

**SEKISUI**

**FOAM**  
INTERNATIONAL  
Global Foam Solutions

Physically Cross-linked Polyolefin Foam

**SOFTLON**



**PHYSICALLY**  
CROSSLINKED  
SEKISUI TECHNOLOGY





# How SOFTLON is made

SOFTLON was created using new cross-linking technology developed by Sekisui Chemical. The manufacturing technology was invented following decades of Sekisui Chemical's proprietary research. Polyolefin foam is commercialized as SOFTLON through the following processes.

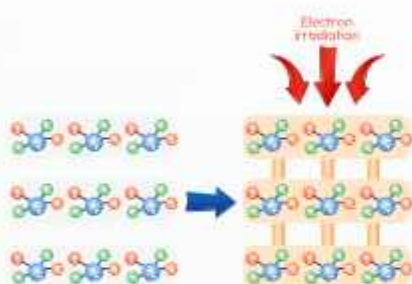


01

## Extrusion

### Extruding Polyolefin

Polyolefin resin is mixed with foaming agents and auxiliary materials, and formed through extrusion. Our high-precision extrusion technique is the basis for our products' fine thickness tolerance.

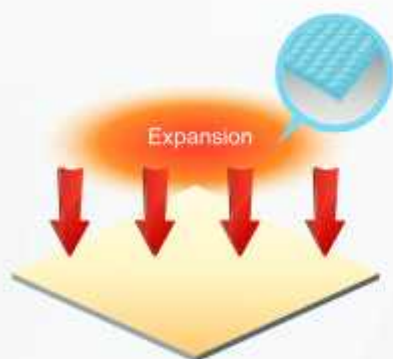


02

## Cross-linking

### Physically Cross-linking

Polyolefin is physically cross-linked with electron beams to cross-link the molecules. This electron irradiation technique is a unique technology in the field of applied industrial radiation, winning the Award of the Society of Polymer Science Japan.

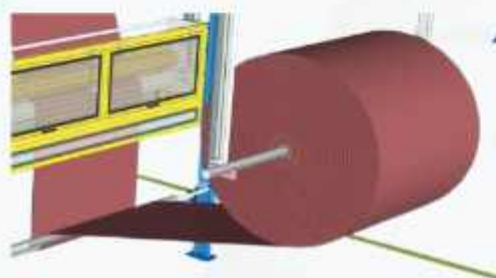


03

## Foaming

### Foaming

Foamed polyolefin expands from 5 to 40 times its original volume. The fine closed-cells are resistant to water and chemicals. This supports the stable, superior quality of SOFTLON.



04

## Winding

### Winding into sheets

SOFTLON is a soft and continuous sheet-type product. SOFTLON allows for flexible fabrication, such as lamination and moulding.



# Key Properties of SOFTLON



**SOFTLON**  
is made from  
polyolefin polymer



## ► Chemical resistance

Polyolefin polymers have good resistance to acids, alkalis and solvents.

## ► Thermoplastic

Polyolefin is thermoplastic. Thermoplastic softens with heat and can be thermoformed, making Softlon an ideal foam material for thermoforming applications.

## ► Ease of fabrication

A variety of methods can fabricate Softlon. Please see the 6th page.

## ► Water resistance

Polyolefin polymers do not corrode by water.

## ► Elasticity/cushioning

Polyolefin polymers provide good elasticity and cushioning performance.



**SOFTLON**  
is made by  
physically cross-linking  
polyolefin



## ► Thermal performance

Physically cross-linking produces fine and even cell structures. Fine and even foam cells contribute to lower thermal conductivity. Physically cross-linked polyolefin foam is ideal for energy saving and preventing condensation.

## ► Aesthetically better

Physically cross-linking produces smooth, aesthetically better, and intact skin on foam surface

## ► Physical property

Superior tensile strength, tear strength and other physical properties.



**SOFTLON**  
is with closed  
cell foam structure



## ► Thermal performance

Air trapped in closed-cell foam contributes to lower thermal conductivity and superior thermal insulation performance.

## ► Buoyancy

Closed cell foam does not absorb water and floats on water.

## ► Lightweight

Foamed materials are lightweight alternatives to solid (non-foamed) materials. Closed-cell and physically cross-linked polyolefin foam maintains good physical strength.

## ► Sealing performance

Closed-cell foam has a very low water absorption ratio and is airtight, making it a good sealing material.



# Applicaion of SOFTLON

## Consumer Appliances

## Consumer Appliances

The outstanding thermal performance of Softlon is ideal for thermal insulation and condensation pretension for consumer appliance applications. Flame retardant grades to meet UL94 HF-1 requirements are available. Softlon heat-resistant grades are the perfect material for insulation tubes. Softlon has lower acid contents because it is cross-linked by physical means, but not chemical means, which require strong acid. The risk of corrosion of copper and aluminium is lower with Softlon.



## Mobility

## Mobility

### Drive Innovation Forward with Softlon: The Lightweight Mobility Solution

In the dynamic world of automotive engineering, material innovation is crucial for enhancing performance, efficiency, and sustainability. Softlon presents a cutting-edge alternative to conventional solid plastic materials, offering lightweight, flexible, and high-performance solutions perfect for contemporary mobility applications.

#### Design Flexibility

With thermoformable grades, Softlon enables more innovative, ergonomic, and integrated component designs, giving automotive designers the freedom to create without compromise.

#### Sustainable Alternative

Move toward a more sustainable future. Softlon supports lightweighting strategies and can help reduce reliance on heavy, rigid plastics.

#### Applications in Mobility

- Interior components,
- HVAC systems,
- Battery insulation for EVs,
- Acoustic and thermal insulation,
- Lightweight structural panels





## Cap Seals

## Cap Seals

SOFTLON S Perfect leakage-preventing seals are particularly important for the storage of water dispensers and liquid containers in general. Used in food and cosmetics packaging, Softlon® by Thai Sekisui Foam ensures optimal sealing.

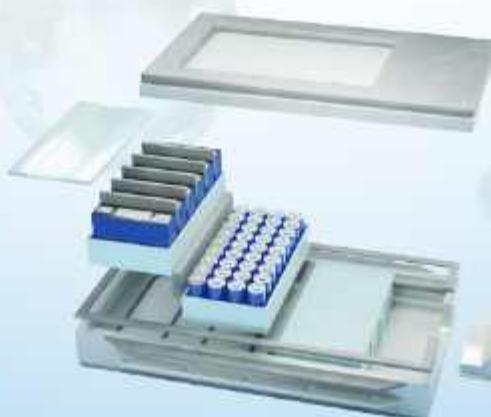


## Lithium - ion battery application

## Lithium - ion battery application

Softlon is used in various applications because of its well-balanced thermal insulation, flexibility, sealing, cushioning, resilience, durability, chemical resistance, and sound insulation performances.

Softlon offers cutting-edge solutions for thermal and acoustic management in lithium-ion battery applications.





## Packaging



### Why Choose Softlon for Packaging?

Softlon PE Foam is engineered to deliver superior protection and performance in all your packaging needs. With a smooth surface finish and custom vacuum formable grades, Softlon offers the perfect balance of cushioning, formability, and durability-ideal for protecting fragile and sensitive products.

The smooth surface of Softlon is ideal for packaging applications to protect fragile products. Softlon has excellent vacuum formability. Specially designed grades for the vacuum forming process are also available. An anti-static grade is also available to reduce the risk of static electricity building up on the foam surface and damaging electrical parts during transportation.

## Medical & Health Care

### Medical Pads

#### SOFTLON ES for Medical & Health Care Applications

Our SOFTLON ES lineup-made from high-quality polyethylene copolymer foam-delivers a unique combination of exceptional flexibility, durability, and safe and softness to skin that makes it an ideal solution for a wide range of medical applications.

#### Why SOFTLON ES?

**Superior Flexibility:**

Designed to contour seamlessly to the body, SOFTLON ES foam adapts effortlessly to uneven surfaces.

This makes it a perfect material for medical pads, cushions, and orthopedic supports, ensuring a snug and secure fit every time.

#### Comfort & Skin-Friendliness:

Softlon ES is gentle to the touch and non-irritating, making it ideal for direct skin contact. Whether used in wound care pads or patient positioning supports, it ensures comfort during prolonged use.

#### Lightweight & Resilient:

Even though it's lightweight, SOFTLON ES offers excellent dimensional stability and impact resistance-maintaining its form even under pressure or prolonged use.

#### Applications in Medical & Healthcare Fields:

- Patient cushioning and pressure-relief pads
- Orthopedic bracing and support components
- Medical device padding and seals
- Disposable and reusable wound care products
- Personal protective equipment (PPE) inserts





## Tape Base

Thinner Softlon grades are perfect for tape-base foam, which requires waterproofing and extra cushioning. Softlon grades with improved soft touch are suitable for medical pads applications. Ultra-thin Softlon XL-H is also available to meet thinner tape requirements.

Ideal for sealing, and soundproofing, Softlon greatly improves the durability and efficiency of tape applications.

Softlon PE foam tapes are versatile and can be utilized in numerous applications across various industries. Common applications include:

- Automotive Industry
- Construction
- Electronics
- Consumer Appliances
- Medical



## Thin Foam

### Xlim - Smart Phones & Displays

Sekisui Foam International's leading-edge foaming technology enables the manufacturing of industry-leading ultra-thin polyolefin foam that is as thin as 0.06 mm. Ultra-thin Xim has excellent flexibility, shock-absorbing, and water-sealing performance. Xlim is widely used for smartphone and display applications.

#### It has below characteristics

- High shock absorption
- High waterproofness
- High compression recovery speed
- Low contamination

#### Application of Thin Foam

- Smart Phone Camera Gasket
- Smart Watch - Water & Dust Proof Gaskets
- Fixing Tape for automotive and motorcycle displays





# List of SOFTLON Grade

## Softlon Grade Selection Table

Applications	Softlon S	Softlon FR-ND	Softlon IF	Softlon NF
Grade Description	Standard Grade	Flame Retardant	Heat Resistance	Vacuum Forming
Temperature Range	★ (Up to 80°C)	★ (Up to 80°C)	★★ (Up to 100°C)	★★★ (Up to 120°C)
Thermal insulation sheets	★★★	★★★	★	★★
Thermal Insulation tubes	★★★★	★★★★	★	★★★★
Thermal Forming	★★	★★	★★★★	★★★★
Tape Base	★★	★	★★	★
Automotive Interior	★★	★★★★	★★★★	★★★★
Lithium Ion Battery	-	★★★★	★★★★	★★★★
Cap Seal	★★★	-	-	★★
Cushioning	★★★	★★★★	★★★★	★★
Gaskets	★★★★	★★★★	★★	★★
Skin Contact	-	-	-	-
Acoustic Insulation	-	-	-	-

For other applications, please contact SFI sales engineers.



Softlon ES	Softlon XL-IF	Softlon OPC	Xlim	Softlon SP/Eplion QV
Improved softness	Tape base	Softness & acoustic	Ultra thin	Superior heat resistance
★ (Up to 80°C)	★ (Up to 80°C)	★ (Up to 80°C)	★ (Up to 80°C)	★★★★ (Up to 140°C)
★	-	★★	-	-
★	-	-	-	-
★	-	-	-	★★★★
★★★★	★★★★	-	★★★★	-
★★	★	★★★★	★	★★★★
-	-	★★	★	★★★★
-	-	-	-	-
★★	-	★★★★	-	★
★★	-	★★★★	★★★★	★
★★★★	★	-	-	-
-	-	★★★★	-	-

★★★★★ Best Suitable Products  
 ★★ Recommended  
 ★ Testing Recommended  
 - Not Recommended



## (Typical) Physical Properties of SOFTLON-S

High

Density

Low

PROPERTY	Unit	#0503	#1003	#1503	#2003	#3003	#4003
Cell structure		Closed	Closed	Closed	Closed	Closed	Closed
Average diameter of cell	mm	0.26	0.27	0.28	0.30	0.30	0.32
Apparent density	g/cm <sup>3</sup>	0.20	0.10	0.066	0.050	0.033	0.025
Thickness <small>(Note 1)</small>	mm	3	3	3	3	3	3
Tensile strength	kPa (Vertical)	2,570	1,290	950	560	420	310
	kPa (Horizontal)	1,790	1,000	510	400	290	220
Elongation	% (Vertical)	380	328	280	220	204	161
	% (Horizontal)	300	265	175	170	165	141
Tear strength	kPa (Vertical)	122.5	61.7	41.2	31.4	23.5	19.6
	kPa (Horizontal)	101.9	51.0	30.4	20.6	14.7	12.7
Compressive Hardness	kPa	15.7	8.3	5.6	5.0	3.1	2.6
	kPa(25%)	323	63	59	53	33	29
Compressive Strength	kPa(50%)	559	155	143	128	98	83
	kPa(75%)	1,735	502	441	343	320	246
Compression set	%	3.5	4.0	4.5	5.1	6.5	7.5
Repeat Compression set	%	3.0	3.4	4.0	4.5	5.3	5.9
Thermal Conductivity	W/mK	-	-	-	-	0.0345	0.0321
Dimensional change under heat (22 hours under 70 degrees C)	%(Vertical)	-0.54	-0.83	-1.03	-1.43	-1.45	-1.50
	%(Horizontal)	-0.10	-0.20	-0.30	-0.40	-0.75	-0.90
Water absorption	mg/cm <sup>3</sup>	0.02	0.03	0.04	0.05	0.07	0.09

(Measuring method : JIS K6767)

(Note1) Thickness : Foams are flexible in general. During measurement, as the sample foam changes its thickness depending on the compression, a dial gauge with 0.01 mm graduation was used with a sample area of 10 cm<sup>2</sup> and sample pressure 2g/cm<sup>2</sup>.

(Note2) Physical property values are representative values and cannot be used as standards.



# Fabrication of SOFTLON

Softlon can be fabricated by a varieties of methods at ease.

## Shaping



### Slitting

Softlon can be slit by a slitter and a band knife



### Routing

Softlon can be fabricated by a routering



### Die-cutting

Softlon can be cut by press die-cutting



### Thermoforming

Softlon can be vacuum formed and press moulded



### Tube forming

Softlon can be formed in tubular shape

## Surface Treatments



### Printing

Softlon can be printed

### Embossing

Softlon can be embossed with and without PE film



### Corona Treatment

Corona treatment of Softlon improve adhesion of adhesive



### Adhesive Coating

Adhesive tape can be laminated on Softlon Transfer adhesive can be coated on Softlon surface



### Lamination

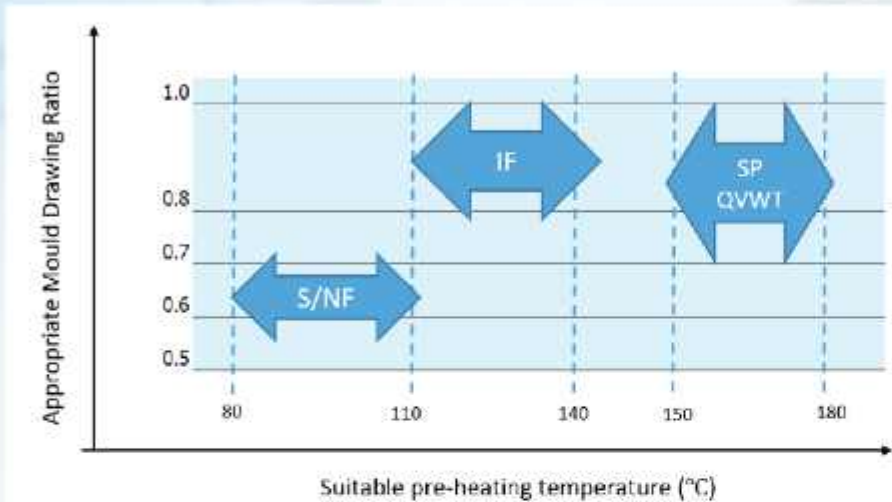
Softlon and other materials can be laminated by flame and wet glue. Extrusion lamination can be done on Softlon surface



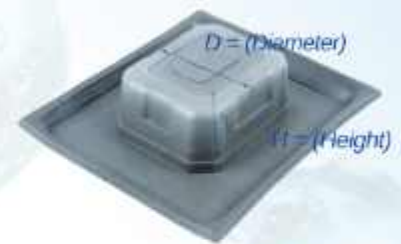
# Vacuum Forming

Softion is made from foamed thermoplastic. Thermoplastic can be softened by applying heat and hardened after cooling. Softion performs excellently in tensile strength, elongation, and tear strength since it is made from physically cross-linked polyolefin foam. Softion IF series and SP series are developed for thermoforming applications enhancing thermo-formability. These characteristics make Softion an ideal solution for thermoforming applications.

## Mould Drawing Ratio



Vacuum Forming Direction



$$\text{Mould Drawing Ratio} = \frac{H=(\text{Height})}{D=(\text{Diameter})}$$



## Commonly Used Softion Grades for Vaccum formed Trays.

Grades	Foam Types	Advantages
S Type	Standard	Reasonable pricing
IF type	High elongation	Easy thermo forming
NF-C Type	High stiffness & rigidity	Holding shapes



Physically Cross-linked Polyolefin Foam

# SOFTLON OPC

## NEW GENERATION OPENCELL FOAM

### Key Features of Softlon® OPC

#### Unique Technology.

Softlon® OPC is a partially open cell foam made from Sekisui's unique physically crosslinked foam technology. Unlike conventional open cell PE foams, Softlon® OPC is made without crushing the cell structure and skiving the surface. This allows Softlon® OPC to provide superior physical properties associated with a uniform cell structure whilst maintaining a smooth skin to enhance aesthetic value.



### Outstanding features

- Extremely soft and flexible
- Excellent sound absorption
- Available in continuous rolls for easy lamination & fabrication
- Easily compressible with excellent recovery
- Outstanding thermal conductivity
- Durable and chemically resistant
- Compresses to form an airtight seal
- Wide operating temperature range
- Fire resistant grade available
- Available in a range of thicknesses and densities

Softlon® OPC is a new generation partially open cell polyolefin foam manufactured in continuous rolls.

## Softlon OPC Availability

<b>Thickness</b>	3, 5, 7, 8, 10, 15 and 20mm
<b>Availability</b>	50 kg/m <sup>3</sup> , 33 kg/m <sup>3</sup> and 25 kg/m <sup>3</sup>
<b>Densities</b>	• S: Standard
<b>Grades</b>	• FR-ND: Flame Retardant
<b>Colours</b>	• S Type - White (80) and Black (99), FR-ND Type Gray (90)
<b>Surface</b>	• Skin coating for water sealing tightness.
<b>Adhesive Coating</b>	Available on request

\*Available in sheets and rolls

\*\*Other grades, colour and expansion can be available on request





# Application of **SOFTLON OPC**

Sortion OPC is a partially open cell foam made from Sekisui's unique physically crosslinked foam technology. Key features of Softlon OPC include sound absorption, thermal performance, superior flexibility, and lightweight design.



**Battery Application**



**Air Conditioning Application**



**Construction Application**



**Consumer Appliances**



**Undershield Automotive Application**



## TECHNICAL SPECIFICATIONS

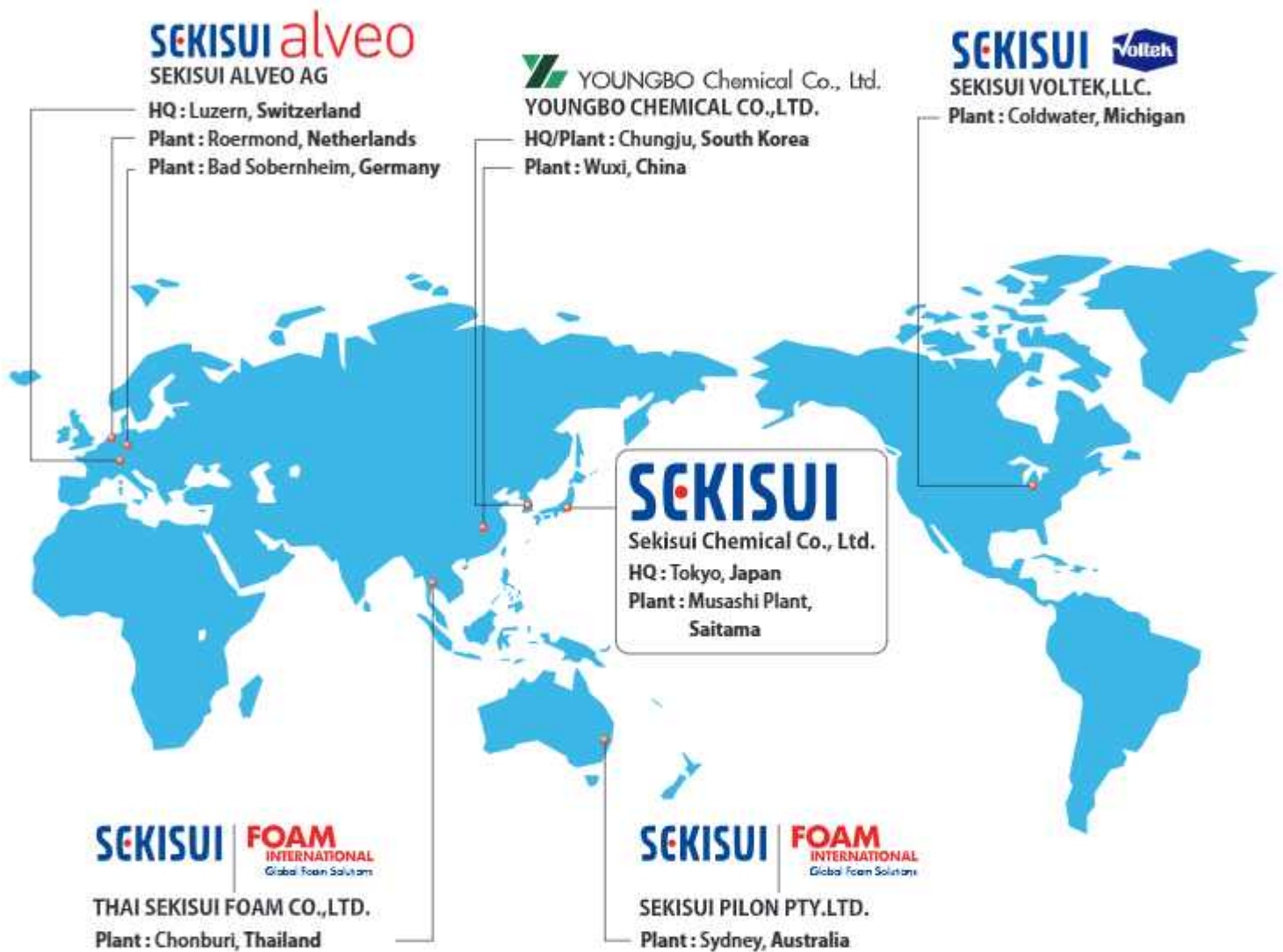
### Physical Properties

Property	Test Method	Units	2000 OPC	3000 OPC Typical Value	4000 OPC
Expansion	Internal	cc/gr	20 times	30 times	40 times
Density	Internal	kg/m <sup>3</sup>	50	33	25
<b>Tensile Strength</b>	JIS K6767				
Long tudinal		kg/cm <sup>2</sup>	6.5	3.8	3.3
Crosswise		kg/cm <sup>2</sup>	3.8	2.1	1.7
<b>Elongation</b>	JIS K6767				
Longitudinal		%	290	190	130
Crosswise		%	240	160	170
<b>Tear Strength</b>	JIS K6767				
Longitudinal		kg/cm	4.0	2.2	1.8
Crosswise		kg/cm	3.3	1.5	1.0
<b>Compression Strength</b>	Internal				
25% deflection		kg/cm <sup>2</sup>	0.26	0.07	0.01
50% deflection		kg/cm <sup>2</sup>	0.71	0.26	0.02
70% deflection		kg/cm <sup>2</sup>	0.26	0.92	0.05
<b>Compression Set</b>	JIS K6767				
25% deflection		% set	2.4	2.2	3.1
<b>Dimensional Change Heat</b>	70 °C, 22h				
Longitudinal		- %	0.57	0.75	0.68
Crosswise		- %	2.66	1.71	2.63
<b>Noise Reduction Coefficient (NRC)</b>	ISO 354				
		3000 OPC, 6mm	-	-	0.10
		4000 OPC, 6mm	-	-	0.15
		4000 OPC, 15mm	-	-	0.45
Working Temp Range	Internal	°C		-80/+100	
Water Absorption	JIS K6767	mg/cm <sup>2</sup>	0.14	0.31	2.07
Thermal Conductivity	ASTM C518	W/m. °K, 23°C	-	-	0.034



## Foam production bases

Sekisui Chemical is the world's largest & leading manufacturer of cross-linked polyolefin foam and operates 8 plants worldwide. All operating under ISO quality systems.



**SEKISUI**

**FOAM**  
INTERNATIONAL  
Global Foam Solutions

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