Textile Treatments

Shin-Etsu Silicone

Water repellency

Transparency

Bringing you higher grade, higher performance textile products.

Weatherability

Stretch back

Softness

Bringing you higher grade, higher performance textile products.

Silicone textile treatments exhibit many excellent properties. They are characterized by very low surface tension, high water repellency, easy release and good lubricity, and they are chemically inactive.

Silicone textile treatments can be used to treat natural fibers, synthetic fibers and recycled fibers to impart water repellency, waterproofness and softness, while also improving the fiber's wrinkle resistance, rebound resilience and other tactile qualities. Silicone textile treatments can also improve the fabric's sewability and soil-release (SR) properties. Thus, silicone textile treatments are used extensively by manufacturers looking to create higher grade, higher performance textile products and to achieve differentiation. Silicone textile treatments contribute to better fabrics for daily living and more sophisticated fashions.

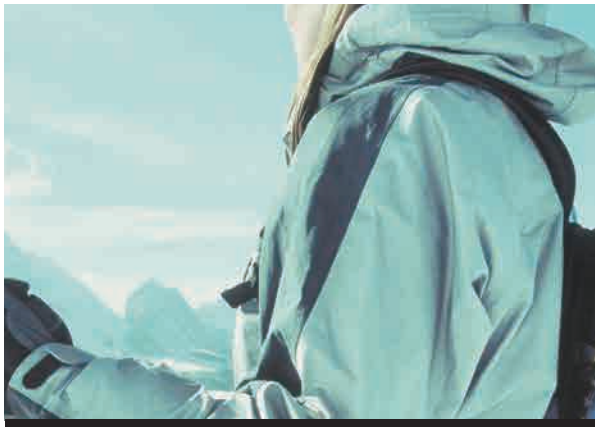
With our diverse product line, Shin-Etsu Silicone serves the wide-ranging needs of the textile industry.

Contents

In general, silicone textile treatments offer the following features.

Water repellency

The silicone forms a film on fibers (as an oil film or hard coating), which provides outstanding water repellency while still retaining a soft hand.



Silicones are highly water repellent.

Softness

Silicones greatly reduce the friction coefficient between fibers to achieve a distinctive softness.

Durability

Silicones form a flexible Coating on fiber surfaces, thereby improving the fabric's durability against washing and dry cleaning.

Silicones offer unique softness.

Rebound resilience (stretch back properties)

Silicones form a flexible coating on fiber surfaces, thereby improving the fabric's stretch back properties and softness.

Transparency

Silicones form a transparent coating on fiber surfaces, for enhanced deep coloring and fastness※.

※Fastness: the durability of a dye or dyed item under various conditions, or its resistance to various chemicals.

Weather and heat resistance

Silicones are based on a chemically bonded backbone of siloxane bonds (Si-O-Si). Silicones have a higher intermolecular binding energy compared to typical organic resins, which are composed of C-C-C bonds, which gives silicones their excellent weather and heat resistance.

Silicones have exellent rebound resilience

※Before using these products, be sure to conduct your own tests to determine whether a particular product is suitable for the intended application.

Purposes and applications

Product name	Purpose
Texture improving agents	Texture improving agents are oil-in-water (O/W※) emulsions consisting of dimethyl silicone or modified silicone emulsified with various emulsifiers. Texture improving agents can be used to treat natural fibers, synthetic fibers and recycled fibers to make fabrics softer and improve their tactile qualities, cutting properties and sewability. Texture improving agents are thus useful for creating textile products with a high-grade feel or improved working properties. ※O/W emulsion: an emulsion prepared by dispersing an oil in water.
Water repellents	Silicone water repellents can be used to treat cotton, polyester, acetate and other fibers, yielding a fabric that is soft and water repellent. Treated, water-repellent fabrics are used to manufacture clothing, raincoats, ski wear and umbrellas.
Textile treatment agents	Textile treatment agents can be used to treat woven and non-woven fabric made from natural or synthetic fibers to improve the fabric's lubricity as well as its cutting properties and sewability. These agents can also be used to treat yarn and sewing thread to help prevent thread breakage.
Soil-release agents, Water-absorbency improving agents	Both types of agents are used to enhance the soil-release properties and water absorbency of synthetic fibers, or of natural fibers that have become Extra hydrophilic as a result of a softening treatment or resin treatment. These agents also improve softness and smoothness.
Special processing agents	Silicone textile treatments include special products used for anti-slip treatment, anti-tack treatment and antimicrobial treatment. These special products are useful for creating textiles with enhanced functionality.

	Properties	Type, Application
	Emulsion	Amino-modified
		Epoxy-modified
		Dimethyl
		Reactive
	Emulsion	For inorganic fibers
	Solvent based	Room temperature type
		Coating agent
	Emulsion	Dimethyl
	Emulsion	Extra hydrophilic
	Oil	Polyether-modified
	Emulsion	Anti-slip agent
	Solvent based	Anti-tack agent
		Antimicrobial agent

Texture improving agents

Amino-modified silicone softening agents

These are emulsions made using amino-modified silicone Fluid.
They yield textiles that have a soft and viscous texture.

POLON-MF-14 Improves softness and sewability.

POLON-MF-14EC Gives the silky wet texture and improves softness. POLON-MF-14EC is a microemulsion, which means it has excellent stability and better compatible with other chemicals.

KM-9771 Gives a full hand and improves smoothness and softness. Suitable for deep color processing.

POLON-MF-63 Gives a resilient, soft hand. POLON-MF-52 is an emulsion polymer, and thus offers excellent emulsion stability.

■General properties

Grade \ Parameter	Appearance	Nonvolatile content (%) (105℃×3h)	pH	Ionic	Base oil	
					Viscosity (mm^2/s)	FGEW (g/mol)※
POLON-MF-14	Creamy white liquid	15	7.0	Nonionic	300	7,500
POLON-MF-14EC	Bluish white Translucent liquid	34	7.0	Nonionic	650	1,900
KM-9771	Creamy white liquid	33	5.0	Nonionic	30,000	20,000
POLON-MF-63	Creamy white liquid	32	6.0	Cationic	Over 100,000	10,000

※Functional group equivalent weight

(Not specified values)

Epoxy-modified silicone softening agents

These are emulsions made using epoxy-modified silicone. Treated fabrics are soft and smooth with a dry hand. In addition, these agents do not cause yellowing of fabrics.

POLON-MF-18T High epoxy-modification rate. Improves smoothness and softness.

X-51-1264 Non-yellowing formula. Contains no nonylphenol, and yields textiles that are smooth with a soft hand. X-51-1264 is an emulsion polymer, and thus offers excellent emulsion stability.

■General properties

Grade \ Parameter	Appearance	Nonvolatile content (%) (105℃×3h)	pH	Ionic	Base oil	
					Viscosity (mm^2/s)	FGEW (g/mol)
POLON-MF-18T	Creamy white liquid	37	7.5	Nonionic	15,000	3,500
X-51-1264	Creamy white liquid	32	6.7	Anionic	Over 100,000	10,000

Functional group equivalent weight

(Not specified values)

Dimethyl silicone softening agents

These are emulsions made using dimethyl silicone. They improve softness, cutting properties and sewability.

POLON-MF-33 High-viscosity reactive silicone emulsion. Superb emulsion stability and yields textiles with a full hand.

■General properties

Grade \ Parameter	Appearance	Nonvolatile content (%) (105℃×3h)	pH	Ionic
POLON-MF-33	Creamy white liquid	30	7.0	Anionic

(Not specified values)

Reactive softening agents

Reactive softeners cure via a crosslinking reaction to form a silicone film. The film has good rebound resilience and stretch back properties. These softeners can be used to treat knit garments to yield a more snug fit, and impart a stiff hand to fabrics.

KM-2002-T

A high viscosity (around 5,000 mPa·s) version of KM-2002-L-1. Can be applied as a coating, and can be used for anti-melt processing※ of synthetic fibers.
KM-2002-T is an emulsion polymer, and thus offers excellent emulsion stability.

※Anti-melt treatment: a treatment applied to fabrics to prevent formation of holes due to friction, cigarette burns, etc.

※Containing tin catalyst

KM-2002-L-1

One-component, highly reactive softener. Yields textiles with a full hand. KM-2002-L-1 is an emulsion polymer, and thus offers excellent emulsion stability.

※Containing tin catalyst

POLON-MF-56

High strength version of KM-2002-L-1.
Yields fabrics that resist shrinkage and have excellent rebound resilience.

※Containing tin catalyst

KM-9772

This silicone emulsion forms a silicone rubber film, and contains no tin catalysts or other organometallic compounds.

■General properties

Parameter / Grade	Appearance	Nonvolatile content (%) (105℃×3h)	pH	Ionic	Catalysts with which softener are typically used
KM-2002-T	Creamy white liquid	40	6.0	Anionic	Self crosslinking
KM-2002-L-1	Creamy white liquid	44	6.0	Anionic	Self crosslinking
POLON-MF-56	Creamy white liquid	40	5.0	Anionic	Self crosslinking
KM-9772	Creamy white liquid	40	5.0	Anionic	Self crosslinking

(Not specified values)

Water repellents

Solvent based water repellents

Solvent based water repellents contain reactive silicones diluted with an organic solvents. Unlike emulsion type water repellents, solvent based water repellents exhibit none of the negative effects associated with emulsifiers, and because organic solvents permeate easily into the fibers, the water repellency treatment is highly effective.

KS-7002

One-component, room-temperature water repellent. Treated fabric will be water repellent with a soft and silky wet texture. Can be used on leathers.

POLONCOAT-E

Provides highly durable waterproofing. Poloncoat E can be used for anti-melt treatment of synthetic fibers, and for treating fabrics to enhance rebound resilience.

■General properties

Parameter / Grade	Appearance	Viscosity mPa·s	Nonvolatile content (%) (105℃×3h)	Specific gravity 25℃	solvent	Catalysts with which softener are typically used
KS-7002	Colorless transparent liquid	20	54	0.95	Isopropyl alcohol	Self crosslinking
POLONCOAT-E	Colorless to pale yellow transparent liquid	15,000	27	0.9	Toluene	CAT-PG, CAT-PD

(Not specified values)

Water repellents for inorganic fibers

Glass fiber, rock wool and other inorganic fibers treated with these products will be water repellent and have excellent weatherability and durability, in addition to having a soft hand. The treated inorganic fibers are used to manufacture soundproofing materials for use along highways and to make thermal insulation mats for home use.

POLON-MF-33A

Made using a base of high viscosity silicone. Improves weatherability, durability and softness. POLON-MF-33A has good compatibility with phenolic resins with good results. POLON-MF-33A is an emulsion polymer, and thus offers excellent emulsion stability.

■General properties

Parameter / Grade	Appearance	Nonvolatile content (%) (105℃×3h)	pH	Ionic	solvent	Catalyst with which softener is typically used
POLON-MF-33A	Creamy white liquid	30	6.0	Anionic	Solvent free	Self crosslinking

(Not specified values)

Textile treatment agents

POLON-MN-ST

POLON-MN-ST has excellent emulsion stability and causes little decrease in fastness. Suitable for use as a smoothness improving agent for non-woven clothes.

■General properties

Parameter / Grade	Appearance	Nonvolatile content (%) (105℃×3h)	pH	Ionic
POLON-MN-ST	Creamy white liquid	31	6.5	Anionic

(Not specified values)

Soil-release agents & Water-absorbency improving agents

POLON-SR-CONC

Hydrophilic polyether-modified silicone. Improves softness and can be used to improve soil-release properties, antistatic properties and water-absorbency.

■General properties

Parameter / Grade	Appearance	Active ingredient (%)	pH	Ionic
POLON-SR-CONC	Pale yellow translucent liquid	100	—	—

*Grease-like consistency at low temperatures.

(Not specified values)

Special processing agents

POLON-MF-28T
Anti-slip agents

A dispersion of organic, colloidal silica in liquid.
POLON-MF-28T gives a soft hand and does not hinder water repellency. POLON-MF-28T also has good compatibility with other chemicals.

KS-731
Anti-tack agents

KS-731 can be added to acrylic resin coating agents to provide an anti-tack effect.

POLON-MF-50
Antimicrobial agents

POLON-MF-50 is an antimicrobial agent based on a silane compound functionalized with quaternary ammonium groups. It provides a long-lasting antimicrobial effect.
*Please contact a Shin-Etsu sales representative for details.

■General properties

Parameter / Grade	Appearance	Nonvolatile content (%) (105℃×3h)	pH	Ionic	solvent
POLON-MF-28T	Translucent liquid	17	5.0	Slightly Cationic	Contains methanol
KS-731	Colorless transparent liquid	20	—	—	Toluene
POLON-MF-50	Pale yellow translucent liquid	40	7.0	Cationic	methanol

(Not specified values)

1 Emulsion type textile treatments

Emulsion type textile treatments can be used in combination with various resin-based textile treatments, thereby greatly enhancing the effects of such resin-based agents. Before using these emulsion type textile treatments, be sure to do a beaker test to determine their stability and compatibility with other agents.

Precautions

1. Cationic catalysts (CAT-FZ) should not be used in combination with anionic substances as this may result in gelation or separation. In general, resins which may be used in combination with cationic catalysts include methylol melamine, methylol urea and glyoxal-based resins. (Certain products may cause separation of the emulsion or reduced pot life, so be sure to do a preliminary test prior to use.)

2. When strong water repellency is required, use an organic amine salt- or zinc-nitrate-based agent as the resin catalyst. Note that adequate water repellency cannot be achieved if magnesium chloride- or a composite salt-based agent is used as the resin catalyst without first preparing the textile by washing in warm water or by soaping.

3. POLON-MF-33 anionic product should not be used in combination with cationic substances as there may be problems of poor miscibility.

4. POLON-MF-33 features a base of highly polymerized silicone. If textiles are processed using high speed wringers, this characteristic of POLON-MF-33 may cause equipment to gum up. If this occurs, the stability of POLON-MF-33 can be improved by adding an emulsion stabilizer or a penetrating agent.

2 Solution type textile treatments

POLONCOAT-E can be used in combination with acrylate ester coating agents. However, when using POLONCOAT-E in combination with products containing reactive acrylate ester or isocyanates, CAT-PD should not be used as it is not compatible with these compounds.

Removal of silicones

No method has been established for removal of silicone textile treatment films that have cured on the textiles. But silicones can be removed to some degree using the following methods.

Using alkali

Immerse the silicone treated fabric in a bath containing a mixture of synthetic detergent (5–10 g/L) and sodium carbonate (50–100 g/L). Heat the liquid to 50–60 °C, then wash the cloth. Next, wash in plain warm water and rinse.

Using acid

Wash the fabric in a bath containing a mixture of synthetic detergent (5–10 g/L) and oxalic acid (10–50 g/L). Next, wash in plain warm water and rinse.

Using organic solvent

Immerse the fabric in an organic solvent such as toluene or industrial gasoline*, then wash.

*Industrial gasoline is described in JIS K 2201. It is generally used as a solvent or cleaning agent, and differs from gasoline used as fuel.

Precautions

When working with these products it is important to take proper precautions. This means checking to determine whether the treatment fluid or other chemicals will have undesirable effects on the fabric, and also includes safety and hygiene issues regarding contact with the skin and eyes, inhalation of solvent vapors, and risk of fire. For more information, see the section on “Storage and handling”.

Catalysts and treatment methods

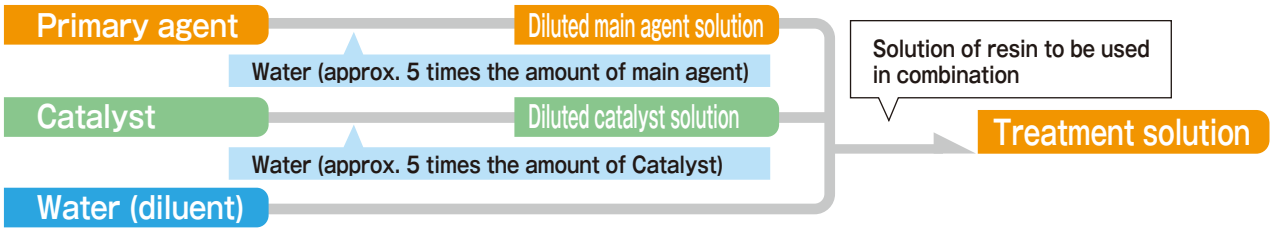
Silicone textile treatments can be more effective when used in combination with a catalyst. Different catalysts will produce different results, so be sure to choose a catalyst suitable for the application.

Catalysts for emulsion type silicone textile treatments

Parameter / Grade	Features	Appearance	Non-volatile matter content (%) (105℃×3h)	pH	Ionic	Standard blend ratios* (%)	Applicable textile treatments:
CAT-PM-4PS-2T	Strongest catalytic action. Cures at 100–120 °C. Cures at low temperatures. ※containing tin catalyst	Creamy white liquid	39	5.0	Nonionic	5–20	POLON-MF-33 Others

*Standard blend ratios are indicated as X parts by weight to 100 parts of the main agent. (Not specified values)

Treatment methods



Treatment procedures

1 Scouring of the raw fabric

If the fabric is to be treated for water repellency, be sure to scour the raw fabric. Hydrophilic sizing agents, surfactants, oil solutions and other substances are present on most textiles. If these substances remain when the textile is treated with silicone, it will be difficult to achieve good water repellency and the treatment will be less durable against repeated washes.

2 Preparing the treatment solution

In general, the user may experience problems with silicone textile treatments if the main agent and catalyst are mixed together directly. With emulsion products, this can mean gelation or separation; with solution type products, it can lead to thickening or reduced stability of the treatment bath. It is thus critical to dilute the components before mixing. Note that the method of preparing the treatment solution differs from product to product, so be sure to use a method that works for the particular product.

3 Application

Whether applying by dipping, coating, or spraying, be sure to clean the tub thoroughly prior to application. Tubs made of stainless steel are ideal. Moreover, the bath temperature should be kept below 30 °C to prevent degradation of the treatment solution.

4 Heat treatment

In general fabrics should first be dried to remove moisture or solvent in preparation for heat treatment. The treatment conditions will vary depending on various factors including the type of fiber, cloth thickness, the resin used in combination, and the dryer used. But as a general rule, baking equipment or heat setting equipment capable of heating to 140–180 °C should be used.

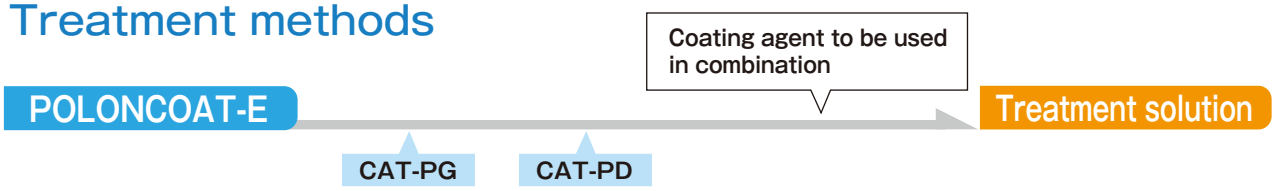
Catalysts for use with solution type silicone textile treatments

Parameter / Grade	Features	Appearance	Non-volatile matter content (%) (105℃×3h)	Standard blend ratios* (%)	Applicable textile treatments:
CAT- PG	Catalyst for waterproof coating agents Toluene solution. High activity. ※containing tin catalyst	Colorless to pale yellow transparent liquid	43	2–5	POLONCOAT-E
CAT- PD	Adhesion assistant. Reaction promoter. Ethanol solution.	Colorless to pale yellow transparent liquid	10※2	2–5	

*1: Standard blend ratios are indicated as X parts by weight to 100 parts of the main agent.
*2: Amount of active ingredient (due to low boiling point of main ingredients)

(Not specified values)

Treatment methods



5 Aftertreatment

If the textile is treated with silicone alone, there is generally no need for soaping or a warm water wash afterward. However, when emulsion type silicone textile treatments are used in combination with resin treatment agents, the fabric should be soaped or washed in warm water to remove unreacted resins, surfactants and other unwanted substances to boost the water repellency effect and to remove odors.

Preparatory drying and heat treatment temperatures

Textile treatment agent	Preparatory drying temp. (°C)	Heat treatment temp. (°C)
POLONCOAT-E	50-80	120-180

●Times required for preparatory drying and heat treatment will vary depending on the condition of the textile being processed, but in most cases the following will serve as general guidelines.
Preparatory drying: 80–100 °C/2–5 min.
Heat treatment: 120–180 °C/1–5 min.

Application examples

1 Texture improving agents

Softening of various textile products

POLON-MF-14EC	1.0 parts
Water	99.0

Improving smoothness & softness of various textile products

POLON-MF-18T	1.0 parts
Water	99.0

Improving resilience & softness of various textile products

POLON-MF-63	1.0 parts
Water	99.0

2 Water repellents

Waterproof coating of nylon & polyester taffeta (can be used for anti-melt treatment)

POLONCOAT-E	100.0 parts
CAT-PG	2.0
CAT-PD	2.0

*Knife coating method

Improving water repellency of acrylic coating agents

Acrylic coating agent	80.0 parts
POLONCOAT-E	20.0
CAT-PG	0.4
CAT-PD	0.4

*Knife coating method

3 Special processing

Soil-release and water absorbency treatments of polyester & E/C

POLON-SR-CONC	1.0 parts
Sumitex Resin NS-19※1	8.0
Accelerator X-80※2	2.5
Water	88.5

*1: Sumitex Resin NS-19 (made by Sumitomo Chemical)
*2: Accelerator X-80 (made by Sumitomo Chemical)
E/C fabrics are a blend of polyester and cotton fiber.

Improving texture of polyester fill

POLON-MF-33	5.0 parts
KBM-602※	0.5
CAT-PM-4PS-2T	0.3
Water	94.2

*Contact Shin-Etsu for more information on KBM-602.

For air-permeable water repellency treatment and waterproofing

POLONCOAT-E	10.0 parts
CAT-PG	0.2
CAT-PD	0.2
Industrial gasoline	89.6

*Applied via a padding process using a solution treatment bath.

4 Other types of processing

Improving cutting properties and sewability of E/C fabric

POLON-MF-33	0.5 parts
Water	99.5

E/C fabrics are a blend of polyester and cotton fiber.

Water repellency treatment of glass fiber and inorganic fiber (1)

(Softness, weatherability, and water repellency treatments)

Phenolic resin (product with 50% solid content)	10.0 parts
POLON-MF-33A	2.0
Water	88.0

*Applied via a padding process or spray process. Requires curing temperature of 250 °C.

Water repellency treatment of glass fiber and inorganic fiber (2)

(Softness, weatherability, and water repellency treatments)

Phenolic resin (product with 50% solid content)	20.0 parts
POLON-MF-33A	3.0
Inorganic salt	5.0
Ammonia water (23%)	13.0
KBE-903※	0.3
Water	58.7

*Contact Shin-Etsu for more information on KBE-903.

Packaging

Product name	Packaging	※1L plastic bottles	※1L cans	18L cans				
	Contents	1Kg	1Kg	12Kg	15Kg	16Kg	17Kg	18Kg
POLON-MF-14		●				●		
POLON-MF-14EC		●				●		
KM-9771		●				●		
POLON-MF-63		●				●		
POLON-MF-18T		●				●		
X-51-1264		●				●		
POLON-MF-33		●				●		
KM-2002-T		●					●	
KM-2002-L-1		●					●	
POLON-MF-56		●				●		
KM-9772		●				●		
KS-7002			●			●		
POLONCOAT-E			●		●			
POLON-MF-33A		●				●		
POLON-MN-ST		●			●			
POLON-SR-CONC			●					●
POLON-MF-28T		●				●		
KS-731			●		●			
POLON-MF-50			●		●			

※Packaged in boxes of 10

Notes about product quality, storage and handling

1. When mixing and dissolving a catalyst (CAT) with an emulsion type textile treatment, homo-mixers and other powerful mixers should not be used as they may cause the emulsion to break.

2. POLON-MF-28T and POLON-MF-50 all contain organic solvents. When treating textiles with these products, be cautious of bleeding or discoloration of the pigments and dyes.

3. Please be aware that if pigments from processing cloths or other materials dissolve into the emulsion treatment bath, it may reduce the stability of the bath.

4. SILFIX has somewhat poor dispersibility. When using this product, dilute with 5 to 10 parts of water before mixing SILFEX with the other ingredients.

5. Silicone textile treatments may degrade with exposure to heat, light, acids, alkalis and certain other substances. Close product containers tightly and store in a cool, dark place (out of direct sunlight, at room temperature or lower).

6. As freezing of an emulsion type textile treatment will cause the emulsion to break, special care should be taken with regard to storage of these products in cold climate regions.

7. Be sure to read the Material Safety Data Sheets (SDS) for these products before use. SDS are available from the Shin-Etsu Sales Department.

Safety and hygiene

1. When handling these products, take care to avoid contact with skin and mucous membranes. If necessary, wear a chemical cartridge respirator or powered air purifying respirator, protective gloves, etc. In case of contact, wash immediately and thoroughly with soap or running water.

2. In case of eye contact, flush immediately and thoroughly with plenty of water, and consult a physician if necessary.

3. Products that contain solvents should be handled in well ventilated areas. Take care to avoid inhaling solvent vapors.

4. The work area should be equipped with local exhaust ventilation.

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The Development and Manufacture of Shin-Etsu Silicones are based on the following registered international quality and environmental management standards.

Gunma Complex	ISO 9001 (JCQA-0004)	ISO 14001 (JCQA-E-0002)
Naoetsu Plant	ISO 9001 (JCQA-0018)	ISO 14001 (JCQA-E-0064)
Takefu Plant	ISO 9001 (JQA-0479)	ISO 14001 (JQA-EM0298)

CM009

http://www.shinetsusilicone-global.com/

This is an edited version of the product data released on Feb. 2017