



Shin-Etsu Silicone

For Electrical, Electronic and General Industrial Use

RTV Silicone Rubber



MEETING THE DEMANDS OF A VARIETY OF APPLICATIONS

Shin-Etsu Silicone’s electrical, electronic and general industrial use RTV silicone rubber, in liquid or paste form, has been developed primarily for the gluing, sealing, and potting of electrical and electronic equipment. As electrical and electronic equipment becomes smaller, lighter, and more sophisticated, ever higher quality and performance is required of their structural components and materials. Shin-Etsu Silicone’s high-performance RTV silicone rubber products can meet a wide variety of needs, offering outstanding heat and low-temperature resistance, weather resistance, and electrical properties. Our wide range of products contributes to increased reliability of electrical and electronic equipment and communications equipment.



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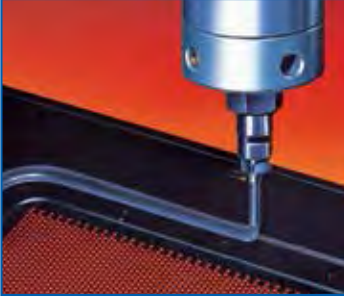
RTV

RTV stands for Room Temperature Vulcanizing.
RTV silicone rubber changes from a liquid state to a solid (or elastic body) by a variety of curing methods.
Our lineup features Shin-Etsu’s original products of different viscosities, with various distinctive properties.
You can choose products that meet the needs of your specific application.

Features of RTV Silicone Rubber

1 Heat and cold resistance

Suitable for heat-resistant seals of heating devices such as microwave ovens.



They can be used at temperatures ranging from -50°C to $+250^{\circ}\text{C}$. They remain flexible even when used continuously from -40°C to $+180^{\circ}\text{C}$.

5 Shock resistance

For applications such as vibration insulation of optical pickups.



After curing, they absorb shock and vibration, which prevents damage to electrical and electronic components, glass, and other delicate objects.

2 Adhesion

Suitable for heat-dissipating seals of heat pipes.



They exhibit outstanding adhesive strength on numerous materials including metals, glass, and plastics. There are types available that suit a variety of different applications, substrates, and usage conditions. For certain substrates, the use of a primer is recommended.

6 Oil and chemical resistance

For sealing and potting of equipment and sensors for automotive use.



Resistance to chemicals and oils is far better than that of organic rubber. Products include gasoline-resistant and engine-oil-resistant formulations.

3 Electrical properties

For moisture-proof coating of electrodes and other applications.



Their ability to maintain stable electrical properties even through environmental changes such as temperature and humidity changes makes them ideal for insulation sealing applications in electrical and electronic equipment.

7 Weather resistance

For sealing equipment used outdoors.



With superior resistance to ultraviolet rays, ozone and water, these products can be exposed to outdoor conditions for long periods of time resulting in little if any deterioration.

4 Non-solvent formulations

For coating various substrates.



Non-solvent adhesives and coating agents are available. (There are also solvent types available.)

8 Waterproof and airtight

Suitable for sealing various household ceramics.



After curing these products exhibit outstanding waterproof and airtight performance. They are ideal for sealing electronic parts and equipment that are vulnerable to moisture, and for sealing in the bathroom, kitchen, or wherever water is used.

Selection Guide

Types of curing reactions

Shown below are RTV silicone rubbers of different reaction types, each with distinctive characteristics.

Curing reaction types and characteristics of RTV silicone rubbers

Curing reaction	Characteristics	Generated gas	RTV classification	Handling classification
Condensation reaction	The curing reaction begins upon exposure to atmospheric moisture. Small quantities of gases are generated during curing. Shrinkage (weight): about 4%	Acetone	Acetone type	Room-temperature curing type
		Alcohol	Alcohol type	
		Oxime ^{*2}	Oxime type	
		Acetic acid	Acetic acid type	
Addition reaction	Heating will accelerate the curing process with almost no curing shrinkage.	None	Addition type	Heat curing type Room-temperature curing type
UV reaction ^{*1}	Cures rapidly through exposure to UV rays.	None	UV type	—

*1 UV cure products require detailed explanation, so please contact the nearest Shin-Etsu Sales Department directly.

*2 Oxime gas: MEKO (Methyl ethyl ketoxime)

Characteristics						Brief description
	Cure speed	Anti-corrosiveness	Tack free	Storability	Hermetic heat resistance	
Reaction type						
Acetone type	○	◎	◎	○	◎	Non-corrosive and quick-drying, with excellent hermetic heat resistance
Alcohol type	○	◎	○	△	×	Low corrosiveness and low odor with excellent stress crack characteristics
Oxime type	○	△	○	○	△	Oxime generated during curing is corrosive to copper
Acetic acid type	○	×	○	○	△	Strong odor and metal corrosion due to generated acetic acid gas during curing
Addition type (one-component)	◎	◎	—	△	—	Rapid curing and strong adhesion by heat-curing
Addition type (two-component)	◎	◎	—	◎	—	Both heat-curing and room-temperature-curing types are available

● Hermetic heat resistance: the heat resistant stability of the uncured product when stored hermetically.

● Stress cracks: cracks which occur when plastic or other materials under strain come in contact with adhesives containing solvents, etc.

◎ : excellent ○ : good △ : fair × : poor — : n/a

Viscosity and workability

● Viscosity before curing

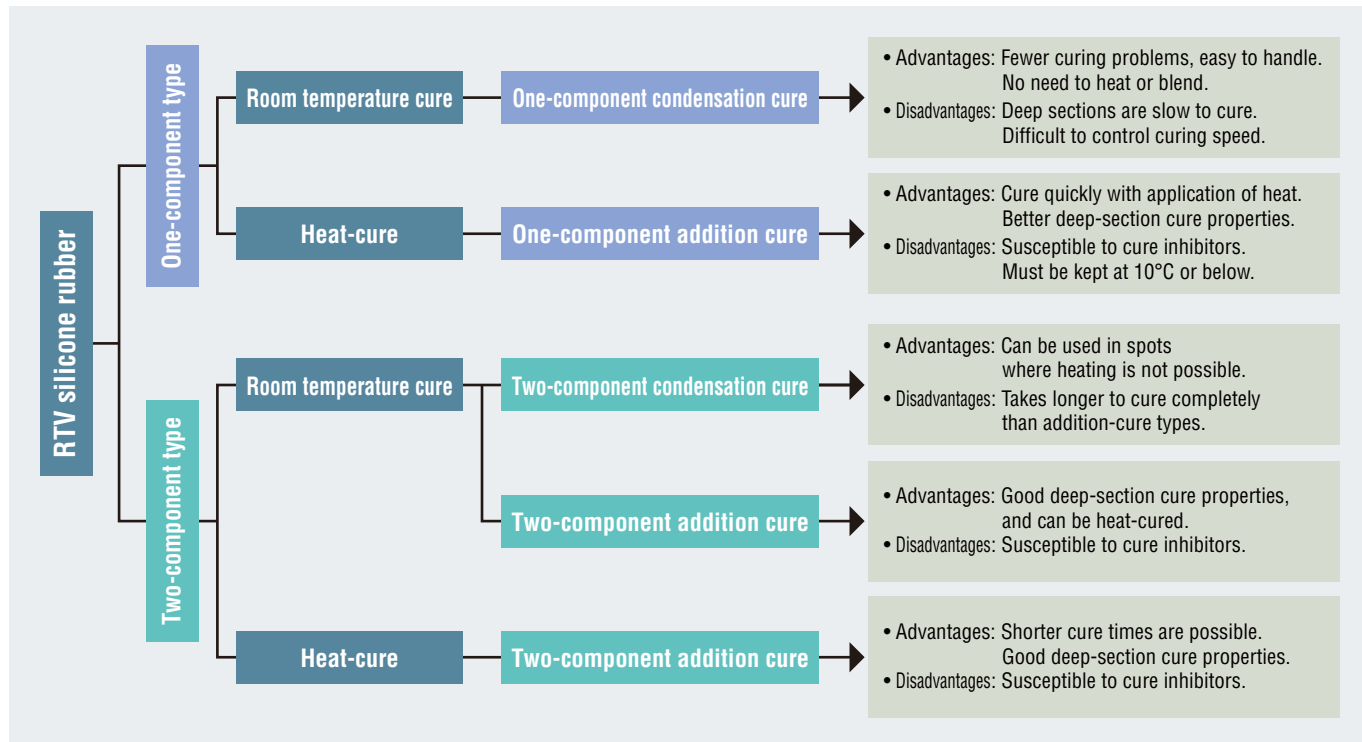
Generally speaking, RTV silicone rubber products start as a liquid and cure to become an elastic body. The viscosity values listed in this catalog should provide a guideline as to workability. Flowable, low viscosity products are suitable for potting and coating. Medium viscosity products and non-flowable high viscosity products (paste consistency) are suitable for sealing and adhesion or fastening of parts.





RTV silicone rubbers each have their respective workability and storability characteristics, and are divided into one-component and two-component types.

Types of RTV silicone rubber



Parameter	One-component type		Two-component type	
	Room-temperature-curing type	Heat-curing type	Room-temperature-curing type	Heat-curing type
Blending	Unnecessary	Unnecessary	Required	Required
Deaeration ^{*1}	Unnecessary	Unnecessary	Required	Required
Deep-curing	Inferior	Excellent	Excellent ^{*2}	Excellent
Cure speed regulation	Impossible	Impossible	Possible	Possible
Accelerated curing	Impossible	Heating	Impossible	Heating
Storability	Airtight, room-temperature storage	Refrigeration required	Room-temperature storage	Room-temperature storage

*1 Deaeration: the process of allowing a substance to stand, or degassing to remove interfused air bubbles that may degrade dielectric properties.
 *2 Please refer to the handling precautions on page 31.

Comparison with other resins

General properties of silicone rubber (comparison)
 [Coefficient of linear expansion / Tensile modulus of elasticity]

	Coefficient of linear expansion ppm/°C	Tensile modulus of elasticity N/mm ²
Silicone	2-4×10 ⁻⁴	0.01-20
Epoxy	5-8×10 ⁻⁵	2,000-5,000
Polyurethane	10-20×10 ⁻⁵	70-3,000
Acrylic	10-20×10 ⁻⁵	

(Room temperature: 23°C)

Performance Characteristics

■ Curing properties

Condensation cure type
(One-component type)

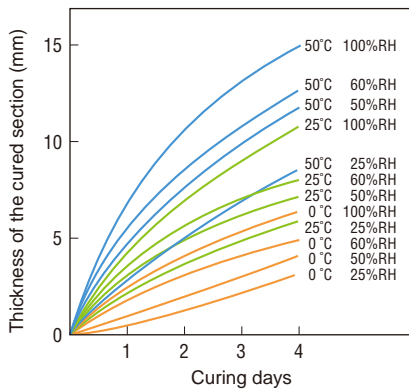
The required curing time for one-component condensation cure type RTV silicone rubber is dependent on the thickness of the rubber, the air temperature, and the relative humidity. Curing begins on the surface, so as the thickness increases, the curing time required for the inner portion increases accordingly. Generally, cure speed will accelerate as temperature and humidity rise. At 23°C / 50%RH*, surface curing normally begins after 1 to 60 minutes – a 2 mm sample will become a fully elastic body in about 24 hours. Please note that 3 days are required to achieve full mechanical strength, and about 7 days are required for the product to exhibit certain characteristics including electrical and adhesion properties.

* RH is the abbreviation for Relative Humidity.

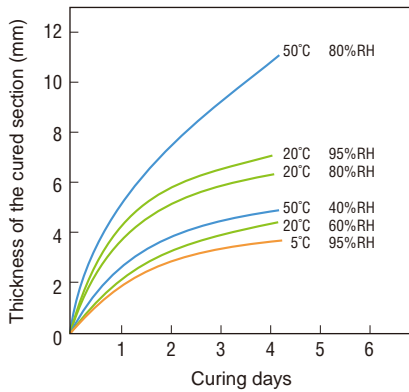
It is 100 times the value of the water vapor actually contained in the air divided by the saturated water vapor at that air temperature.

■ Relationship between cure speed and temperature and humidity

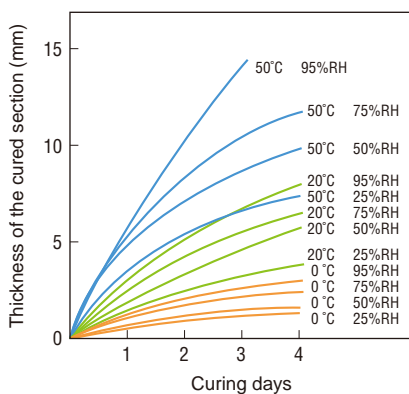
KE-42
(acetic acid type)



KE-348
(acetone type)

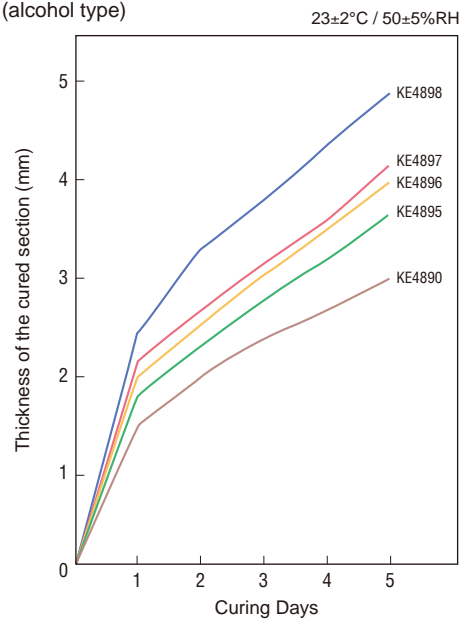


KE-45
(oxime type)



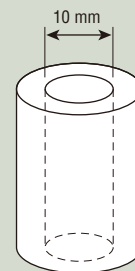
■ Cure speed

KE-489 Series
(alcohol type)



Measuring cure speed

To measure the relationship between rubber thickness and cure time, a polyethylene container is filled with RTV silicone rubber. The inside diameter of the container is 10 mm. The cure time will vary as the thickness of the cured part, temperature and humidity change.



* The data shown is that of typical products. Related products will exhibit similar tendencies.

Addition cure type
(One-component type)

General one-component addition cure type RTV silicone rubber will cure in 30 minutes to 1 hour when heated to between 100°C and 150°C. They exhibit excellent deep-cure properties and cure uniformly, regardless of thickness. However, curing may be slower in spots where heat is not easily transmitted. As the following chart shows, physical properties are achieved by heating to 100°C for 1 hour, but some products will not cure even after an hour if not heated to above 80°C.

Note: some products will cure at 80°C but will not possess adhesive strength.

Curing conditions and physical properties

KE-1820

Parameter	Heating temperature °C		80	100	120			150
	Heating time h		1	1	1	2	3	1
Hardness Durometer A			Does not cure	37	40	41	41	45
Elongation at break				690	650	660	670	550
Tensile strength				5.8	5.4	5.5	5.7	5.1
PBT Adhesive shear strength				1.6	2.0	2.0	2.3	2.0
PBT cohesion break rate				100	100	100	100	100

Testing method: complies with JIS K 6249.

(Not specified values)

Addition cure type
(two-component type)

Curing occurs after 5 minutes to 1 hour when heated to temperatures from 80°C to 150°C. The higher the curing temperature, the shorter the cure time. Please note that changing the amount of curing agent will not greatly affect cure speed.

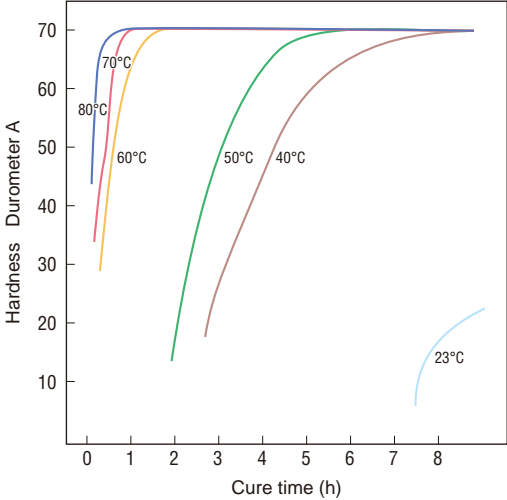
Relationship between temperature and cure time

KE1204A/B

Temperature °C	Cure time
25	24~48 h
50	5~6 h
60	1.5~2 h
80	1 h
100	10~15 min
120	5~10 min
150	5 min

Temperature's effect on cure state

KE1204A/B



Curing inhibition
When addition cure type RTV silicone rubber comes in contact with sulfur, phosphorous, nitrogen compounds and substances containing organometallic salts (such as amine-based epoxy curing agents, urethane isocyanates, sulfur vulcanized rubber and soldering flux) defective curing may occur at the point of contact. Please refer to the information about additives on page 14.

■ Adhesion

Condensation cure type
(one-component type)

With the exception of special materials such as polyolefin-based resins and fluororesins, condensation cure products exhibit superior adhesion to most materials.

■ Adhesion to various materials

KE-348 (acetone type)

Adherend		Adhesion
Metal	Aluminum	◎
	Stainless steel	△
	Iron	△
	Chrome	○
	Copper	○
	Melamine-coated board	○
	Vinyl-coated steel plate	○
Stone	Glass	◎
	Mortar	×
	Tile face	○
	Tile back	△
Plastic	Phenol	◎
	PVC (hard)	○
	PVC (soft)	○
	Epoxy	◎
	Acrylic	×
	FRP	△
Rubber	Neoprene	×
	Butyl rubber	×
Wood	Cedar	○

◎: most suitable ○: suitable △: will adhere, but caution required ×: not suitable

KE-489 Series (alcohol type)

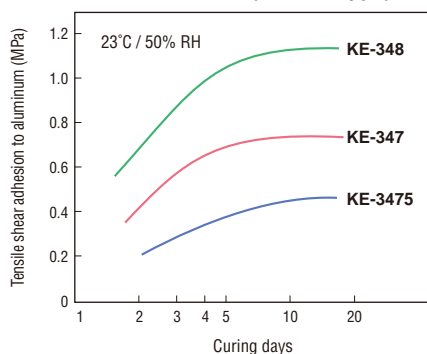
unit: MPa

Adherend	Grade	KE-4898	KE-4897	KE-4896	KE-4895	KE-4890
	Aluminum		1.0	0.7	0.6	0.4
Stainless steel		0.7	0.5	0.4	0.2	1.2
Copper		0.8	0.5	0.4	0.3	1.4
Glass		1.0	0.6	0.5	0.4	1.3
Polycarbonate		0.7	0.5	0.3	0.2	0.3
ABS		0.8	0.5	0.3	0.2	1.4
Noryl		0.8	0.5	0.4	0.2	1.4
Epoxy		0.8	0.5	0.3	0.2	1.5
PBT		0.7	0.5	0.4	0.2	1.2
Acrylic		0.8	0.5	0.3	0.2	0.4

Curing conditions: 23±2°C / 50±5% RH for 7 days, measured in compliance with JIS K 6249. (Not specified values)
Tensile speed: 50 mm/min

■ Change in adhesive strength over time

KE-3475 / KE-347 / KE-348 (acetone type)



As shown in the graph, the adhesive strength increases as curing progresses. Although it varies depending on the thickness of the rubber, a cure time of at least 7 days is usually required to reach full adhesive strength.

Testing method: complies with JIS K 6249.

■ Lap shear strength with various materials

KE-3427/KE-3428 (acetone type)

Adherend	Lap shear strength MPa (cohesion break rate %)	
	KE-3427	KE-3428
Glass	0.7 (100)	1.4 (100)
Aluminum	0.4 (100)	1.3 (100)
SUS	0.4 (100)	1.3 (100)
Copper	0.4 (100)	1.1 (100)
Iron	0.4 (100)	1.1 (100)
Brass	0.4 (100)	0.9 (100)
Acrylic	0.4 (100)	0.9 (70)
ABS	0.4 (100)	0.9 (100)
Epoxy	0.3 (100)	1.2 (100)
Nylon 6	0.3 (100)	1.1 (100)
Nylon 66	0.3 (100)	1.1 (100)
Noryl	0.5 (100)	1.0 (100)
PVC (hard)	0.4 (100)	1.0 (100)
Polyester	0.4 (100)	0.9 (100)
PBT	0.4 (100)	1.1 (100)
Bakelite	0.4 (100)	1.1 (100)
Polystyrol	0.4 (100)	1.3 (100)
PPS	0.4 (100)	—
SPS	0.5 (100)	1.1 (100)

(Not specified values)

Condensation cure type
(two-component type)

KE-200 (two-component acetone type)

Adherend	Lap shear strength MPa	Cohesion break rate %
Epoxy	0.27	100
Polyester	0.32	100
PBT	0.16	0
PVC	0.25	100
Acrylic	0.14	0
Polycarbonate	0.30	100
Phenol	0.26	100
Nylon 66	0.27	100
Nylon 6	0.27	100
Iron	0.30	100
Copper	0.30	100
Stainless steel	0.28	100

Curing conditions: 23±2°C / 50±5% RH for 3 days.
Testing method: complies with JIS K 6249.

* Cohesion break: a condition in which the materials do not separate at the surface, but break in the materials themselves, or in which all material is left on the surface.

(Not specified values)

Addition cure type
(one- and two-component types)

Addition cure type RTV silicone rubbers exhibit superior adhesion to epoxy (non-amine-based) and aluminum. There are also products available that adhere to engineering plastics such as PBT and PPS.

Lap shear strength with various materials
(one-component type)

Adherend	Lap shear strength MPa (cohesion break rate %)		
	KE-1820	KE-1830	FE-61
Glass	2.7 (100)	2.5 (100)	0.90 (100)
Aluminum	2.5 (100)	2.5 (100)	0.90 (100)
Stainless steel	2.1 (100)	2.5 (100)	1.0 (100)
Nickel	2.1 (100)	2.0 (100)	0.90 (100)
Chrome	2.5 (100)	2.3 (100)	0.90 (100)
Copper	2.1 (100)	1.9 (100)	0.90 (100)
Epoxy	2.0 (100)	1.8 (100)	0.90 (100)
Polycarbonate	0.50 (0)	0.79 (0)	0.73 (50)
PBT	2.0 (100)	2.5 (100)	0.90 (100)

Testing method: complies with JIS K 6249.

(Not specified values)

KE1802A/B/C (three-component type)

Adherend	Lap shear strength MPa
Epoxy	2.3
Unsaturated polyester	2.3
Phenol	2.0
Noryl	1.8
PBT	2.1
Polycarbonate	1.8
Aluminum	1.8
Copper	1.7
Stainless steel	2.3
Mild steel	2.0
Chrome	2.0
Nickel	1.6

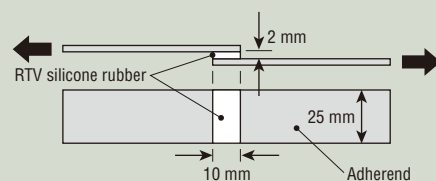
* will also adhere to materials including glass, ceramics, and film.

Testing method: complies with JIS K 6249.

(Not specified values)

Testing the lap shear strength

The RTV silicone rubber is applied as shown in the figure. After curing, shear adhesion is measured using a tension tester.



Curing conditions : condensation cure type 23±2°C / 50±5% RH for 7 days.
addition cure type 120°C for 1 hour.

RTV silicone rubber thickness : 2 mm
Adhesive surface : 10 × 25 mm
Tensile speed : 50 mm/min

Electrical properties

Condensation cure type
(one-component type)

KE-489 Series (alcohol type)

Parameter		Conditions	Initial: 25°C	100°C×200 h	200°C×200 h	100°C×500 h	200°C×500 h
KE-4898	Volume resistivity	TΩ·m	30	30	30	40	50
	Dielectric breakdown strength (1 mm)	kV	25	25	25	25	25
	Dielectric constant	50 Hz	2.8	2.8	2.7	2.8	2.7
	Dissipation factor	50 Hz	2×10 ⁻³	2×10 ⁻³	2×10 ⁻³	2×10 ⁻³	2×10 ⁻³
KE-4896	Volume resistivity	TΩ·m	50	50	20	20	20
	Dielectric breakdown strength (1 mm)	kV	24	24	24	24	24
	Dielectric constant	50 Hz	2.8	2.8	2.7	2.7	2.7
	Dissipation factor	50 Hz	1×10 ⁻³	1×10 ⁻³	2×10 ⁻³	3×10 ⁻³	1×10 ⁻³
KE-4890	Volume resistivity	TΩ·m	6	30	30	20	20
	Dielectric breakdown strength (1 mm)	kV	25	25	24	25	23
	Dielectric constant	50 Hz	3.4	3.3	3.4	3.3	3.4
	Dissipation factor	50 Hz	1×10 ⁻³	1×10 ⁻³	1×10 ⁻³	1×10 ⁻³	1×10 ⁻³

Testing method: complies with JIS K 6249.

(Not specified values)

Curing conditions: 23±2°C / 50±5% RH for 7 days.

Addition cure type
(two-component type)

KE1204A/B

Parameter		Conditions	Initial	150°C×500 h	200°C×500 h	250°C×500 h
Volume resistivity		TΩ·cm	2	0.1	2	0.1
Dielectric breakdown strength (1 mm)		kV	27	27	28	29
Dielectric constant	50 Hz		3.3	3.3	3.3	3.2
	1 MHz		3.3	3.2	3.2	3.1
Dissipation factor	50 Hz		2×10 ⁻³	1×10 ⁻³	1×10 ⁻³	1×10 ⁻³
	1 MHz		1×10 ⁻⁴	1×10 ⁻⁴	1×10 ⁻⁴	1×10 ⁻⁴

Testing method: complies with JIS K 6249.

(Not specified values)

Conditions used to produce the test specimen: 100°C for 30 min.

Heat resistance

Condensation cure type
(one-component type)

KE-3417 (heat-resistant, acetone type)

Heat resistance Physical properties of rubber (300°C)	Deterioration (day count)	Hardness (Durometer A)	Elongation %	Tensile strength MPa
	Initial	35	200	1.4
	7 days	30	240	1.2
	14 days	40	150	1.1
	30 days	52	100	0.9
Heat resistance Shear adhesive strength (300°C)	Deterioration (day count)	Glass		Aluminum
	Initial	0.7		0.6
	7 days	0.9		0.6
	14 days	0.6		0.5
	30 days	0.8		0.7

Testing method: complies with JIS K 6249.

(Not specified values)

Addition cure type
(two-component type)

KE1204A/B

Parameter		Conditions	Initial	200°C			250°C
				100 h	500 h	1,000 h	100 h
Hardness	JIS-A		70	76	77	76	70
Tensile strength	MPa		3.5	4.6	4.3	4.3	4.1
Elongation at break	%		90	70	90	70	60
Weight variation	wt%		—	-1.7	-3.4	-3.8	-2.2

Testing method: complies with JIS K 6249.

(Not specified values)

Conditions used to produce the test specimen: 100°C for 30 min.

Weather resistance and durability

Condensation
cure type
(one-component type)

KE-45 (Oxime type) – Results of outdoor exposure testing

Physical properties of rubber

Parameter Exposure period	Hardness Durometer A	Tensile strength MPa	Elongation at break %	Estimated luminous intensity J/m ²			Estimated precipitation mm
				Ultraviolet rays	Visible light rays	Infrared rays	
Initial	30	2.3	350	—	—	—	—
1 month	35	2.0	370	1.60×10 ⁷	6.44×10 ⁷	9.13×10 ⁷	21
3 months	34	2.0	330	5.46×10 ⁷	2.81×10 ⁸	3.00×10 ⁸	63
6 months	37	2.0	360	1.44×10 ⁸	7.74×10 ⁸	8.80×10 ⁸	335
1 year	37	2.0	320	3.00×10 ⁸	1.63×10 ⁹	1.59×10 ⁹	1,376
2 years	37	1.8	310	5.87×10 ⁸	3.33×10 ⁹	3.32×10 ⁹	2,130

Testing method: complies with JIS K 6249.

(Not specified values)

* The PH-11M-2AT actinometer was used in the tests.

Adhesion

Adherend: Glass, PRIMER-C used.

Parameter Exposure period	Maximum tensile stress N/mm ²	Cohesion break rate %	Estimated luminous intensity J/m ²			Estimated precipitation mm
			Ultraviolet rays	Visible light rays	Infrared rays	
Initial	0.70	100	—	—	—	—
1 month	0.67	100	1.70×10 ⁷	9.39×10 ⁷	9.03×10 ⁷	28
3 months	0.69	100	6.75×10 ⁷	3.98×10 ⁸	3.57×10 ⁸	123
6 months	0.71	100	1.72×10 ⁸	9.79×10 ⁸	9.01×10 ⁸	413
1 year	0.70	100	3.01×10 ⁸	1.70×10 ⁹	1.61×10 ⁹	1,361
2 years	0.71	100	5.82×10 ⁸	3.37×10 ⁹	3.31×10 ⁹	2,154

Testing method: complies with JIS A 1439.

(Not specified values)

* The PH-11M-2AT actinometer was used in the tests.

KE-348 (acetone type) – Adhesion after outdoor submersion in water

Substrates	Primer	Measurement parameter Submersion time (days)	Maximum tensile stress N/mm ²	Elongation at break %	Cohesion break rate %
After 7 days	0.58	280	100		
After 30 days	0.49	222	100		
JIS aluminum	C	Before submersion	0.72	250	100
		After 7 days	0.68	230	100
		After 30 days	0.68	240	100

Testing method: complies with JIS A 1439.

(Not specified values)

KE-3423 (acetone type) – Ozone resistance

We tested deterioration in an ozone atmosphere. There is little deterioration even in adverse environments.

Parameter	Deterioration time	Start	200 h	400 h	600 h	800 h	1,000 h
Elongation at break %	120	110	100	80	80	100	
Tensile strength MPa	0.3	0.3	0.3	0.3	0.2	0.3	

Curing conditions: 23±2°C / 50±5% RH×7 days

(Not specified values)

Deterioration conditions: 23°C / 100 ppm×1,000 h

Addition
cure type
(one-component type)

KE-1830 – Adhesive durability

Test conditions		Tensile shear adhesive strength MPa (cohesion break rate %)	
		PBT	Aluminum
Initial		2.5 (100)	2.5 (100)
Gasoline immersion	25°C×100 h	Release	0.4 (100)
Pressure-cooker test	121°C×50 h	2.3 (100)	2.9 (100)
	121°C×100 h	PBT deterioration	3.0 (100)
Antifreeze	121°C×240 h	—	2.3 (100)
Salt water spray (JIS Z 2371)	35°C×240 h	2.1 (60)	2.5 (100)
High temperature test	150°C×1,000 h	3.2 (100)	3.3 (100)
Ozone resistance (80 ppm)	40°C×300 h	2.7 (100)	2.5 (100)
Shock resistance test 1,000 cycles	between -55°C and 150°C, 1 h each	2.8 (100)	3.2 (100)

(Not specified values)

■ Chemical resistance

Condensation cure type
(one-component type)

■ KE-42-AL (acetic acid type) — Chemical resistance

Chemical	Parameter		Appearance	Hardness Durometer A	Tensile strength MPa	Elongation at break %
	Aqueous solution concentration	%				
Initial value				26	2.5	400
Sulfuric acid	5	No abnormality detected (NAD)		27	2.2	440
	10			24	2.0	370
	20			25	2.5	500
	50		Surface adhesion	28	1.6	270
Hydrochloric acid	5	NAD		25	2.5	450
	10			26	2.2	430
	20			26	1.3	240
	50			23	1.3	310
Nitric acid	5	NAD		26	2.4	520
	10	Surface adhesion		21	1.7	450
	20			20	0.9	250
Acetic acid	100	Surface adhesion		27	2.5	510
Casein soda	0.5	NAD		24	2.3	440
	2			27	2.5	450
	4			21	2.0	550
	15			24	3.0	460
Ammonia	5	NAD		22	1.8	330
	10			22	1.9	380
	20			22	2.3	370
Pyridine	5	NAD		23	2.3	540
	10			21	1.8	530
	20			20	1.7	510
Carbon disulfide	—	NAD		26	2.5	410

Curing conditions: 23±2°C / 50±5% RH×7 days
Immersion conditions: 23°C×40 days

(Not specified values)

■ KE-3423 (acetone type) — Chemical resistance (coefficient of volumetric expansion)

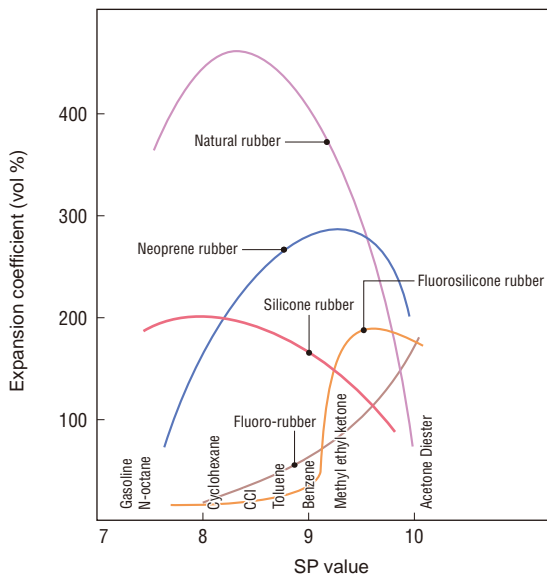
This was a test of the volumetric expansion of a cured specimen immersed in chemical solutions. The specimen did not dissolve, but did swell.

Sample	Item	Gasoline	Engine oil	Gear oil	ATF
KE-3423	%	490	7.4	17	9.1

Shape: 30×30×2 mm

Curing conditions: 23±2°C / 50±5% RH×7 days
Immersion conditions: 23°C×40 h

(Not specified values)



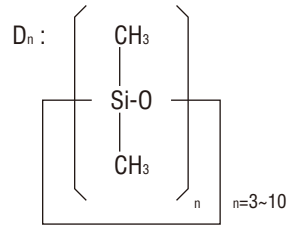
■ Silicone and solubility parameter value Relationship of solubility parameter values (SP values) of solvents and the expansion coefficient of rubber

Fluorosilicone rubber in particular exhibits outstanding resistance to solvents, but silicone rubber also exhibits superior solvent resistance to that of other rubbers.

Low-molecular-weight (LMW) siloxane

What is LMW siloxane?

The figure at right shows the chemical formula of low-molecular-weight siloxane, a nonreactive cyclic dimethyl polysiloxane (generally D₃-D₁₀), which is volatile and therefore sublimates into the atmosphere both during and after curing. As shown below, LMW siloxane has been reported to cause electrical contact failure under certain conditions.



Reduced LMW siloxane products (products that offer an answer to the problem of electrical contact failure)

These are products formulated with reduced levels of LMW siloxane, which has been shown to cause electrical contact failure under certain conditions.

Our products are basically $\sum D_n$ (n=3~10): below 300 ppm or below 500 ppm. Electrical contact failure can occur under the conditions shown below, and while these products are not an absolute remedy, we do recommend the use of reduced LMW siloxane products for electrical and electronic applications. (For information about these products, please refer to P. 20~21.)

Comparison of LMW siloxane concentration in common products and reduced LMW siloxane products (uncured extraction data)

D _n	KE-45 (Common products)	KE-3490 (Reduced LMW siloxane products)
3	10 >	10 >
4	500	10 >
5	260	10 >
6	240	10 >
7	220	10 >
8	160	50
9	170	50
10	220	60
$\sum D_n$ (n=3~10)	1,770	160

[GC conditions] GC:gas chromatography
 Equipment capillary gas chromatograph:Shimadzu GC-14A
 Column DURABOND DB-1701
 Column Temp. 50°C → 300°C (15°C/min)
 Inj. Temp. 300°C
 Carrier Gas He (30 cm/sec)
 Detector FID
 Injection rate 2 μl
 Extraction solvent acetone

KE-3490 is a reduced LMW siloxane product, with $\sum D_n$ (n=3~10) controlled to below 300 ppm. (Not specified values)

Electrical contact failure

It has already been noted that various substances may lead to contact failure. Contact failure may be caused by organic materials such as human body oils and organic gases, or inorganic materials such as hydrogen sulfide and ammonia gas. Electric and electronic manufacturers report that LMW siloxane can cause contact failure in the low-voltage, low-current range.

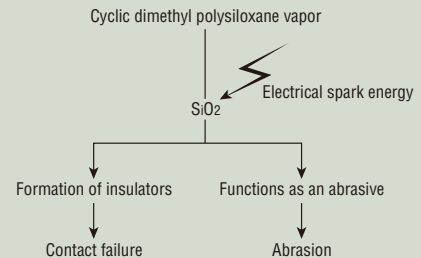
Relationship of load conditions to contact reliability

Effects of load on contact reliability (micro-relay)

Load			Presence of Si accretion at point of contact (Y/N)	Contact resistance
1	DC1 V	1 mA	N	No increase measured
2	DC1 V	36 mA	N	Occasional increase of several ohms
3	DC3.5 V	1 mA	N	No increase measured
4	DC5.6 V	1 mA	Y	No increase measured
5	DC12 V	1 mA	Y	Increase of several ohms, up to infinity
6	DC24 V	1 mA	Y	Around 1,500 times, readings of infinity were seen; at 3,000 times, all were infinity
7	DC24 V	35 mA	Y	Around 3,000 times, readings of infinity were seen; at 4,500 times, all were infinity
8	DC24 V	100 mA	Y	No increase measured
9	DC24 V	200 mA	Y	No increase measured
10	DC24 V	1 A	Y	No increase measured
11	DC24 V	4 A	Y	No increase measured

[Test conditions] Switching frequency: 1 Hz, temp.: room temperature, contact force: 13 g
 Presented by: The Institute of Electronics, Information and Communication Engineers (corporation), Yoshimura and Itoh EMC76-41 Feb. 18, 1977.

Mechanisms of contact failure



Dimethyl polysiloxane HO-[Si(CH₃)₂O]_n-H with a degree of polymerization between 200 and 1,000 is used among the prime ingredients of RTV silicone rubber, but the dimethyl polysiloxane derived in the normal manufacturing process does contain ring structures in trace amounts. Because this cyclic dimethyl polysiloxane is nonreactive and volatile, there is sublimation during and sometimes after curing. As shown in the figure above, this sublimated cyclic dimethyl polysiloxane can be a mechanism of contact failure under certain conditions.

Various additives

1. Additives used to regulate cure speed

In certain applications and working conditions, you may want to control the cure time of two-component RTV. In such cases, please use a cure accelerator or cure retardant. These agents are all effective when added in small amounts.

[Precautions]

● Be sure to add the prescribed curing agent in the standard, measured amount.

Without the addition of the curing agent, the product will not cure, even with the addition of cure accelerators or retardants.

● Always measure accurately.

If a cure accelerator is added in excessive amounts, the product may cure during blending, while excessive amounts of a cure retardant can slow curing to such an extent that the product may not be completely cured even after several days.

● Additives for condensation cure products and those for addition cure products cannot be used in combination.

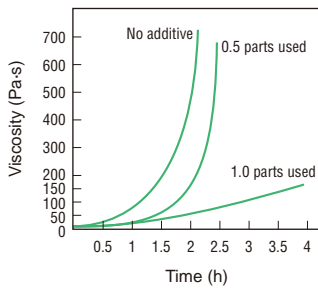
For example, if a condensation cure type additive is mistakenly added to an addition cure RTV rubber, a faulty cure will result.

* Please contact the nearest Shin-Etsu Sales Department for details.

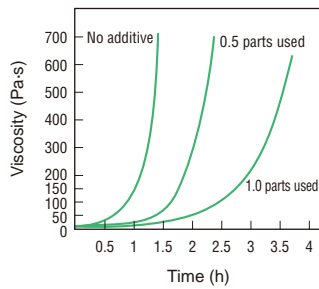
Additive		Characteristics
Cure accelerators	For condensation cure products only CAT-RS	By adding 0.1~ 0.5% CAT-RS in combination with the curing agent, cure time can be greatly reduced. However, the workable time will also be shortened.
	For addition cure products only X-93-405	For example, by adding 1~2% to the base resin, cure time can be cut in half. However, the workable time will also be halved.
Cure retardants	For condensation cure products only WETTER-NO.5	For example, by adding 1~2% to the base resin, cure time and workable time can be doubled.
	For addition cure products only SEIGYOZAI-NO.6-10	For example, by adding 1% to the base resin, cure time and workable time can be lengthened by approx. 2.5 times.

Additive quantity and viscosity change

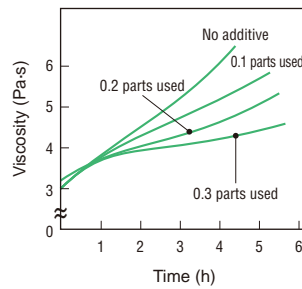
KE-66: Condensation cure type
WETTER-NO.5 (25°C)



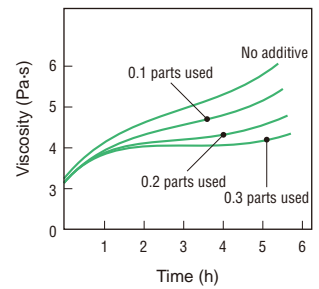
KE-66: Condensation cure type
WETTER-NO.5 (40°C)



KE1212A/B/C: Addition reaction type
SEIGYOZAI-NO.6-10 (25°C)



KE1212A/B/C: Addition cure type
SEIGYOZAI-NO.6-10 (20°C)



2. Diluents

Please use RTV-THINNER or KE-1204-THINNER as a diluent if you want to reduce the viscosity of the curing agent. For example, by adding 10% RTV-THINNER, the viscosity can be reduced by about half. However, excessive amounts of RTV-THINNER or KE-1204-THINNER will have adverse effects on the physical properties, so please refer to the figure at right regarding additive quantities. We recommend 10% or below as a standard additive quantity. RTV-THINNER and KE-1204-THINNER contain no organic solvents such as toluene or xylene.

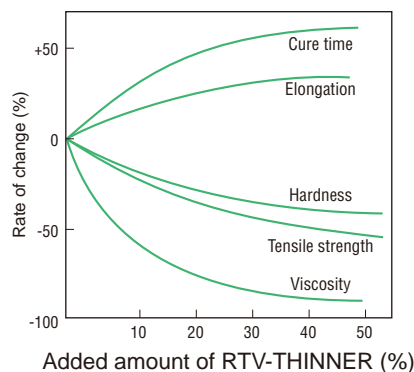
Effects of diluents on various properties

- Base resin viscosity → reduction (major effect)
- Workable time (cure time) → extension (slight effect)
- Hardness, tensile strength → reduction (major effect)
- Elongation → enhancement (slight effect)

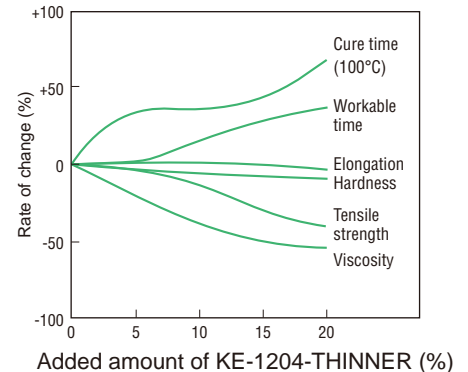
* When used with an addition cure product, a small quantity of RTV-THINNER can greatly reduce viscosity, but with a degradation of physical properties. If possible, KE-1204-THINNER should be used with addition reaction products.

Relationship of quantity of added diluent and various physical properties

Condensation cure type



Addition cure type



3. Barrier coat

BARRIER-COAT NO.6 is a low viscosity liquid, and can thus be brushed on or applied as a spray. Applying it to the base form can prevent curing inhibition and the mutual adhesion of RTV silicone rubbers. Please note that BARRIER-COAT NO.6 does not have adhesive properties and therefore cannot be used as an adhesion primer.

Appearance	Specific gravity 25°C	Viscosity 25°C Pa·s	Solvent
Colorless transparent liquid	0.82	0.5	Toluene

4. Curing inhibitors of addition cure type RTV silicone rubber

Curing inhibitors include such substances as sulfur, phosphorus, nitrogen compounds, water, and organometallic salts. In addition, condensation cure type RTV silicone rubber may act as a curing inhibitor.

[Specific examples of curing inhibitors]

●Organic rubbers (natural rubber, and synthetic rubbers such as chloroprene rubber, nitrile rubber, and EPDM) ●Soft PVC resins ●Amine-cured epoxy resins ●Rubber clay and oil clay ●Isocyanates of urethane resins ●Condensation cure type RTV silicone rubber ●Some vinyl tape adhesives, glues, paints (polyester-based paints, etc.), waxes, soldering flux, and pine gum

■Primers

Primers are pre-treatment agents. The application of a primer on some substrates will ensure better adhesion.

■Primer selection standards

Substrates		Grade	KE-41	KE-42	KE-44	KE-45	KE-347	KE-348
Glass	Glass						○	○
	Sun cut glass						C	C
	Ceramics		○	○	○	○		—
	Enamel						○	○
	Tile							○
Stone	Marble		—	—	MT	MT	MT	MT
	Slate							
	Mortar							
	Concrete							
Metal	Aluminum		○	○			○	○
	Stainless steel						×	×
	Iron		—	—	○	○		
	Copper							
	Tin							
	Chrome		○	C			○	○
	Nickel				C	C		
	Galvanized steel		—	—	○	○		
	Tinplate							
Painted panel	Baked acryl		—	—	C	C	○	○
	Melamine paint				○	○		
Rubber	Silicone rubber		○	○	C	○	C	○
Plastic	Hard PVC		—	—	×	○		○
	Acrylic		T	T	T	T		—
	Polycarbonate		D-2	D-2	D-2	D-2	D-2	D-2
	Nylon 66		—	—	C	○	C	○
	PBT		×	×	×	×	×	×
	ABS				U, T	U, T		
	Epoxy		○	○			○	○
	Polyester				○	○		
	Phenol							
	Urethane		C	C	C	C	C	C
	Teflon							
	Polyethylene		×	×	×	×	×	×
	Polypropylene							

○: Adheres without primer ×: Won't adhere even with primer MT, C, D-2, U, T: name of optimal primer (e.g. U = Primer U)

[Method of application]

1. Eliminate moisture, oil, and dirt from the area to be treated.
2. Apply to the adherend with a brush or soft cloth.
3. Air-dry, and allow primer to dry completely before continuing with the next process.

[Precautions]

- Be sure to adequately prepare the substrate surface prior to application. Inadequate preparation may lead to poor adhesion.
- Adhesive strength will vary depending on the materials and surface condition of the adherend. We recommend testing a small sample before full application.
- Always provide adequate ventilation when working.
- Primers fall under the category of UN Hazardous Materials. (See p. 26 for details.) They should never be used near open flame or in high temperature conditions. Primers should be stored in a sealed container in a cool, dark place away from flame.

Product Listing by Intended Use

One-component RTV silicone rubber

Primary application and characteristics	Grade	Cure type (by-product gas)	Brief description	Intended use				Page
				Sealing	Coating	Potting	Thermally conductive	
General electrical purpose	KE-3423	Condensation cure (acetone)	Very low viscosity, reduced low-molecular-weight (LMW) siloxane		○			24
	KE-347	Condensation cure (acetone)	Medium viscosity	○	○			18
	KE-3475	Condensation cure (acetone)	Low viscosity	○	○			24
	KE-3479	Condensation cure (acetone)	High viscosity	○				18
	KE-348	Condensation cure (acetone)	Paste	○				18
	KE-3495	Condensation cure (acetone)	Low viscosity, reduced LMW siloxane	○	○			20, 24
	KE-4895	Condensation cure (alcohol)	Low viscosity, reduced LMW siloxane	○	○			20, 24
	KE-4896	Condensation cure (alcohol)	Medium viscosity, reduced LMW siloxane	○	○			20
	KE-4897	Condensation cure (alcohol)	High viscosity, reduced LMW siloxane	○				20
	KE-4898	Condensation cure (alcohol)	Paste, reduced LMW siloxane	○				20
	KE-1056	Addition cure	Transparent gel, excellent low-temperature resistance			○		23
	KE-1151	Addition cure	Thixotropic gel, excellent low-temperature resistance			○		23
	KE-1820	Addition cure	High strength	○				19
	KE-1825	Addition cure	Paste	○				19
	KE-1830	Addition cure	High viscosity	○	○			19
	KE-1831	Addition cure	Non-flammable (UL certified product*1)	○				19
	KE-1833	Addition cure	Excellent adhesion to PPS, heat resistant	○				19
	KE-1842	Addition cure	Low viscosity, low hardness		○	○		19, 24
	KE-1884	Addition cure	Low-temperature curing, medium viscosity, reduced LMW siloxane	○	○			21
	KE-1885	Addition cure	Low-temperature curing, high viscosity, reduced LMW siloxane	○				21
KE-1886	Addition cure	Low-temperature curing, low viscosity, reduced LMW siloxane	○	○	○		21, 24	
Non-flammable (UL certified product *1)	KE-3424-G	Condensation cure (acetone)	Low viscosity, reduced ultra-LMW siloxane	○	○			21, 24
	KE-3490	Condensation cure (acetone)	Paste, reduced LMW siloxane	○				20
	KE-3494	Condensation cure (acetone)	Medium viscosity, reduced LMW siloxane	○	○			20
	KE-40RTV	Condensation cure (Oxime)	Paste	○				18
	KE-4890	Addition cure (alcohol)	Paste, reduced LMW siloxane	○				20
MIL standard *2	KE-3497	Condensation cure (acetone)	Medium viscosity, reduced LMW siloxane	○	○			20
	KE-3498	Condensation cure (acetone)	Paste, reduced LMW siloxane	○				20
Thermal conductivity	KE-3493	Condensation cure (acetone)	Thermal conductivity (1.6 W/m-K), reduced LMW siloxane	○			○	24
	KE-3466	Condensation cure (acetone)	Thermal conductivity (1.9W/m-K), reduced LMW siloxane, Non-flammable (UL certified product*1)	○			○	24
	KE-3467	Condensation cure (acetone)	Thermal conductivity (2.4W/m-K), reduced LMW siloxane, Non-flammable (UL certified product*1)	○			○	24
	KE-1862	Addition cure	Thermal conductivity (0.83 W/m-K)	○		○	○	24
	X-32-2020	Addition cure	Thermal conductivity (1.9 W/m-K), low viscosity, reduced LMW siloxane	○		○	○	24
	KE-1867	Addition cure	Thermal conductivity (2.2W/m-K), reduced LMW siloxane, Non-flammable (UL certified product*1)	○		○	○	24
Conductivity	KE-3491	Condensation cure (acetone)	Conductive (resistance: 2Ω-m), reduced LMW siloxane	○				21
	KE-3492	Condensation cure (acetone)	High conductivity (resistance: 0.002 Ω-m), reduced LMW siloxane	○				21
Super heat resistance	KE-3417 *3	Condensation cure (acetone)	Medium viscosity, cannot be used as an insulator, reduced LMW siloxane	○				21
	KE-3418 *3	Condensation cure (acetone)	Paste, cannot be used as an insulator, reduced LMW siloxane	○				21
Oil- and solvent-resistance	FE-123	Condensation cure (acetic acid)	Oil- and solvent-resistant	○				25
	FE-57	Addition cure	Gel, oil- and solvent-resistant			○		23, 25
	FE-61	Addition cure	Oil- and solvent-resistant	○				25
	X-32-1619	Addition cure	Oil- and solvent-resistant, low viscosity	○		○		25

*1 See p. 27 for details about UL certified products. *2 MIL standard: certified to MIL-A-46146A. *3 Cannot be used as an insulator.
LMW: low-molecular-weight

Primary application and characteristics	Grade	Cure type (by-product gas)	Brief description	Intended use				Page
				Sealing	Coating	Potting	Thermally conductive	
Plastic adhesion	KE-3427	Condensation cure (acetone)	Adheres to plastics	○				21
	KE-3428	Condensation cure (acetone)	Adheres to plastics	○				21
General industrial purpose	KE-41	Condensation cure (acetic acid)	High viscosity	○				18
	KE-42	Condensation cure (acetic acid)	Paste	○				18
	KE-44	Condensation cure (oxime)	High viscosity	○				18
	KE-441	Condensation cure (oxime)	Low viscosity	○	○			18
	KE-445	Condensation cure (oxime)	Low viscosity	○	○			18
	KE-45	Condensation cure (oxime)	Paste	○				18
	KE-45-S	Condensation cure (oxime)	Solvent/diluent type	○	○			18

Two-component (three-component) RTV silicone rubber

General electrical purpose	KE-103	Addition cure	Transparent rubber, will cure at room temperature		○			22
	KE-108	Condensation cure (alcohol)	Transparent rubber, will cure at room temperature		○			22
	KE-119	Condensation cure (alcohol)	Potting, high hardness		○			22
	KE-66	Condensation cure (alcohol)	Potting, self-bonding	○	○	○		19, 22
	KE-200	Condensation cure (acetone)	Rapid-cure potting, self-bonding, reduced LMW siloxane	○		○		22
	KE-1800T-A/B	Addition cure	Translucent rubber, adhesive	○				19
	KE-1031-A/B	Addition cure	Transparent rubber, adhesive	○	○	○		22
	KE-1051J-A/B	Addition cure	Transparent gel, high viscosity, will cure at room temperature			○		23
	KE-1012-A/B	Addition cure	Transparent gel, will cure at room temperature			○		23
	KE-106	Addition cure	Transparent rubber, high hardness			○		22
	KE-109E-A/B	Addition cure	Transparent rubber, adhesive		○	○		22
	KE-118	Condensation cure (alcohol)	Self-bonding	○		○		19
Non-flammable (UL certified product* ¹)	KE1204A/B	Addition cure	Reduced LMW siloxane			○		22
	KE1204AL/BL	Addition cure	Low viscosity, reduced LMW siloxane			○		22
	KE-1281-A/B	Addition cure	Adhesive, low hardness, reduced LMW siloxane	○		○		21, 22
	KE1800A/B/C	Addition cure	Adhesive, high hardness	○				19
	KE-1801-A/B/C	Addition cure	Adhesive, high hardness	○				19
	KE1802A/B/C	Addition cure	Adhesive, high hardness	○				19
Foaming	KE-513-A/B	Condensation cure (hydrogen)	Filling, foaming, triple-volume foam	○				25
	KE-521-A/B	Addition cure (hydrogen)	Filling, foaming, triple-volume foam	○				25
Thermal conductivity	KE-1861-A/B	Addition cure	Adhesive, Thermal conductivity (0.83 W/m-K)	○		○	○	24

LMW: low-molecular-weight

■ Sealing – General industrial purpose

Grade		One-component room-temperature cure				
		KE-45	KE-44	KE-441	KE-445	KE-45S
Cure type (by-product gas)		Condensation (oxime)	Condensation (oxime)	Condensation (oxime)	Condensation (oxime)	Condensation (oxime)
Brief description		Paste	High viscosity	Low viscosity	Low viscosity	Solvent/diluent type
Appearance	Consistency	Paste	Viscous liquid	Liquid	Liquid	Toluene solution
	Color	See p. 28	See p. 28	See p. 28	See p. 28	See p. 28
Viscosity	Pa·s	—	70	15	5	0.6
Density 23°C	g/cm ³	1.05	1.04	1.04	1.05	1.05
Hardness Durometer A		30	25	20	25	20
Tensile strength	MPa	2.0	2.0	1.7	2.0	2.0
Elongation at break	%	350	300	280	200	350
Volume resistivity	TΩ·m	5	5	5	5	5
Dielectric breakdown strength*	kV	23	20	20	25	21
Dielectric constant 50 Hz		3.0	2.8	2.8	2.8	3.0
Dissipation factor 50 Hz		5×10 ⁻³	5×10 ⁻³	5×10 ⁻³	5×10 ⁻³	5×10 ⁻³
Thermal conductivity	W/m·K	0.21	0.21	0.21	0.21	0.21
Tack-free time	min	6	40	60	20	60
Lap shear strength	MPa	1.0 (aluminum)	1.2 (aluminum)	1.0 (aluminum)	0.3 (aluminum)	—

Data: Relationship between cure speed and temperature and humidity (KE-44, 45, 441, 42) ... p. 6 *Measured by 1 mm
 Outdoor exposure testing (KE-45) ... p. 11
 Chemical resistance (KE-42-AL) ... p. 12

(Not specified values)

■ Sealing – General electrical purpose (one-component)

Grade		One-component room-temperature cure		
		KE-40RTV	KE-42	KE-41
Cure type (by-product gas)		Condensation (oxime)	Condensation (acetic acid)	Condensation (acetic acid)
Brief description		UL certified product	Paste	High viscosity
Appearance	Consistency	Paste	Paste	Viscous liquid
	Color	See p. 28	See p. 28	See p. 28
Viscosity	Pa·s	—	—	100
Density 23°C	g/cm ³	1.58	1.05	1.04
Hardness Durometer A		60	28	30
Tensile strength	MPa	2.9	2.0	2.5
Elongation at break	%	200	400	250
Volume resistivity	TΩ·m	1	1	1
Dielectric breakdown strength*	kV	25	22	20
Dielectric constant 50 Hz		3.9	3.0	2.9
Dissipation factor 50 Hz		1×10 ⁻²	5×10 ⁻³	5×10 ⁻³
Thermal conductivity	W/m·K	0.42	0.21	0.21
Tack-free time	min	12	5	6
Lap shear strength	MPa	1.0 (aluminum)	1.0 (aluminum)	1.0 (aluminum)

*Measured by 1 mm

(Not specified values)

One-component room-temperature cure		
KE-348	KE-3479	KE-347
Condensation (acetone)	Condensation (acetone)	Condensation (acetone)
Paste	High viscosity	Medium viscosity
Paste	High viscosity	Medium viscosity
See p. 28	See p. 28	See p. 28
—	75	55
1.05	1.06	1.04
30	30	30
2.0	2.5	2.5
400	350	300
1	2	3
23	20	25
3.0	2.9	2.9
4×10 ⁻³	3×10 ⁻³	3×10 ⁻³
0.21	0.21	0.21
1	2	4
1.2 (aluminum)	1.5 (aluminum)	1.0 (aluminum)

Data:

Relationship between cure speed and temperature and humidity (KE-348) ... p. 6
 Change in adhesive strength over time (KE-3475, 347, 348) ... p. 8
 Adhesion after outdoor submersion in water (KE-348) ... p. 11
 *Measured by 1 mm

(Not specified values)

■ Sealing – General electrical purpose (one-component)

Grade		One-component heat cure					
		KE-1820	KE-1825	KE-1830	KE-1831	KE-1833	KE-1842
Cure type		Addition	Addition	Addition	Addition	Addition	Addition
Brief description		High viscosity	Paste	High viscosity	Non-flammable UL V-0 certified product	Good adhesion to PPS, heat resistant	Low hardness
Appearance	Consistency	Paste	Paste	High viscosity	Paste	High viscosity liquid	Low viscosity
	Color	Opaque white	Opaque white	Light gray	Black	Reddish brown	White
Viscosity	Pa·s	—	—	110	120	140	4.0
Density 23°C	g/cm ³	1.08	1.06	1.27	1.28	1.34	1.00
Curing conditions, standard cure time		120°C×1 h	120°C×1 h	120°C×1 h	120°C×1 h	120°C×1 h	120°C×1 h
Hardness Durometer A		45	29	40	30	33	10
Tensile strength	MPa	5.4	3.3	4.3	3.9	3.4	0.4
Elongation at break	%	600	600	300	400	330	200
Volume resistivity	TΩ·m	4	2	5	2	2	1
Dielectric breakdown strength	kV	25	22	25	25	25	20
Dielectric constant 50 Hz		3.5	3.5	3.5	3.5	3.5	3.5
Dissipation factor 50 Hz		5×10 ⁻³	5×10 ⁻³	5×10 ⁻³	5×10 ⁻³	5×10 ⁻³	5×10 ⁻³
Thermal conductivity	W/m·K	0.25	0.20	0.27	0.27	—	—
Lap shear strength	MPa	2.0 (aluminum)	1.5 (aluminum)	2.0 (aluminum)	2.3 (aluminum)	1.8 (aluminum)	0.2 (aluminum)

*Measured by 1 mm

(Not specified values)

■ Sealing/General electrical purpose (two-component)

Grade		Two-component room-temperature cure		Two-component heat cure			
		KE-118	KE-66	KE1800A/B/C	KE-1801-A/B/C	KE1802A/B/C	KE-1800T-A/B
Cure type		Condensation (alcohol)	Condensation (alcohol)	Addition	Addition	Addition	Addition
Brief description		Self-bonding	Self-bonding	UL certified product, adhesive, high strength			Translucent, adhesive, high strength
Appearance	Consistency	Liquid	Liquid	Paste	Paste	Paste	Paste
	Color	Light gray	Light gray	A: white B/C: colorless transparent	A:white B/C: colorless transparent	A:black B/C: colorless transparent	A/B: translucent
Viscosity	Pa·s	2	5	A:350/B:14/C:0.25×10 ⁻³	A:350/B:14/C:0.25×10 ⁻³	A:300/B:14/C:0.25×10 ⁻³	A:350 / B:200
Density 23°C	g/cm ³	1.14	1.25	1.10	1.10	1.10	1.08
Curing conditions, standard cure time		23°C×72 h	23°C×72 h	120°C×1 h	120°C×1 h	120°C×1 h	120°C×1 h
Hardness Durometer A		45	40	28	28	30	26
Tensile strength	MPa	1.5	1.5	5.0	5.0	5.0	5.5
Elongation at break	%	90	140	600	600	600	600
Volume resistivity	TΩ·m	4	4	0.5	0.1	0.1	1
Dielectric breakdown strength*	kV	25	25	25	25	25	23
Dielectric constant 50 Hz		3.3	—	3.1	3.1	3.1	—
Dissipation factor 50 Hz		4×10 ⁻³	—	1×10 ⁻³	1×10 ⁻³	5×10 ⁻³	—
Thermal conductivity	W/m·K	0.17	—	0.17	0.17	0.17	0.17
Workable time 23°C	h	0.3	1.5	4.0	4.0	6.0	6.0
Lap shear strength	MPa	—	0.6 (copper) 0.6 (Bakelite)	1.7 (glass) 1.7 (polycarbonate)	1.7 (glass) 1.7 (polycarbonate)	1.7 (glass) 1.7 (polycarbonate)	1.5 (PBT)
Name of curing agent		CAT-118-BL	CAT-RC	KE1800B (KE1800C)	KE1800B (KE1800C)	KE1800B (KE1800C)	—
Blend ratio		100 / 5	100 / 2	100 / 10 / 2	100 / 10 / 2	100 / 10 / 2	100 / 100

*Measured by 1 mm

(Not specified values)

■ Testing method: complies with JIS K 6249. [Conversion to old JIS units] Viscosity: 10 P=1 Pa·s; Strength: 10 kgf/cm²=0.98 MPa; Volume resistivity: 10¹⁴ Ω·cm=1 T Ω·m

■ Sealing/reduced low-molecular-weight siloxane types

Grade		One-component room-temperature cure				
		KE-4898	KE-4897	KE-4896	KE-4895	KE-4890
Cure type (by-product gas)		Condensation (alcohol)	Condensation (alcohol)	Condensation (alcohol)	Condensation (alcohol)	Condensation (alcohol)
Brief description		Paste	High viscosity	Medium viscosity	Low viscosity	UL certified product
Appearance	Consistency	Paste	High viscosity	Medium viscosity	Low viscosity	Paste
	Color	See p. 28	See p. 28	See p. 28	See p. 28	See p. 28
Viscosity	Pa·s	—	100	50	5	—
Density 23°C	g/cm ³	1.04	1.06	1.04	1.04	1.48
Hardness Durometer A		40	40	38	40	50
Tensile strength	MPa	2.2	2.0	1.7	1.5	2.0
Elongation at break	%	360	200	170	140	200
Volume resistivity	TΩ·m	30	50	50	90	6
Dielectric breakdown strength*	kV	25	24	20	20	25
Dielectric constant 50 Hz		2.8	2.8	2.8	2.8	3.4
Dissipation factor 50 Hz		1×10 ⁻³	1×10 ⁻³	1×10 ⁻³	1×10 ⁻³	4×10 ⁻³
Thermal conductivity	W/m·K	—	—	—	—	0.33
Tack-free time	min	6	12	12	11	6
Lap shear strength	MPa	0.8 (aluminum)	0.8 (aluminum)	0.8 (aluminum)	0.5 (aluminum)	1.3 (aluminum)
LMW content $\sum D_3-D_{10}$	ppm	< 300	< 300	< 300	< 300	< 300

* Measured by 1 mm

LMW: low-molecular-weight

(Not specified values)

Grade		One-component room-temperature cure				
		KE-3490	KE-3494	KE-3498	KE-3497	KE-3495
Cure type (by-product gas)		Condensation (acetone)	Condensation (acetone)	Condensation (acetone)	Condensation (acetone)	Condensation (acetone)
Brief description		UL certified product	UL certified product	Paste	Medium viscosity	Low viscosity
Appearance	Consistency	Paste	Medium viscosity	Paste	Medium viscosity	Low viscosity
	Color	Gray	Gray	See p. 28	See p. 28	See p. 28
Viscosity	Pa·s	—	50	—	40	5.5
Density 23°C	g/cm ³	1.18	1.40	1.07	1.07	1.03
Hardness Durometer A		43	35	45	35	30
Tensile strength	MPa	2.5	2.5	3.9	3.0	1.1
Elongation at break	%	350	250	480	250	200
Volume resistivity	TΩ·m	3	3	1	2	4
Dielectric breakdown strength*	kV	28	25	25	24	20
Dielectric constant 50 Hz		3.3	3.5	3.0	3.0	2.8
Dissipation factor 50 Hz		1×10 ⁻²	1×10 ⁻²	1×10 ⁻³	3×10 ⁻³	3×10 ⁻³
Thermal conductivity	W/m·K	0.25	0.42	0.21	0.21	0.21
Tack-free time	min	3	8	1	13	11
Lap shear strength	MPa	1.5 (aluminum)	1.5 (aluminum)	1.5 (aluminum)	0.7 (aluminum)	0.3 (aluminum)
LMW content $\sum D_3-D_{10}$	ppm	< 300	< 300	< 300	< 300	< 300

* Measured by 1 mm

LMW: low-molecular-weight

(Not specified values)

■ Sealing/reduced low-molecular-weight siloxane types

Grade		One-component room-temperature cure			
		KE-3418 ^{*2}	KE-3417 ^{*2}	KE-3427	KE-3428
Cure type (by-product gas)		Condensation (acetone)	Condensation (acetone)	Condensation cure (acetone)	Condensation cure (acetone)
Brief description		Can not be used as an insulator	Can not be used as an insulator	Adheres to plastics	Adheres to plastics
Appearance	Consistency	Paste	Medium viscosity	Medium viscosity	Paste
	Color	Black	Black	Gray	Gray
Viscosity	Pa·s	—	45	55	—
Density 23°C	g/cm ³	1.09	1.05	1.01	1.05
Hardness Durometer A		45	35	24	32
Tensile strength	MPa	2.0	1.4	0.4	1.5
Elongation at break	%	200	200	260	320
Volume resistivity	TΩ·m	1×10 ⁻¹⁰	0.2	40	40
Dielectric breakdown strength ^{*1}	kV	5	5	22	22
Dielectric constant 50 Hz		—	10.5	2.8	2.8
Dissipation factor 50 Hz		—	8×10 ⁻²	2×10 ⁻³	2×10 ⁻³
Thermal conductivity	W/m·K	0.33	0.25	—	—
Tack-free time	min	5	12	6	3
Lap shear strength	MPa	1.4 (aluminum)	0.8 (aluminum)	0.4 (aluminum)	1.3 (aluminum)
LMW content $\sum D_3\text{-}D_{10}$	ppm	< 300	< 300	< 300	< 300

*1 Measured by 1 mm

(Not specified values)

*2 KE-3417 and KE-3418 are not suitable for use as insulators.

Grade		One-component room-temperature cure			One-component heat cure			Two-component heat cure
		KE-3424-G	KE-3491	KE-3492	KE-1884	KE-1885	KE-1886	KE-1281-A/B
Cure type (by-product gas)		Condensation (acetone)	Condensation (acetone)	Condensation (acetone)	Addition	Addition	Addition	Addition
Brief description		Reduced ultra-low-molecular-weight siloxane product, UL certified, electrode coating material	Conductive	Conductive	Low-temperature curing	Low-temperature curing	Low-temperature curing	Adhesive, low hardness, UL certified product
Appearance	Consistency	Low viscosity	Paste	Paste	Medium viscosity	High viscosity	Low viscosity	Low viscosity
	Color	Gray	Black	Black	White	White	Creamy white	A: black / B: light gray
Viscosity	Pa·s	20	—	—	55	100	12	A: 2 / B: 1
Density 23°C	g/cm ³	1.32	1.09	1.88	1.22	1.14	1.03	1.37
Curing conditions, standard cure time		—	—	—	100°C×1 h	100°C×1 h	100°C×1 h	100°C×1 h
Hardness Durometer A		50	50	85	35	36	29	20
Tensile strength	MPa	4.0	3.0	2.0	3.5	3.5	2.9	1.0
Elongation at break	%	180	350	30	230	300	160	140
Volume resistivity	TΩ·m	40	2 ^{*2}	0.002 ^{*2}	10	10	10	1
Dielectric breakdown strength ^{*1}	kV	22	—	—	25	25	25	27
Dielectric constant 50 Hz		3.6	—	—	3.1	3.1	3.1	3.5
Dissipation factor 50 Hz		8.8×10 ⁻³	—	—	1×10 ⁻³	1×10 ⁻³	1×10 ⁻³	1×10 ⁻³
Thermal conductivity	W/m·K	0.4	—	0.84	—	—	—	0.28
Tack-free time	min	6	5	2	—	—	—	7 ^{*3}
Lap shear strength	MPa	0.4 (aluminum)	1.0 (aluminum)	1.0 (aluminum)	1.6 (PBT)	2.0 (aluminum)	0.8 (aluminum)	0.3 (aluminum)
Blend ratio		—	—	—	—	—	—	100 / 100
LMW content $\sum D_3\text{-}D_{10}$	ppm	$\sum D_3\text{-}D_{20} < 300$ ^{*4}	< 300	< 300	< 100	< 100	< 100	< 500

*1 Measured by 1 mm *2 KE-3491, KE-3492: unit = Ω·m *3 Workable time (23°C : h) *4 KE-3424-G is a high-grade product, $\sum D_n$ (n=3-20) <300 ppm

(Not specified values)

LMW: low-molecular-weight

■ Testing method: complies with JIS K 6249. [Conversion to old JIS units] Viscosity: 10 P=1 Pa·s; Strength: 10 kgf/cm²=0.98 MPa; Volume resistivity: 10¹⁴ Ω·cm=1 T Ω·m

■ Potting (rubber)

Grade		Two-component room-temperature cure				
		KE-119	KE-66	KE-103	KE-108	KE-200
Cure type (by-product gas)		Condensation (alcohol)	Condensation (alcohol)	Addition	Condensation (alcohol)	Condensation (acetone)
Brief description		High hardness	Self-bonding	Transparent, room-temperature cure	Transparent, room-temperature cure	Reduced LMW siloxane, rapid cure
Appearance	Consistency	Low viscosity	Low viscosity	Low viscosity	Liquid	Low viscosity
	Color	Reddish brown	Light gray	Colorless transparent	Colorless transparent	Colorless translucent
Viscosity	Pa·s	17	5	1	0.7	2.8
Density 23°C	g/cm ³	1.47	1.25	0.97	0.98	1.01
Curing conditions, standard cure time		23°C×72 h	23°C×72 h	23°C×72 h	23°C×72 h	23°C×72 h
Hardness Durometer A		68	40	24	31	25
Tensile strength MPa		5.0	1.5	0.2	—	0.4
Elongation at break %		100	140	100	—	100
Volume resistivity TΩ·m		1	4	0.8	0.1	60
Dielectric breakdown strength*1 kV		23	25	20	23	20
Dielectric constant 50 Hz		—	—	3.1	—	2.9
Dissipation factor 50 Hz		—	—	1×10 ⁻³	—	3×10 ⁻³
Thermal conductivity W/m·K		0.23	—	0.15	0.15	0.21
Workable time 23°C h		2.0	1.5	3.0	6.0	0.58
Lap shear strength MPa		—	0.6 (copper) 0.6 (Bakelite)	—	—	0.4 (aluminum)
Name of curing agent		CAT-RP	CAT-RC	CAT-103	CAT-108	CX-200
Blend ratio		100 / 10	100 / 2	100 / 5	100 / 5	100 / 10
LMW content $\sum D_3\text{--}D_{10}$ ppm		—*2	—*2	—*2	—*2	< 300

Data: Adhesion to various materials (KE-200) ... p. 8 *1 Measured by 1 mm *2 Not a reduced LMW siloxane product

(Not specified values)

LMW: low-molecular-weight

Grade		Two-component heat cure					
		KE1204A/B	KE1204AL/BL	KE-1031-A/B	KE-106	KE-109E-A/B	KE-1281-A/B
Cure type		Addition	Addition	Addition	Addition	Addition	Addition
Brief description		Reduced LMW siloxane		Transparent, adhesive	Transparent, high strength	Transparent, adhesive	UL certified product, low hardness, reduced LMW siloxane
Appearance	Consistency	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid
	Color	A: reddish brown / B: light gray	A: reddish brown / B: light gray	A/B: colorless transparent	Colorless transparent	A/B: colorless transparent	A: black / B: light gray
Viscosity	Pa·s	A: 6 / B: 4	A: 4 / B: 2	A: 1 / B: 0.7	3.5	A: 1 / B: 1	A: 2 / B: 1
Density 23°C	g/cm ³	1.54	1.52	0.97	1.02	1.00	1.37
Curing conditions, standard cure time		100°C×15 min	100°C×15 min	80°C×2 h	150°C×30 min	100°C×1 h	100°C×1 h
Hardness Durometer A		70	65	20	56	25	20
Tensile strength MPa		3.5	3.0	0.4	8.0	1.3	1.0
Elongation at break %		70	80	150	100	140	140
Volume resistivity TΩ·m		1	2	0.1	3	6	1
Dielectric breakdown strength*1 kV		27	27	20	23	23	27
Dielectric constant 50 Hz		3.2	3.3	3.1	3.1	2.8	3.5
Dissipation factor 50 Hz		1×10 ⁻³	5×10 ⁻³	1×10 ⁻³	5×10 ⁻³	6×10 ⁻⁴	0.001
Thermal conductivity W/m·K		0.45	0.29	0.15	0.15	0.15	0.28
Workable time 23°C h		8.0	8.0	4.0	2.0	4.0	7.0
Lap shear strength MPa		—	—	0.1 (aluminum)	—	0.2 (aluminum)	0.3 (aluminum)
Name of curing agent		—	—	—	CAT-RG	—	—
Blend ratio		100 / 100	100 / 100	100 / 100	100 / 10	100 / 100	100 / 100
LMW content $\sum D_3\text{--}D_{10}$ ppm		< 500	< 500	—*2	—*2	—*2	< 500

Data: Relationship between cure speed and time (KE1204) ... p. 7

*1 Measured by 1 mm *2 Not a reduced LMW siloxane product

(Not specified values)

Relationship of quantity of added diluent and various physical properties (KE-1204-THINNER) ... p. 14 LMW: low-molecular-weight

■ Potting (gel)

Grade	One-component heat cure			Two-component room-temperature cure		
	KE-1056	KE-1151	FE-57	KE-1051J-A/B	KE-1012-A/B	
Cure type	Addition	Addition	Addition	Addition	Addition	
Brief description	Low-temperature-resistant, transparent gel	Low-temperature-resistant, thixotropic gel	Oil- and solvent-resistant gel	Transparent gel	Transparent gel	
Appearance	Consistency	Liquid	Liquid	Liquid	Liquid	
	Color	Slightly clouded color	Translucent	Light brown	A/B: colorless transparent	A/B: colorless transparent
Viscosity ^{*1}	mPa·s	800	2,500	2,000	A: 800 / B: 600	A: 1,000 / B: 800
Specific gravity 25°C		0.98	1.00 ^{*4}	1.28	0.97	0.97
Curing conditions / Standard cure time		130°C×30 min	130°C×30 min	125°C×2 h	23°C×24 h	110°C×30 min
Hardness Penetration ^{*2}		90	90	60	65	50
Tensile strength	MPa	—	—	—	—	—
Volume resistivity	TΩ·m	8.0	8.0	0.02	10	8.0
Dielectric breakdown strength ^{*3}	kV	14	18	—	—	14
Dielectric constant 50 Hz		3.0	3.0	7.0	3.0	3.0
Dissipation factor 50 Hz		5×10 ⁻⁴	5×10 ⁻⁴	1×10 ⁻²	5×10 ⁻⁴	5×10 ⁻⁴
Thermal conductivity	W/m·K	0.2	0.2	—	0.2	0.2
Workable time 23°C	h	—	—	—	1.0	4.0
Blend ratio		—	—	—	100 / 100	100 / 100

*1 1,000 mPa·s=1 Pa·s

*2 Hardness (penetration) – see figure below.

*3 Measured by 1 mm

*4 Testing temperature: 23°C

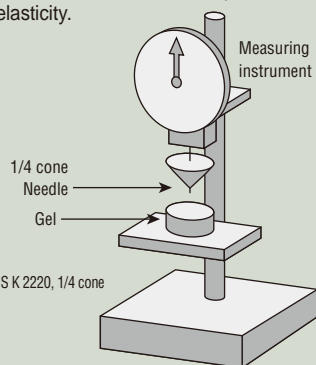
(Not specified values)

Hardness (penetration)

Because the modulus of elasticity of silicone gel is less than 10⁵ Nm/m², it cannot be measured with common sclerometers.

Hardness (penetration) is usually measured as illustrated in the figure below.

Furthermore, there is a correlation between penetration and modulus of elasticity.



Coating

Grade		One-component room-temperature cure					One-component heat cure	
		KE-3423	KE-3475	KE-3495	KE-4895	KE-3424-G	KE-1842	KE-1886
Cure type (by-product gas)		Condensation (acetone)	Condensation (acetone)	Condensation (acetone)	Condensation (alcohol)	Condensation (acetone)	Addition	Addition
Brief description		Reduced LMW siloxane product	Low viscosity	Reduced LMW siloxane product	Reduced LMW siloxane product	Reduced ultra-LMW siloxane, UL certified, electrode coating material	Low viscosity, low hardness	Reduced LMW siloxane, low-temperature curing
Appearance	Consistency	Low viscosity	Low viscosity	Low viscosity	Low viscosity	Low viscosity	Low viscosity	Low viscosity
	Color	Pale yellow cloudy white	See p. 28	See p. 28	See p. 28	Gray	White	Creamy white
Viscosity	Pa·s	0.6	2.5	5.5	5	20	4.0	12
Density 23°C	g/cm ³	0.98	1.04	1.03	1.04	1.32	1.00	1.03
Curing conditions, standard cure time		—	—	—	—	—	120°C×1 h	100°C×1 h
Hardness Durometer A		20	25	30	40	50	13	29
Tensile strength		0.5	1.0	1.1	1.5	4.0	0.4	2.9
Elongation at break		140	200	200	140	180	200	160
Volume resistivity		60	3	4	90	40	1	10
Dielectric breakdown strength ^{*1}		25	22	20	20	22	20	25
Dielectric constant 50 Hz		3.0	3.0	2.8	2.8	3.6	3.5	3.1
Dissipation factor 50 Hz		3×10 ⁻³	3×10 ⁻³	3×10 ⁻³	1×10 ⁻³	8.8×10 ⁻³	5×10 ⁻³	1×10 ⁻³
Thermal conductivity		0.17	0.21	0.21	—	0.4	—	—
Tack-free time		5	5	11	11	6	—	—
Lap shear strength		0.3 (aluminum)	0.4 (aluminum)	0.3 (aluminum)	0.5 (aluminum)	0.4 (aluminum)	0.2 (aluminum)	0.8 (aluminum)
LMW content $\sum D_3-D_{10}$ ppm		< 300	— ^{*2}	< 300	< 300	$\sum D_3-D_{20} < 300$ ^{*3}	— ^{*2}	< 100

*1 Measured by 1 mm *2 Not a reduced LMW siloxane product *3 KE-3424-G is a high-grade product, $\sum D_n (n=3-20) < 300$ ppm LMW: low-molecular-weight (Not specified values)

Thermally conductive types

Grade		One-component room-temperature cure			One-component heat cure			Two-component heat cure
		KE-3493	KE-3466	KE-3467	KE-1862	X-32-2020	KE-1867	KE-1861-A/B
Cure type (by-product gas)		Condensation (acetone)	Condensation cure (acetone)	Condensation cure (acetone)	Addition	Addition	Addition cure	Addition
Brief description		Reduced LMW siloxane product	Reduced LMW siloxane product, UL certified	Reduced LMW siloxane product, UL certified	Medium viscosity	Reduced LMW siloxane product	Reduced LMW siloxane product, UL certified	Adhesive, thermally conductive
Appearance	Consistency	Paste	Medium viscosity	High viscosity	Medium viscosity	High viscosity	Medium viscosity	Medium viscosity
	Color	See p. 28	White	White	Gray	Gray	Gray	A/B: light gray
Viscosity	Pa·s	—	50	100	60	100	60	A: 50 / B: 50
Density 23°C	g/cm ³	1.46	2.80	2.90	2.22	2.82	2.92	2.22
Curing conditions, standard cure time		—	—	—	120°C×1 h	120°C×1 h	120°C×1 h	120°C×1 h
Hardness Durometer A		73	88	91	83	78	75	75
Tensile strength		2.0	3.1	3.6	6.0	2.5	2.1	6.4
Elongation at break		70	30	30	80	40	60	80
Volume resistivity		1	2.9	5.9	10	1.0	1.2	10
Dielectric breakdown strength ^{*1}		35	24	25	25	23	23	25
Dielectric constant 50 Hz		4.2	5.9	4.6	4.0	5.0	6.7	4.0
Dissipation factor 50 Hz		2×10 ⁻³	4.7×10 ⁻³	4.0×10 ⁻³	1.6×10 ⁻³	2.0×10 ⁻³	4.5×10 ⁻³	1.6×10 ⁻³
Thermal conductivity		1.6	1.9	2.4	0.83	1.9	2.2	0.83
Tack-free time		1	7	4	—	—	—	5.0 ^{*2}
Lap shear strength		0.8 (aluminum)	0.5 (aluminum)	0.5 (aluminum)	1.3 (aluminum)	1.0 (aluminum)	1.0 (aluminum)	1.0 (aluminum)
Name of curing agent		—	—	—	—	—	—	—
Blend ratio		—	—	—	—	—	—	100 / 100
LMW content $\sum D_3-D_{10}$ ppm		< 300	< 300	< 300	— ^{*3}	< 500	< 300	— ^{*3}

*1 Measured by 1 mm *2 Workable time (23°C : h) *3 Not a reduced LMW siloxane product (Not specified values)
LMW: low-molecular-weight

■ Foams

		Two-component room-temperature cure	
Grade		KE-513-A/B	KE-521-A/B
Cure type (by-product gas)		Condensation (hydrogen)	Addition (hydrogen)
Brief description		Triple-volume foaming	Triple-volume foaming
Appearance	Consistency	Low viscosity	Low viscosity
	Color	A: white / B: black	A: black / B: white
Viscosity	Pa·s	A: 4 / B: 6	A: 8 / B: 3
Density 23°C	g/cm ³	Approx. 0.5	Approx. 0.5
Curing conditions, standard cure time		23°C×24 h	23°C×24 h
Hardness Durometer A		10	14
Tensile strength	MPa	0.2	0.2
Elongation at break	%	110	120
Volume resistivity	TΩ·m	2	4
Dielectric breakdown strength*1	kV	15	15
Dielectric constant 50 Hz		2.6	2.2
Dissipation factor 50 Hz		2×10 ⁻³	5×10 ⁻³
Thermal conductivity	W/m·K	0.22	0.23
Workable time 23°C	h	0.2	0.15
Blend ratio		100:10	100:100

*1 Measured by 1 mm

(Not specified values)



■ Oil- and solvent-resistant types (fluorosilicone)

		One-component room-temperature cure	One-component heat cure		
Grade		FE-123	FE-61	X-32-1619	FE-57
Cure type (by-product gas)		Condensation (acetic acid)	Addition	Addition	Addition
Brief description		Oil- and solvent-resistant	Oil- and solvent-resistant	Oil- and solvent-resistant	Oil- and solvent-resistant gel
Appearance	Consistency	Paste	Medium viscosity	Low viscosity	Low viscosity
	Color	See p. 28	Light gray	Light gray	Light brown
Viscosity	Pa·s	—	60	20	2
Density 23°C	g/cm ³	1.34	1.43	1.46	1.28*2
Curing conditions, standard cure time		—	120°C×1 h	120°C×1 h	125°C×2 h
Hardness Durometer A		40	25	25	—
Tensile strength	MPa	2.5	1.7	1.1	—
Elongation at break	%	250	170	130	—
Volume resistivity	GΩ·m	0.1	2.0	2.0	20
Dielectric breakdown strength*1	kV	17	18	18	—
Dielectric constant 50 Hz		8.0	6.5	6.5	7.0
Dissipation factor 50 Hz		3×10 ⁻²	1×10 ⁻²	1×10 ⁻²	1×10 ⁻²
Thermal conductivity	W/m·K	0.17	—	—	—
Tack-free time	min	5	—	—	—
Lap shear strength	MPa	1.0 (aluminum)	0.6 (aluminum)	0.2 (aluminum)	—

*1 Measured by 1 mm *2 25°C

(Not specified values)

■ Testing method: complies with JIS K 6249. [Conversion to old JIS units] Viscosity: 10 P=1 Pa·s; Strength: 10 kgf/cm²=0.98 MPa; Volume resistivity: 10¹⁴ Ω·cm=1 T Ω·m

■ Primers

Grade	RTV type compatibility	Intended substrate	Characteristics	Drying time 23°C (min)	Usage amount (g/m ²)	Packaging			UN No.
PRIMER-C	One-component condensation cure type	Glass, enamel, tile, porcelain, metal, plastic	Pale yellow transparent liquid, rubber volatile oil	15	35	100 g (bottle)	250 g (square can)	1 kg (can)	UN-1133
PRIMER-MT	One-component condensation cure type	Stone, mortar, slate, concrete	Colorless transparent liquid, toluene, isopropanol	30	200	100 g (bottle)	250 g (square can)	1 kg (can)	UN-1866
PRIMER-T	One- and two-component condensation cure types	Plastic	Colorless transparent liquid, toluene, isopropanol	15	50	100 g (bottle)	250 g (square can)	1 kg (can)	UN-1866
PRIMER-D-2	One-component condensation cure type	Fluorine paint, PVC, plastic	Colorless transparent liquid, ethanol	30	100	100 g (bottle)	250 g (square can)	—	UN-1133
PRIMER-U	One-component condensation cure type	Plastic, metal	Colorless transparent liquid, volatile oil	15	30	100 g (bottle)	250 g (square can)	1 kg (can)	UN-1133
PRIMER-S	One- and two-component condensation cure types	Metals	Colorless transparent liquid	30	35	100 g (bottle)	500 g (bottle)	1 kg (poly bottle)	UN-1866
PRIMER-NO.4	One- and two-component addition cure types	Plastic, metal	Aliphatic hydrocarbon	40	35	100 g (bottle)	—	1 kg (can)	UN-1133

Data: primer selection standards – p. 15; preparation and usage – p. 30

■ Curing agents

Grade	Compatible base resin	Consistency and appearance	Packaging			UN No.
CAT-103	KE-103	Colorless transparent liquid	50 g (bottle)	—	800 g (can)	Not applicable
CAT-RG	KE-106	Colorless transparent liquid	—	100 g (bottle)	900 g (can)	Not applicable
CAT-108	KE-108	Colorless to pale yellow liquid	50 g (bottle)	—	800 g (can)	UN-1760
CAT-118-BL	KE-118	Blue transparent liquid	50 g (bottle)	100 g (bottle)	800 g (can)	UN-1993
CAT-RC	KE-66	Colorless transparent liquid	20 g (bottle)	40 g (bottle)	800 g (can)	UN-1760
CAT-RP	KE-119	Light blue liquid	—	100 g (bottle)	1 kg (can)	UN-3802
CX-200	KE-200	Blue liquid	—	100 g (bottle)	900 g (can)	UN-3267
KE1800B	KE1800-KE-1801-KE1802	Colorless transparent	—	100 g (bottle)	1 kg (can)	Not applicable
KE1800C	KE1800-KE-1801-KE1802	Colorless transparent	20 g (bottle)	—	400 g (can)	UN-1866

■ Diluents, Additives and Coatings

	Diluent		Additive				Coating
Category	Thinner		Cure accelerator		Cure retardant		Agent to prevent curing inhibition
Grade	RTV-THINNER	KE-1204-THINNER	CAT-RS	X-93-405	WETTER-NO.5	SEIGYOZAI-NO.6-10	BARRIER-COAT NO.6
Characteristics	Colorless transparent liquid	Colorless transparent liquid	Pale yellow to pale yellowish brown liquid	Pale yellow liquid	Colorless transparent liquid	Colorless transparent liquid	Colorless transparent liquid
Compatible base resin	Two-component condensation cure type	Two-component addition cure type	Two-component condensation cure type	Two-component addition cure type	Two-component condensation cure type	Two-component addition cure type	Two-component addition cure type
Usage amount	As needed per application (<10%)	1~3%	0.1~0.5%	Up to 1%	1~2%	Up to 1%	As needed
Effect	Can be used to adjust viscosity, but will also change general physical properties.	Can be used to adjust viscosity if used in the proportions shown above.	Greatly reduces cure time. Please note that workable time will also decrease proportionately.	Cure time can be reduced by half, but workable time will also be halved.	Workable time and cure time can be extended by approx. 2 times.	Workable time and cure time can be extended by approx. 2.5 times.	Application to the base form can prevent the incidence of curing inhibition and prevent the mutual bonding of RTV rubbers.
Handling precautions	Excessive amounts will adversely affect physical properties. Be sure to measure KE-1204-THINNER accurately.		Additives for condensation cure products and addition cure products differ, and cannot be used interchangeably. With cure accelerators and retardants, always accurately measure the specified curing agent and add the standard amount.				Cannot be used as an adhesive primer.
Packaging	1 kg (can)	1 kg (can)	100 g (bottle)	100 g (bottle)	100 g (bottle)	100 g (bottle)	100 g (bottle)
			1 kg (can)	1 kg (can)	1 kg (can)	1 kg (can)	1 kg (can)
UN No.	NON	NON	NON	NON	NON	NON	UN-1866

Data: Relationship of quantity of added diluent and various physical properties ... p. 14 BARRIER-COAT NO.6 ... p. 15

■ UL listing General RTV silicone rubbers correspond to UL 94HB, but the following products are UL registered.

Approved products [File no. E48923]

	Shin-Etsu grade	Reaction type (by-product gas)	UL list item	
			Registered product name Material Dsg	Level Flame Class (Min. Thk)
One-component room-temperature cure	KE-3494	Condensation (acetone)	KE-3494	94V-0 {1.5 mm} 94V-1 {0.75 mm}
	KE-3490	Condensation (acetone)	KE-3490	94V-0 {3.0 mm} 94V-1 {0.75 mm}
	KE-3467	Condensation (acetone)	KE-3467	94V-0 {2.0 - 2.2 mm} 94V-1 {0.8 mm}
	KE-3466	Condensation (acetone)	KE-3466	94V-1 {0.8 - 0.9 mm}
	KE-3424-G	Condensation (acetone)	KE-3424G	94V-1 {2.0 mm}
	KE-3497-T	Condensation (acetone)	KE-3497T	94HB {0.75 mm}
	KE-3497-W	Condensation (acetone)	KE-3497W	94HB {0.75 mm}
	KE-347	Condensation (acetone)	KE-347	94HB {0.75 mm}
	KE-4890	Condensation (alcohol)	KE-4890	94V-0 {0.75 mm}
	KE-40RTV	Condensation (oxime)	KE-40RTV	94V-0 {0.75 mm}
	KE-45	Condensation (oxime)	KE45&	94HB {1.5 mm}
One-component heat cure	KE-1831	Addition	KE-1831	94V-0 {0.75 mm}
	KE-1867	Addition	KE-1867	94V-0 {0.8 mm}
Two-component room-temperature	KE-200	Condensation (acetone)	KE-200	94HB {1.5 mm} 94V-1 {8.5mm}
Two-component heat cure	KE1204A/B KE1204AL/BL	Addition	KE-1204-LTV	94V-0 {0.89 mm}
	KE-1281-A/B	Addition	KE-1281	94V-1 {0.8 mm}
	KE1800	Addition	KE-1800	94V-0 {3.0 mm} 94V-1 {1.5 mm}
	KE1802	Addition	KE-1802	94V-0 {3.0 mm} 94V-1 {0.75 mm}

Figures within brackets { } indicate minimum thickness.

UL94 flammability classification criteria

Classification	Criteria
94V-0*	A set of 5 specimens is tested. The flaming combustion time for each specimen does not exceed 10 seconds, and total time for the set does not exceed 50 seconds.
94V-1*	A set of 5 specimens is tested. The flaming combustion time for each specimen does not exceed 30 seconds, and total time for the set does not exceed 250 seconds.
94HB	In the horizontal burn test, burning stops before the 100 mm reference mark.

*A rectangular test strip (width: 13.0 mm, length: 125 mm, thickness: smallest practical) is supported at one end. A 20 mm flame is applied to the free end for 10 seconds, then removed. The time that the strip continues to burn is measured. Once combustion stops, the flame is again applied in the same manner and combustion time is measured again.



Flame resistance testing left: silicone rubber / right: organic rubber

■ One-component RTV silicone rubber (room-temperature cure type)

Grade	Indicated color	100 g×20 tubes						330 mL×20 cartridges						1 kg×10 cans		UN No.
		W	T	B	G	R	Other	W	T	B	G	R	Other	W	T	
KE-3417				○						○						UN-1993
KE-3418				○						○						UN-3077
KE-3423														○		UN-1133
KE-3424-G					○ ^{*1}					○						UN-1993
KE-3427					○					○						UN-3082
KE-3428					○					○						UN-3082
KE-3466		○ ^{*2}							○							Not applicable
KE-3467		○ ^{*2}							○							Not applicable
KE-347*		○	○	○					○	○	○					UN-1993
KE-3475*		○	○						○	○				○	○	UN-1993
KE-3479*			○							○						UN-1993
KE-348*		○	○						○	○	○					Not applicable
KE-3490					○ ^{*3,4}						○					UN-3077
KE-3491				○						○						UN-3077
KE-3492				○ ^{*5}												UN-1866
KE-3493		○ ^{*6}							○							UN-3077
KE-3494					○ ^{*3}						○					UN-1993
KE-3495*		○	○						○	○				○		UN-3082
KE-3497*		○	○						○	○						UN-1993
KE-3498*		○							○							UN-3077
KE-40RTV*		○ ^{*7}			○ ^{*7}				○		○					Not applicable
KE-41*		○	○						○	○						Not applicable
KE-42*		○	○	○					○	○	○	○		○ AL		Not applicable
KE-44*		○	○	○	○				○	○	○	○				Not applicable
KE-441*		○	○			○			○	○			○			Not applicable
KE-445*		○							○	○	○		○		○	Not applicable
KE-45*		○	○	○		○	○ YW		○	○	○	○	○	○ YW		Not applicable
KE-45-S*														○	○	UN-1866
KE-4890*		○ ^{*8}			○ ^{*8}				○			○				Not applicable
KE-4895*		○	○						○	○						Not applicable
KE-4896*		○	○						○	○						Not applicable
KE-4897*		○	○						○	○						Not applicable
KE-4898*		○	○						○	○						Not applicable
FE-123*		○ ^{*9}	○ ^{*9}						○							Not applicable

*1 120 g×20 tubes *2 250 g×20 tubes *3 110 g laminated tube is available. *4 200 g×20 tubes are available.

*5 160 g×20 tubes *6 130 g×20 tubes *7 150 g×20 tubes *8 140 g×20 tubes *9 120 g×1 tube

Please contact our sales department separately regarding 15-20 kg pails.

W: white, T: transparent, B: black, G: gray, R: reddish brown,

GB: dark gray, YW: ivory, LG: light gray, AL: aluminum

★ When ordering products with this mark,

please specify the product name, color, packaging, and amount.

Example) Tube : KE-45-W, 100 g×20 tubes

Cartridge: KE-45-W, 330 mL×20 cartridges

■ One-component RTV silicone rubber (heat cure type)

Grade	100 g×20 tubes	330 mL×20 cartridges	1 kg×10 cans	UN No.
KE-1056			○: slightly clouded color	Not applicable
KE-1151			○: translucent	Not applicable
KE-1820	○: creamy white	○: creamy white	○: creamy white	Not applicable
KE-1825	○: creamy white	○: creamy white	○: creamy white	Not applicable
KE-1830	○: light gray	○: light gray	○: light gray	Not applicable
KE-1831	○: black			Not applicable
KE-1833		○: reddish brown/black	○: reddish brown	Not applicable
KE-1842	○: white		○: white	Not applicable
KE-1862	○ ^{*1} : gray		○: gray	Not applicable
KE-1867	○ ^{*1} : gray		○: gray	Not applicable
FE-57			○: light brown	Not applicable
FE-61	○ ^{*2} : light gray		○: light gray	Not applicable
KE-1884	○: white		○: white	Not applicable
KE-1885	○: white		○: white	Not applicable
KE-1886	○: creamy white		○: creamy white	Not applicable
X-32-1619	○ ^{*2} : light gray			Not applicable
X-32-2020	○ ^{*1} : gray		○: gray	Not applicable

*1 200 g×20 tubes

*2 130 g×20 tubes

■ Two-component RTV silicone rubber (room-temperature cure and heat cure types)

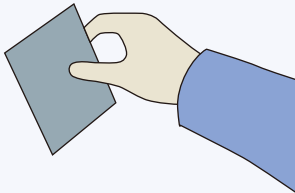
Grade	1 kg×10 cans	16 kg can	20 kg can	UN No.
KE-66*	○: light gray		○: light gray	Not applicable
KE-103*	○: colorless transparent	○: colorless transparent		Not applicable
KE-1031-A/B	○: Agent A/B: colorless transparent	○: Agent A/B: colorless transparent		Not applicable
KE-1051J-A/B	○: Agent A/B: colorless transparent	○: Agent A/B: colorless transparent		Not applicable
KE-1012-A/B	○: Agent A/B: colorless transparent	○: Agent A/B: colorless transparent		Not applicable
KE-106*	○: colorless transparent	○: colorless transparent (18 kg)		Not applicable
KE-108*	○: colorless transparent	○: colorless transparent		Not applicable
KE-109E-A/B	○: Agent A/B: colorless transparent	○: Agent A/B: colorless transparent		Not applicable
KE-118*	○: light gray		○: light gray	Not applicable
KE-119*	○: reddish brown		○: reddish brown	Not applicable
KE1204A/B	○: Agent A: reddish brown/Agent B: light gray		○: Agent A: reddish brown/Agent B: light gray	Not applicable
KE1204AL/BL	○: Agent A: reddish brown/Agent B: white		○: Agent A: reddish brown/Agent B: white	Not applicable
KE-1281-A/B	○: Agent A: black/Agent B: light gray		○: Agent A: black/Agent B: light gray	Not applicable
KE1800A* KE1800B/C*	○: Agent A: white Agent B/C: colorless transparent		○: Agent A: white Agent B/C: colorless transparent	Agent A/B: Not applicable Agent C: UN-1866
KE-1801-A* KE1800B/C	○: Agent A: white Agent B/C: colorless transparent		○: Agent A: white Agent B/C: colorless transparent	Agent A/B: Not applicable Agent C: UN-1866
KE1802A* KE1800B/C	○: Agent A: black Agent B/C: colorless transparent		○: Agent A: black Agent B/C: colorless transparent	Agent A/B: Not applicable Agent C: UN-1866
KE-1800T-A/B	○: Agent A/B: translucent		○: Agent A/B: translucent	Not applicable
KE-1861-A/B	○: Agent A: white/Agent B: light gray			Not applicable
KE-200*	○: colorless translucent	○: colorless translucent (18 kg)		UN-3082
KE-513-A/B	○: Agent A: white/Agent B: black		○: Agent A: white/Agent B: black	Agent A: Not applicable/Agent B: UN-1866
KE-521-A/B	○: Agent A: black/Agent B: white		○: Agent A: black/Agent B: white	Not applicable

* For information regarding curing agents, please refer to p. 26.

Directions for Usage

Usage instructions for one-component RTV silicone rubbers

Clean the application surface




Clean the surface of all rust, oil, dirt, grime and other substances that may interfere with adhesion using sandpaper or a solvent (toluene, xylene, other). When cleaning plastics with solvents, use caution as some solvents may damage plastics.

To save for later use

Tubes
Remove the nozzle and seal tightly. Clean residue out of the nozzle using a solvent.


Cartridges
Product should be used all at once if possible. If product remains, seal tightly before storage. If tightly sealed, the product can be kept for several days.

Tubes



Open the tube and load it into the dispenser cartridge.

Cartridges



Cut the nozzle tip and load the cartridge into the dispenser cartridge.

Application can be done by machine or by hand






Photo provided by Musashi Engineering Inc.

Usage instructions for two-component RTV silicone rubbers


Before use

Check the mix ratio carefully when using two-component RTV silicone rubber products. All ratios are given in parts by weight. Put the base polymer (A) into a container, followed by the curing agent (B). Mix thoroughly until evenly mixed throughout. Be sure to deaerate the product after mixing. When using a planetary-centrifugal type mixer/deaerator, friction within the product can cause a sharp rise in temperature. Also be aware that with certain low viscosity products, there may be some settling of the fillers during storage. Before use, first agitate well to disperse the fillers and then proceed to mixing the two components.


To store

Be sure to seal the product tightly before storage. Use a solvent or other cleaning agent to clean stirrers, containers and other tools used in the mixing process after use.

Stir before use




Use




After mixing and deaeration, immediately pour into place.

Weigh




Weigh out both the base polymer and curing agent.


Combine



Deaerate



Mix



Combine the base polymer and curing agent, and mix until color is uniform and consistent.

Handling Precautions

Handling precautions

1. One-component condensation cure type RTV silicone rubber reacts with moisture in the air and begins to cure at the surface. Consequently, the cure speed will vary according to the temperature and humidity of the use environment, but these rubbers do not exhibit good deep-curing and are therefore not suitable for wide-area surface bonding. In addition, please note that if humidity exceeds 100% and water droplets form on the curing rubber, a hydrolytic reaction will precede the crosslinking cure reaction, which will reduce the strength of the post-cured rubber and remain surface tackiness. (See p. 6)
2. Some of the one-component condensation cure type RTV silicone rubbers, such as the acetic acid and oxime types, may corrode metal. The acetic acid type may cause rust, and under sealed conditions the oxime type may corrode copper metals. Conduct a test using a small sample to determine whether the product is suitable for the intended application.
3. The electrical insulative properties will temporarily decline during the curing process. But in nearly all cases, the rubber will exhibit its inherent electrical insulative properties once completely cured.
4. Please note that in some cases, the rubber may not cure if it comes in contact with flux or certain other materials.
5. Do not use condensation cure type RTV silicone rubbers in a completely enclosed space.
6. One-component condensation cure type RTV silicone rubber may yellow over time, but this does not negatively affect the characteristic properties.
7. If addition cure type RTV silicone rubbers become mixed with or come into contact with curing inhibitors (e.g. sulfur, phosphorus, nitrogen compounds, water, organometallic salts, etc.), a defective cure may result, so please use caution. For information about curing inhibitors, see p. 15.
8. Addition cure type RTV silicone rubbers should not be used in humid conditions, as this may cause defective curing and poor adhesion.
9. With addition cure type RTV silicone rubbers, please note that minute quantities of hydrogen gas are released during the curing process.

Usage

1. Completely remove water, oil, dirt, and contaminants from the surface of the adherend.
2. For certain substrates, use a primer as needed.
(For information about primer types, see p. 15.)
3. For products that will become tack-free in a short time, surface treatment should be finished as quickly as possible using a spatula or similar tool.

4. When using two-component RTV silicone rubber products, be sure to agitate, blend, and deaerate thoroughly. Failure to do so may degrade the characteristics of the rubber.
5. When using an air gun, be sure to set the pressure at a safe and proper level. Pressure should generally not exceed 0.2-0.3 MPa.

Safety and hygiene

1. Be sure to provide adequate ventilation when using condensation cure type RTV silicone rubber. During curing, the following gases are generated, depending on the cure type: acetic acid type – acetic acid; alcohol type – methanol; oxime type – methyl ethyl ketone oxime (MEKO); acetone type – acetone. If you experience any unpleasant symptoms please move to an area with fresh air.
2. Uncured RTV silicone rubber may irritate skin and mucous membranes, so avoid eye contact and prolonged skin contact. In case of accidental eye contact, flush with water for at least 15 minutes and see a physician. In case of skin contact, immediately wipe off with a dry cloth and wash with soapy water. Contact lens wearers should exercise adequate caution; if uncured RTV silicone rubber enters the eye, the contact lens may become bonded to the eye.
3. When using, be careful not to rub the eyes with the hands. Please take appropriate precautions such as wearing safety glasses.
4. When exposed to high-temperature conditions exceeding 150°C, FE-123, FE-61, FE-57, and X-32-1619 break down and release trace amounts of a poisonous gas, trifluoropropionaldehyde. When using in high-temperature conditions, be sure to provide adequate ventilation.
5. Primers and some RTV silicone rubbers and curing agents are classified as hazardous materials under the laws of certain countries. In such cases, the laws must be followed regarding storage, labeling, and handling.
6. Keep out of reach of children.
7. Please read the Safety Data Sheet (SDS) before use. SDS can be obtained from our Sales Department.

Storage precautions

1. Store between 1°C~30°C, out of direct sunlight. Some products must be stored between 1°C~25°C. Products with “refrigeration required” on the label must be stored below 10°C.
2. With cartridges, as a general rule it is best to completely use up the product once the cartridge has been opened. If any remains, be sure to seal completely.

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