HRS Co., Ltd.
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SPECIALIST IN
SILICONE RUBBER TECHNOLOGY

Silicone Technology
HRS

Specialist in Silicone Rubber Technology

Thanks for your concern. We will make every effort to meet your service requirements by developing new technologies and products through continuous research and development.

We aim higher

Not being content with the present, we will always be committed to R&D to make better products.

High Quality...

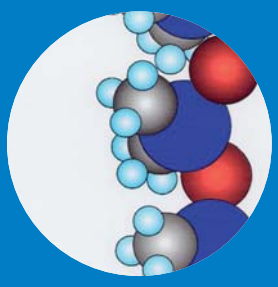
OVERVIEW OF THE **SILICONE RUBBER**

Overview the Silicone Rubber

Silicone rubbers' special features as organosiloxane polymer originate from where they carry both inorganic and organic properties in terms of molecular structure unlike ordinary organic rubbers. In other words, due to the inorganic properties pertaining to Si-O as the main chain in terms of the molecular structure, they are superior to ordinary organic rubbers in heat resistance, chemical stability, electrical insulating property, abrasion resistance, weatherability and ozone resistance among others.

As high polymer of long chains, polydimethylsiloxane which is the basic material of silicone rubbers having a spiral structure and less inter-molecular interactions, results in abundance of elasticity and superior compression set, and enhanced cold resistance. The side chain of organic methyl radical carries special organic properties such as superior reaction, solubility and processibility, along with surface character including waterproof and demoldibility.

Having armed with these properties, silicone has been widely used to replace petrochemical products in all industries including aerospace, munitions industry, automobile, fine chemicals, construction, electric and electronics, food processing, mechanical engineering, medical and pharmaceutical, cosmetics, home appliances, paper film, solar batteries, and semi conductor. Recently, the scope of silicone application has been expanding at a greater speed.



GENERAL PROPERTIES

GENERAL PROPERTIES

1. High bonding energy

Silicone rubber has siloxane bond (Si-O) of molecular structure as the main chains. While carbon bond, C-C, carries 84.9 Kcal/mol, siloxane bond carries 106.0 Kcal/mol in greater capacity and stability. As a result, silicone rubbers are superior in heat resistance, electric insulation, and chemical stability compared to ordinary organic rubbers. The reasons are that Si-o becomes the closest bond to. ionic one and very stable in terms of energetic structure due to the big difference of electric negativity between Si and O.

Classification	Bonding Energy Kcal/mol (KJ/mol)	
	C	SI
C	84.9 (349)	58-80 (240-340)
Si	58-80 (240-340)	45 (189)
H	98.8 (414)	72.6 (304)
O	83.2 (349)	106.0 (423)

2. Low intermolecular force with spiral structure

With its coil shaped spiral structure and low intermolecular force, silicone (dimethylpolysiloxane) is highly elastic and compressible. In addition, since methyl radical group located in the outside of the coil structure is free to rotate on its own, silicone rubber has outstanding water repellency and demoldibility.

We will make the reliable products
under any circumstances and conditions.
By developing qualified products,
we will develop into one of the most reliable companies.

Reliable Product...

R

Liquid Silicone Rubber Molding

The best performance with superior physical properties

LSR injection molding is to increase productivity while reducing labor and cost.

LSR, like HCR, is characterized by high temperature vulcanizing. In addition, its superior flowability derived from the low viscosity makes an automated manufacturing possible through injection molding. Furthermore, as it usually fits into complicated molds with ease, it can be an ideal option for complex design and in case a strict tolerance control is needed.

LSR does not lose its superior properties after molding, and the past-curing is rarely needed.

Currently, a variety of products - spark plug connectors, gaskets and buttons for automobiles as well as keyboards, anode caps, keypads, medical seals and baby nipples - are being manufactured using the LSR technology.

Additionally, thanks to its superior properties of leaving no by-products it is gaining popularity as a next-generation silicone rubber which is expected to replace HCR.

Applications of liquid silicone

LSR is a material suitable for numerous uses from automobiles, spaceships, high-voltage insulators to sculptures, baby products, etc.
Copying machine roller / High-voltage insulators / Keypads / Anode caps / Connector seals / Diaphram & valves / O-ring, Gaskets & Seal / Diving mask & snorkels / Baby nipple / Wire seal / Gromet

Supply capacity and container size

Both A and B are supplied. The inside diameter is as follows.
20KG : 282mm (Can) 200KG : 572mm (Drum)

What are manufactured for injection molders in general can be used.

Storage

LSR should be stored in a cool and dark place with good ventilation and no direct sunlight. Please do not forget to cover the lid after using it. With the lid covered and in the normal temperature range, it can be used with stability for 6 months (in case A and B are not mixed).
Be sure to lid it after use, and the drum is recommended to be used as soon as possible after opening.

Pot life

If the mixture is inside a cold mixer and injection molder at the mixture ratio of 1:1, it can be used for up to 3 days. A new one should be supplied from the 4th day.

- If liquid A and liquid B are mixed, it can be stored in a cool and dark place for up to 72 hours. However, it should be used as soon as possible.

- As the pot life is subject to change depending on storage conditions, a close attention should be paid.



Process

1. LSR, packaged in 20kg or 200kg, is supplied in types of A and B for easy use.
2. After the dispenser pumps liquid A and liquid B, they are transported to the static mixer.
3. While they are transported to the static mixer, additional components can be added.
4. Curing takes place within a few seconds between 170℃~230℃

※ Caution

1. In order for curing not to happen before LSR enter the mold, the temperature of the nozzle and cylinder should be lowered to about 20℃.
2. Demolding what is cured at an extremely high temperature (above 200℃) can produce volatile materials. It is recommended to use a system which will remove them.

Post cure

Most of silicone rubbers are to have the best properties after curing.
Compression set, however, can increase in case of post-curing at 200℃.
At this temperature, a fire can break out due to an emission of the volatile siloxane.
Thus, fresh air should be supplied into the post-curing oven for secondary hardening (100 liter of air per 1kg of silicone rubber)

Linear shrinkage

Linear shrinkage differs depending on the thickness. As the thickness decreases, linear shrinkage increases, and vice versa. It also differs depending on the curing temperature. At a higher temperature, linear shrinkage usually increases.
Linear shrinkage is a factor which must be considered in designing the mold.
Take LSI-200/50. At 171℃ and with the thickness of 2mm, its linear shrinkage is as following.

Non Post-cured 2.7% ±0.5%
Post-cured 3.5% ±0.5%

Compatibility with other substances

The LSR catalyst, which is cured by addition reaction, cannot be cured or can be incompletely cured due to many substances. The above phenomenon is possible to happen with such susstance which are the rubbers cured by sulfuric or organotin compounds, the substances cured by amin, amide, azide, and so on.

Economics of LSR

Properties of LSR

- Thermal resistance
- Ultraviolet resistance and Ozone resistance
- Weatherability
- Excellent dielectricity at high temperatures
- Bio-compatibility

After LSR molding

- No chemical by-products
- The only product itself
- No need to remove by-products

Short cycle time

- Additional curing reaction
- Rapid curing
- Short working time

Strengths of Liquid Silicone Rubber

- Production available with a low injection pressure
- Suitability for fine workings
- Little possible contamination as A and B are mixed inside the injector
- High quality and working efficiency

By concentrating on the field of silicone and securing specialty and expertise, we try to become a leading expert in silicone.

Superb Specialist...

Grade No.	Color	Application	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
			ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
LSI-200/30	TP	General Purpose, High Transparent, High Strength Grade	1.11	360/380	30	7.8	800	22	50	25
LSI-200/40	TP		1.12	350/350	40	9	700	38	60	25
LSI-200/50	TP		1.12	350/350	50	9	650	40	60	25
LSI-200/60	TP		1.13	400/400	60	10	620	42	62	25
LSI-200/70	TP		1.14	450/450	67	10	450	38	65	25
LSI-200/75	TP		1.14	580/550	72	10	350	28	45	25
LSI-200/80	TP		1.14	480/480	76	10.2	320	26	45	25
LSI-280/30	TP	Low viscosity Fabric Coating Grade	1.08	65/55	30	6.2	430	20	70	25
LSI-280/40	TP		1.08	80/80	40	6.8	420	22	65	25
LSI-280/50	TP		1.08	100/100	50	8.5	450	40	60	25
LSI-280/60	TP		1.11	110/110	60	9	320	35	60	25
LSI-280/70	TP		1.12	140/140	68	8.4	200	10	50	25
LSI-304/30	TL	Self- Lubricating Grade Oil Bleed	1.10	300/260	30	5.5	600	31	50	-
LSI-304/40	TL		1.11	300/300	40	5.5	500	35	50	-
LSI-304/50	TL		1.12	350/350	50	6.0	450	35	50	-
LSI-304/60	TL		1.13	400/400	60	7.0	400	35	55	-
LSI-304/70	TL		1.12	250/250	68	6.5	109	10	55	-




Grade No.	Color	Application	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
			ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
LSI-901/40	TP	Low Compression Set, High Rebound Grade	1.13	75/75	40	6.0	350	25	70	15
LSI-901/50	TP		1.12	45/50	50	4.5	180	20	75	15
LSI-901/60	TP		1.15	69/48	60	5.0	100	20	75	15
LSI-901/70	TP		1.18	233/156	70	8.0	100	15	70	15
LSI-902/70	TP		1.15	500	68	9.0	300	10	65	25
HRTV-30	Pink	HRTV, Room Temperature Vulcanization, Mold Cast	1.13	65/55	34	3.2	360	0.5	1	48
HRTV-2035	TP		1.12	30/30	34	7.1	450	0.5	1.5	48
HRTV-1600	Blue		1.37	170/170	54	8.1	290	0.5	1.5	48
HRTV-200/40	TP		1.08	45/45	35	7.3	300	0.5	1.5	48
LSI-500/55 W	White	Flame Retardant Grade	1.33	260/300	56	6	340	16	64	V-0
LSI-500/55 G	Gray		1.34	400/350	54	5.4	350	17	65	V-0
LSI-500/60 BK	Black		1.28	270/220	62	7.2	350	20	60	V-0

General Purpose, **High Transparent, High Strength Grade**

LSI-200/XX Liquid silicone rubbers and their properties

Grade. No	Color	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
		ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
LSI-200/30	TP	1.11	360/380	30	7.8	800	22	50	25
LSI-200/40	TP	1.12	350/350	40	9	700	38	60	25
LSI-200/50	TP	1.12	350/350	50	9	650	40	60	25
LSI-200/60	TP	1.13	400/400	60	10	620	42	62	25
LSI-200/70	TP	1.14	450/450	67	10	450	38	65	25
LSI-200/75	TP	1.14	580/550	72	10	350	28	45	25
LSI-200/80	TP	1.14	480/480	76	10.2	320	26	45	25

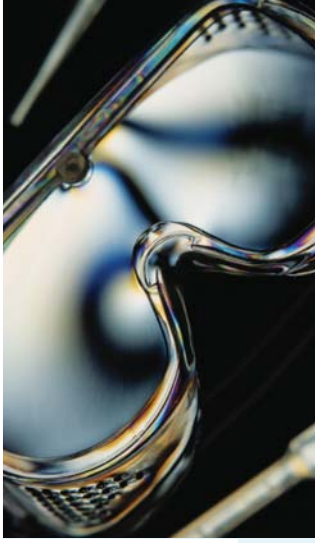
Features

- Higher transparency compared with that of milliable silicone
- Satisfying the condition of FDA21CFR 177.2600
- Fast cure time
- Higher tear strength and mechanical strength

Applications

- Molding in general
- Food packaging
- Diving snorkels and Mask
- Electrical/Electronic boots
- Nipple
- Medical Rubber Articles
- Food Contacted Articles
- Sheet, Gasket, Packing
- Automotive Part

Low viscosity
Fabric Coating Grade



LSI-280/XX Liquid silicone rubbers and their properties

Grade. No	Color	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
		ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
LSI-280/30	TP	1.08	65/55	30	6.2	430	20	70	25
LSI-280/40	TP	1.08	80/80	40	6.8	420	22	65	25
LSI-280/50	TP	1.08	100/100	50	8.5	450	40	60	25
LSI-280/60	TP	1.11	110/110	60	9	320	35	60	25
LSI-280/70	TP	1.12	140/140	68	8.4	200	10	50	25

Features

- Low viscosity and high resilience
- Good Flowability
- Electrically insulating
- Satisfying the condition of FDA21CFR 177.2600

Applications

- Coating agents and water repellents
- Food containers
- Auto Parts
- Hoses
- Seals

Self- Lubricating Grade
Oil Bleed

LSI-304/XX Liquid silicone rubbers and their properties

Grade. No	Color	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
		ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
LSI-304/30	TL	1.10	300/260	30	5.5	600	31	50	-
LSI-304/40	TL	1.11	300/300	40	5.5	500	35	50	-
LSI-304/50	TL	1.12	350/350	50	6.0	450	35	50	-
LSI-304/60	TL	1.13	400/400	60	7.0	400	35	55	-
LSI-304/70	TL	1.12	250/250	68	6.5	109	10	55	-

Features

- Self-lubrication for a long period
- Low compression set

Applications

- Electric connectors
- Electric connectors for automobiles
- Wire seal
- Gromet

Low Compression Set, **High Rebound Grade**

LSI-901/XX, 902/XX Liquid silicone rubbers and their properties

Grade. No	Color	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
		ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
LSI-901/40	TP	1.13	75/75	40	6.0	350	25	70	15
LSI-901/50	TP	1.12	45/50	50	4.5	180	20	75	15
LSI-901/60	TP	1.15	69/48	60	5.0	100	20	75	15
LSI-901/70	TP	1.18	233/156	70	8.0	100	15	70	15
LSI-902/70	TP	1.15	500	68	9.0	300	10	65	25

Features

- Highly economical
- Low compression set after curing
- Low viscosity

Applications

- Molding in general
- Keypad and O/A Rolls
- Packing and Gasket
- Electrical/Electronic boots

HRTV, Room Temperature Vulcanization, Mold Cast

HRTV (Room Temperature Vulcanization) and their Properties

Grade. No	Color	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
		ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
HRTV-30	Pink	1.13	65/55	34	3.2	360	0.5	1	48
HRTV-2035	TP	1.12	30/30	34	7.1	450	0.5	1.5	48
HRTV-1600	Blue	1.37	170/170	54	8.1	290	0.5	1.5	48
HRTV-200/40	TP	1.08	45/45	35	7.3	300	0.5	1.5	48

Features

- High releasability
- Low linear shrinkage
- High flowability
- No need for heat

Applications

- Accessory molding
- Toy molding
- Copy of plaster figures

Flame Retardant Grade

LSI-500/XX Liquid silicone rubbers and their properties

Grade. No	Color	Specific gravity	Viscosity (A/B)	Hardness	Tensile strength	Expansion	Tear strength	Rebound resilience	Compression set
		ASTM D 792	Share Rate $10s^{-1}$ [Pa·s]	ASTM D 2240 Shore A, [HS]	ASTM D 412 [N/mm^2]	ASTM D 412 [%]	ASTM D 624(B) [N/mm]	JIS K 6255 [%]	ASTM D 365 [%]
LSI-500/55 W	White	1.33	260/300	56	6	340	16	64	V-0
LSI-500/55 G	Gray	1.34	400/350	54	5.4	350	17	65	V-0
LSI-500/60 BK	Black	1.28	270/220	62	7.2	350	20	60	V-0

Features

- Excellent flame-retardancy
- High releasability
- Stability at temperature change
- Thermal Shork Stability

Applications

- Lamp holder for TFT, LCD Display
- Home appliance parts
- Office equipment parts
- Other flame-retardance products

CERTIFICATES

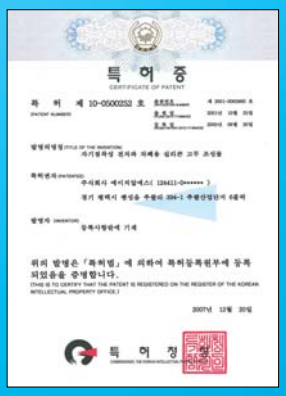
Lampshade with light diffusion silicone Layer

Silicone Lampshade

Silicone Embo Type Sheet

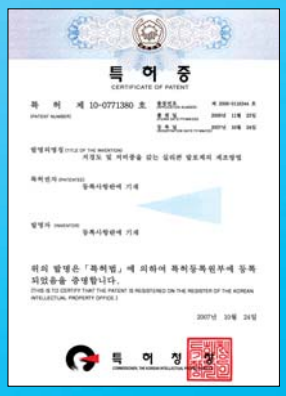
Self-stickiness Thermal Sink-pad

Self-stickiness EMI



Low Specific Gravity Silicone

Low Hardness and Low Specific Gravity Silicone Foam



Buffer sheet for the compression of an AOF

Silicon polymer composition for backlight unit buffer spacer material of LCD

FILK

ISO 9001(DM)

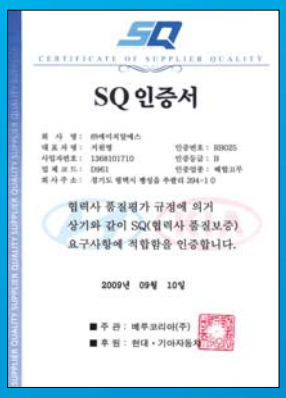
ISO 9001

ISO 14001

ISO 13485

KGMP

SQ



Exports U.S. $10 millions

Inno-Biz

KOTRA GLOBAL BRAND

SAMSUNG/Eco-Partner

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Users are solely responsible for making preliminary tests to determine the suitability of products for their intended use. Statements concerning possible or suggested uses made herein may not be relied upon, or be construed, as a guaranty of no patent infringement.

Pyongtaek Plant

Block 6, Choopal Industrial Complex,
394-1 Choopal-ri, Paengseong-eup,
Pyongtaek-city, Gyeonggi Province,
KOREA 451-805
TEL: 82-31-655-8822
FAX: 82-31-691-5901

Asan Plant

511-13, Shinbong-ri, Yeongin-Myeon,
Asan-City, Chungcheongnam-do,
KOREA 336-822
TEL: 82-41-543-4003
FAX: 82-41-543-4006

Seoul Office

#1605, Miwon B/D, 43 Yoido-dong,
Youngdeungpo-ku, Seoul,
KOREA 150-733
TEL: 82-2-780-6156~8
FAX: 82-2-785-7643

China Plant

Plant 1, Science & Technology Park No.777
Kangyuan Road, Suzhou Xiangcheng Economic
Development Zone.
TEL: 0512-6939-0288
FAX: 0512-6618-9388

www.hrssilicone.cn
www.hrssilicone.com

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