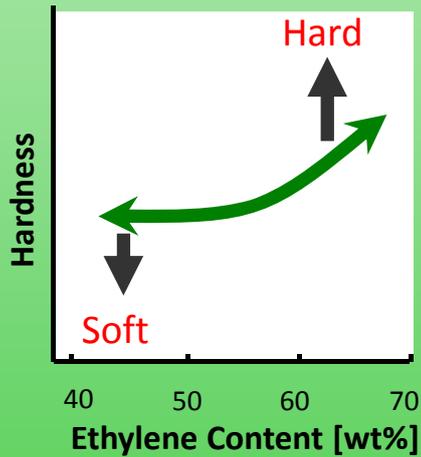
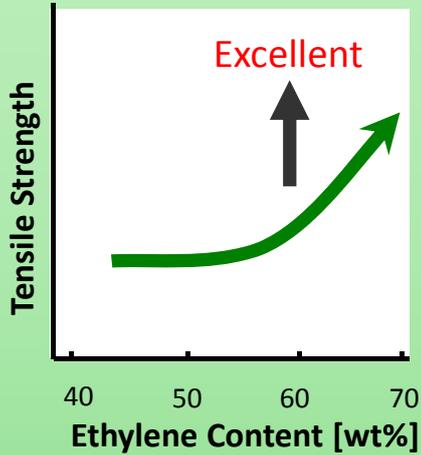
★★★ Excellent, ★★ Fair, ★ Poor

# General Characteristics

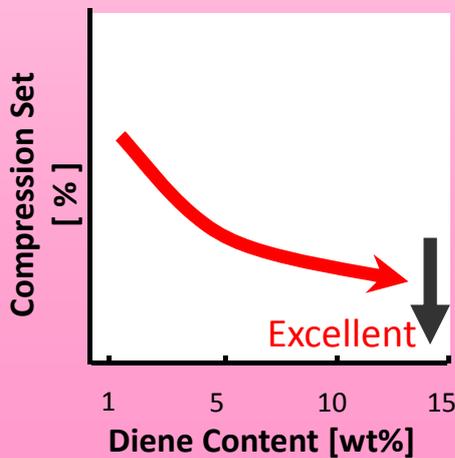
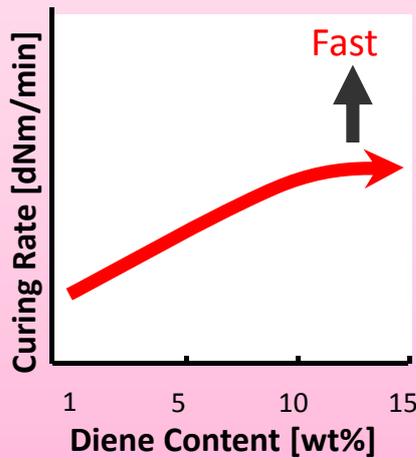
EPT structure's effects on various physical properties



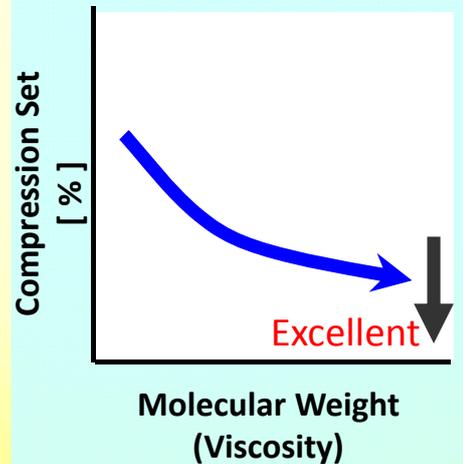
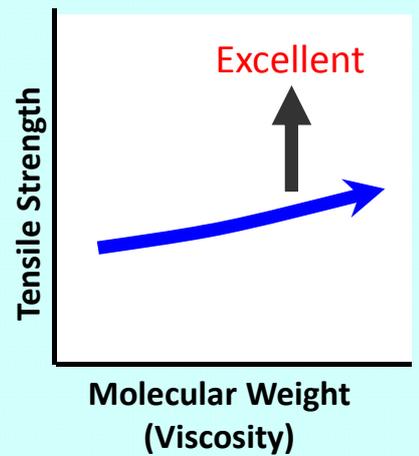
## Ethylene Content



## Diene Content



## Molecular Weight



# Mitsui EPT™ Group

Customers

Various demands

Mitsui EPT™ &  
Technical Support

## Mitsui EPT™ Group

Mitsui EPT™ is a High Quality Product, which is backed with Valuable Insight and Technical Support to propose the best solution for each customer.

### Valuable Insight:

Mitsui Chemicals Inc. has sales professionals located globally to quickly support and assist customers whenever needed

Sales &  
Marketing

### Technical Support:

Mitsui Chemicals Inc. provides EPT formulation designs to achieve customer's target along with ongoing technical support to adjust to customer requests

*One Team*

Production

Research &  
Development

### High Quality Products:

Mitsui Chemicals Inc. produces stable supply and quality through strict quality checks.

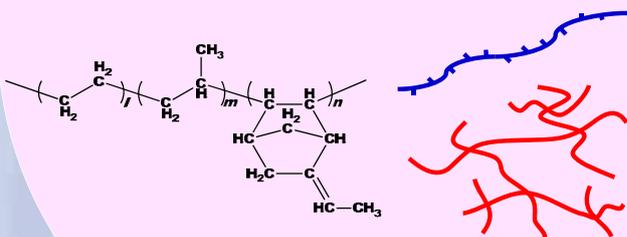
# Features of Mitsui Chemicals' R & D

## ◆ Research and Development Cycle to Create Innovative Products

*Mitsui Chemicals is an extensive company which actively works on research and development and offers a wide range of products from basic monomers to catalysts and plant designs as well. Through this active cycle of research and development throughout the entire company, Mitsui Chemicals offers new and innovative products that exceed market expectations.*

### Polymer Design

Various high performance products can be achieved by our original polymerization technology along with unique catalysts and monomers.



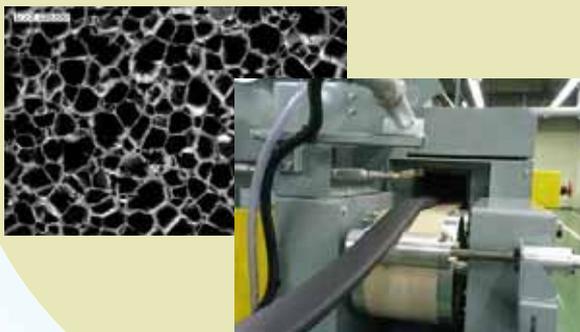
### Production Design

- Quality stability  
(Very Low Amount of Gels)  
(Stable Viscosity)
- Unique Polymer Alloy



### Evaluation & Analysis

Mixing & vulcanization processability, physical & chemical properties are investigated based on the applications.



### Formulation Design

We provide sample formulations accumulated through over 40 years of experience.



# Advantages of Mitsui EPT™

## ◆ Unique Production Process

Mitsui Chemicals uses a state of the art production process which allow the materials produced to have **excellent and stable quality**.

Quality benefits include:

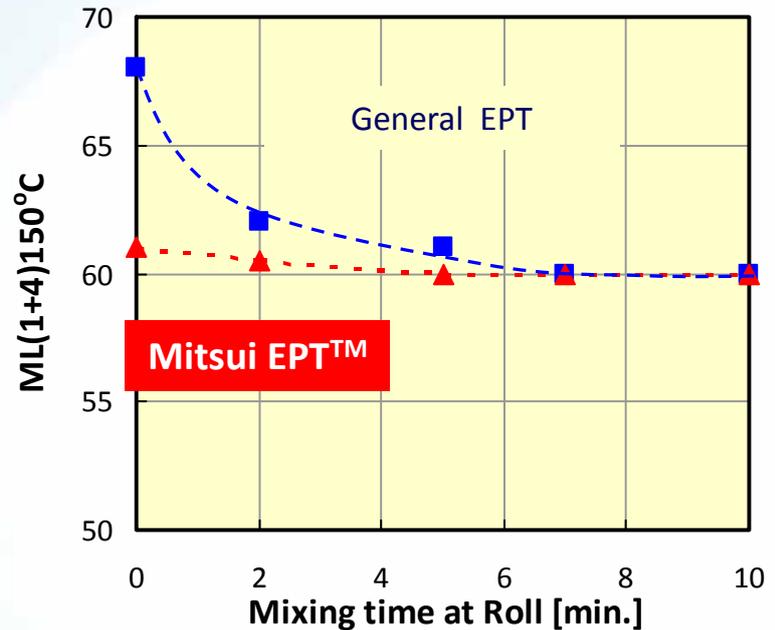
- ▶ Low gel content within the material
- ▶ Stable viscosity when mixing

## ◆ Grades Produced Using the Metallocene Catalyst Technology

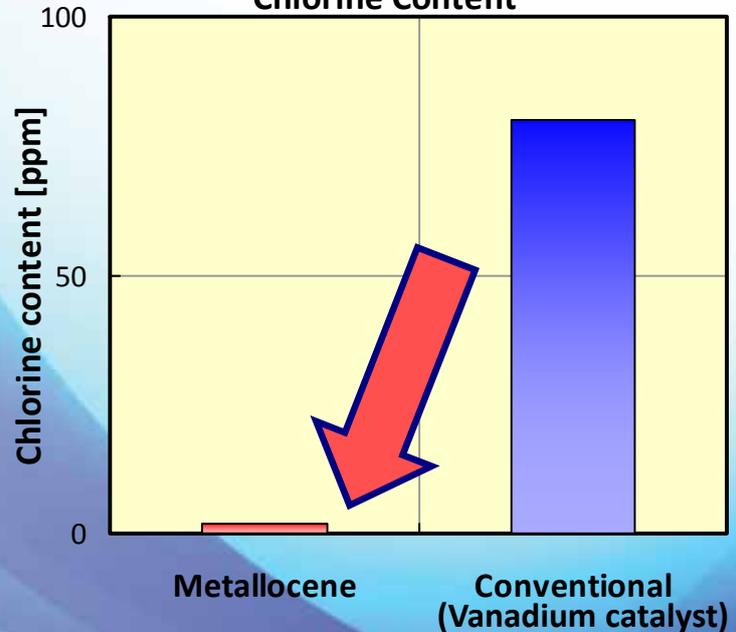
The Metallocene catalyst technology allows new and exciting potential to the long existing EPT world.

- ▶ Low chlorine content for longer lasting products
- ▶ Narrow MWD for higher properties
- ▶ Extremely low gel content within the material
- ▶ Possibilities to realize versatile polymer design
- ▶ A simple and more environmentally friendly production process.

Viscosity Changes of EPT



Chlorine Content



# Mitsui EPT™ Grade Nomenclature

## Quantity of the Third Component

- 0-No Diene
- 2-Low Diene Content
- 3-Medium Diene Content
- 4-High Diene Content
- 8/9-High Diene Content (2 types)
- Branched Structure EPT

## Mooney Viscosity

- 01-ML1+4(100°C) ≐ 10
- 04-ML1+4(100°C) ≐ 40
- 07-ML1+4(100°C) ≐ 70
- 09-ML1+4(100°C) ≐ 90
- 12-ML1+4(100°C) ≐ 120

**3**

**0**

**7**

**2**

**E P M**

## Characteristics of the grade

- 0-Low Ethylene Content
  - Excellent Low Temperature Characteristics
- 1-Broad Molecular Weight Distribution
  - Excellent Processability
- 2-High Ethylene Content
  - High Tensile Strength
- 5-Well Balanced Processability and Tensile Strength  
(Between 0 and 1, Mitsui EPT™ Special Grades)

## E-Oil Extended Grades

## P-Pellet Grades

(H)\*-Wrapped in a High Density Polyethylene Film.

Remove before use.

## M-Metallocene Catalyst Grades

(\*: All Grades are normally wrapped in Low Density PE film but there is an option to wrap in High Density PE Film. Refer to the next page for packaging details)

**Standard Bale**



**Friable Bale**



**Pellet**



# Mitsui EPT™ Grade List

## ■ Mitsui EPT™

		Grade	Mooney Viscosity		Ethylene Content (%)	Diene Content (%)	Oil Content (PHR)	Polymer Design *1	Bale		Packaging		Shipping
			ML(1+4) 125°C	ML(1+4) 100°C					Weight (kg)	Form	Wrapping *2	kg/ Steel Box	kg/ 20' Container
No Diene	Non-Oil Extended	0045	-	40	51	-	-	Broad	25	Standard	LDPE, HDPE	1,050	16,800
Low Diene	Non-Oil Extended	2060M	40	-	55	2.3	-	Narrow	25	Standard	LDPE	1,050	16,800
Medium Diene	Non-Oil Extended	3045	-	40	56	4.7	-	Broad	25	Standard	LDPE, HDPE	1,050	16,800
		3070	47	-	58	4.7	-	Narrow	25	Standard	LDPE, HDPE	1,050	16,800
		3092M	61	-	65	4.6	-	Narrow	25	Friable	LDPE, HDPE	750	12,000
		3110M	78	-	56	5.0	-	Narrow	25	Friable	LDPE, HDPE	750	12,000
	Oil Extended	X-3042E	-	37	66	4.7	120	Narrow	25	Standard	LDPE, HDPE	1,050	16,800
		3062EM	43	-	65	4.5	20	Narrow	25	Standard	LDPE, HDPE	1,050	16,800
									25	Friable	LDPE, HDPE	750	12,000
		3072EM	51	-	64	5.4	40	Narrow	25	Standard	LDPE, HDPE	1,050	16,800
									25	Friable	LDPE, HDPE	750	12,000
		3090EM	59	-	48	5.2	10	Narrow	25	Standard	LDPE	1,050	16,800

## ■ Mitsui EPT™ Pellet Grades

Characteristics		Grade	Mooney Viscosity	MFR	Ethylene Content (%)	Diene Content (%)	Oil Content (PHR)	Polymer Design *1	Pellet		Packaging		Shipping
			ML(1+4) 125°C	190°C, 2.16kg					Weight (kg)	Form	Wrapping	kg/ Pallet	kg/ 20' Container
Medium Diene	Non-Oil Extended	X-3012P	15(100°C)	5g/10min	72	3.6	-	Narrow	25	Pellet	Paper Bag	750	12,000
		3092PM	61	-	65	4.6	-	Narrow	25	Pellet	Paper Bag	750	12,000
	Oil Extended	3072EPM	51	-	64	5.4	40	Narrow	25	Pellet	Paper Bag	750	12,000

## ■ Ethylene 1-Butene Terpolymer (Pellet Grade)

Characteristics		Grade	Mooney Viscosity	MFR	Ethylene Content (%)	Diene Content (%)	Oil Content (PHR)	Polymer Design *1	Pellet		Packaging		Shipping
			ML(1+4) 125°C	190°C, 2.16kg					Weight (kg)	Form	Wrapping	kg/ Pallet	kg/ 20' Container
High Diene	Non-Oil Extended	K-9720	20(100°C)	2g/10min	77	10.4	-	Broad	25	Pellet	Paper Bag	750	12,000

## ■ Mitsui Eptalloy™

Characteristics		Grade	Mooney Viscosity	Polyethylene Content (PHR)	Ethylene Content (%)	Diene Content (%)	Oil Content (PHR)	Polymer Design *1	Bale		Packaging		Shipping
			ML(1+4) 125°C						Weight (kg)	Form	Wrapping	kg/ Steel Box	kg/ 20' Container
Medium Diene	Oil Extended	PX-049PEM	36(150°C)	20	56	5.0	10	Narrow	25	Friable	LDPE	750	12,000

\*1: Polymer Design

**Broad:** Broad Molecular Weight Distribution,

**Narrow:** Narrow Molecular Weight Distribution,

**Branched:** Designed Long Chain Branched EPT,

**Hyper Branched:** Designed Hyper Long Chain Branched EPT

\*2: Melting point of wrapping materials:

**LDPE:** ~ 110°C

**HDPE:** ~ 120°C (Remove before use)

**Low Melt POE:** ~ 70°C

# Selection Guide by Application

※ Applications are representations and can differ depending on the formulation. Please contact a sales professional for details.

## ■ Mitsui EPT™

### Representative Applications

Grade	Automotive				Life, Buildings & Constructions, Electronics, Industrial parts					Specialties & Modifiers					Polymer Features
	Weather Strip (solid)	Weather Strip (sponge)	Corner Joint Sponges	Grommets, Gaskets	Sheet, Roofing, Linings	Belts, Inner Tube, Hoses	Cables, Wires	OA Rolls, Packings	Anti-vibration	TPE / TPV Modifier	Low Density Sponge	High Hardness	Low Hardness	Viscosity Modifier	
0045					★	★★	★								High Heat Resistance, Processability
2060M					★★	★★	★								Heat Resistance
3045					★	★	★★				★★				Heat Resistance, Processability
3070				★★	★	★	★								Processability, Excellent Low Temperature Properties
3092M	★★			★★		★				★		★			High Hardness
3110M	★★			★		★									Good Balance of Strength and Low Temperature Properties
X-3042E								★★	★★				★★		High Molecular Weight, Highly Oil Extended
3062EM	★★		★	★★		★	★★					★			High Hardness
3072EM	★			★★		★			★★	★					High Molecular Weight
3090EM	★★			★★		★★	★								Excellent Low Temperature Properties
X-4010M			★★											★★	Low Viscosity
4021			★		★	★					★			★	Low Viscosity, Processability
4045					★	★	★★	★			★★				Heat Resistance, Processability
4045M			★	★★	★	★	★	★							Heat Resistance, Excellent Low Temperature Properties
4070				★★											Rapid Curing, Processability, High Cross-linking Density
8030M		★★				★	★				★★				Processability, High Cross-linking Density, Excellent Low Temperature Properties
9090M		★★			★					★	★				High Diene Content, Rapid Curing, High Cross-linking Density, Excellent Low Temperature Properties
8120E	★★	★★									★				High Molecular Weight, Excellent Low Temperature Properties

## ■ Mitsui EPT™ Pellet Grades

X-3012P										★		★★		★★	Low Viscosity, Pellet Grade
3092PM	★★									★★		★			High Hardness, Pellet Grade
3072EPM	★			★★					★★	★★					Oil Extended Pellet Grade

## ■ Ethylene 1-Butene Terpolymer (Pellet Grade)

K-9720							★			★★		★★			High Hardness, Pellet Grade
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## ■ Mitsui Eptalloy™

PX-049PEM	★★			★★											EPT / Polyethylene (PE) Blend
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★★ : excellent    ★ : good

# Contact Information



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Mitsui Chemicals Website  
<http://www.mitsuichem.com/>

#### **Disclaimer**

The information contained in this brochure is, to the best of our knowledge, accurate and reliable, but all suggestions are made without warranty, either expressed or implied. The values relevant to properties or the like of the product stated herein were obtained using laboratory test specimens prepared in Mitsui Chemicals laboratories and are not to be used as product specifications, nor assumed to be identical to values obtained on the finished product manufactured by our customers. Nothing herein shall be construed as permission or as recommendation for uses which infringe valid industrial properties or as extending a license under valid industrial properties. Because the conditions and methods of use on the part of our customers are beyond our control, Mitsui Chemicals, disclaims any liability incurred in connection with the use of our products.

#### **Warning**

For safety details, please refer to the Safety Data Sheet (SDS).

Mitsui EPT™ is designed for industrial applications only. Do not use Mitsui EPT™ for medical applications, anything that may be implanted, injected, come in direct contact with skin, or any products which come in direct contact with food and/or beverages. We do not guarantee the safety of Mitsui EPT™, expressed or implied, for medical, or food and beverage related applications.

Please consider and confirm the safety properties of the application based on the intended final product.

Please contact a sales representative if unsure of the safety of an application, before using this product.