

WACKER

CREATING TOMORROW'S SOLUTIONS

ELASTOSIL®

SEMICOSIL®

WACKER SiGel®

ELECTRICS & ELECTRONICS

PROTECTION BY POTTING,
BONDING AND SEALING WITH
SILICONE ELASTOMERS



BENEFIT FROM A DIVERSE RANGE OF OUTSTANDING PROPERTIES – RTV SILICONE ELASTOMERS FROM WACKER

Global Production – Local Customer Support

The silicones that WACKER makes at its various production sites worldwide meet identical quality standards. What's more, we have set up technical centers across the globe to offer all manner of support for product selection, manufacturing, and end-product specification. For more information, visit:

www.wacker.com

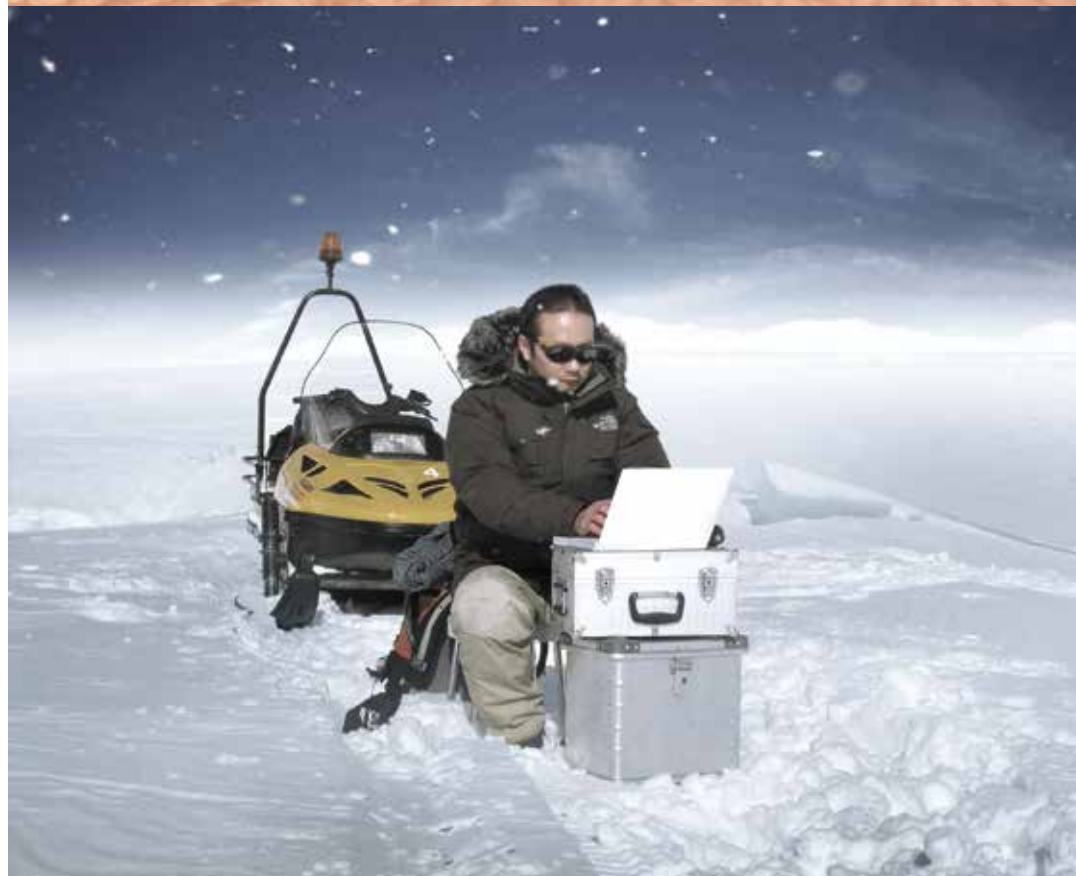
By virtue of their diverse and excellent properties, RTV silicone elastomers from WACKER can be used in a wide variety of potting/encapsulation, bonding, sealing and coating applications.

Property Overview

- Outstanding **thermal resistance from -50 °C to +180 °C**; specialty grades can withstand temperatures up to 250 °C and, at the other end of the scale, down to -100 °C
- Very good bonding to a variety of substrates
- Excellent weathering and radiation resistance
- Very good chemical resistance
- Superlative dielectric properties that remain almost constant over a wide temperature and frequency range
- Excellent environmental compatibility and no known harmful effects
- Water-repellent surface and low moisture uptake
- Low elasticity modulus
- Linear thermal expansion coefficient approx. $3 \times 10^{-4} \text{ m/(m K)}$
- High chemical purity

Main Property Options

- Bonding vs. release
- Thermally conducting vs. non-conducting
- Electrically insulating vs. electrically conducting
- Wide range of viscosities and hardness



Thermal resistance is just one of the outstanding material properties that characterize silicones. Unlike other elastomers, they can withstand temperatures up to 180 °C permanently. At the other end of the scale, silicones remain flexible down to -50 °C, with specialty grades resisting temperatures as low as -100 °C.

SILICONE ELASTOMERS ARE SUITABLE FOR A BROAD RANGE OF APPLICATIONS AND INDUSTRIES

Potting and Encapsulation with Soft Gels



For sensitive electronic devices, such as wire-bonded ICs and sensor applications

Main Properties

- Excellent inherent tack
- Good self-healing effect
- Low levels of bleeding
- Hardness measured in terms of penetration
- Repairability

Potting and Encapsulation with Tough Gels



For requirements with increased hardness, such as for transformers, coil potting or junction boxes for PV applications

Main Properties

- Low viscosities of approx. 1,000 mPa s
- Higher resistance to mechanical and environmental stress
- Increased hardness measured in Shore 00 or Shore A

Bonding, Fixing and Sealing



For electronic components, housing and lids made from PBT, PA and aluminum for automated and manual processes

Main Properties

- Ability to bond dissimilar materials
- Good vibration damping
- Minimum thermal stress
- No risk of galvanic corrosion
- Flowable to non-sag

Conformal Coating



For protecting sensitive electronics such as PCBs, hybrid devices or surface mounted devices

Main Properties

- Versatile processing, such as dispensing and spraying

Automotive Electronics



Applications

- Sealing of electronic control units and housings
- Bonding of hybrid PCBs
- Bonding to heat sinks

For fast production processes and minimized risk of operational failure thanks to reduced mechanical/thermal stress

Measurement & Control, Sensor Technology



Applications

- Coating and encapsulating of sensitive parts in instrumentation and control panels
- Dam and fill protection of selected areas of electronic components
- Sealing off sensor elements and their electronics in harsh environment (ex-proof, high temperature, humidity conditions)
- Sealing of loudspeakers

Consumer Electronics



Applications

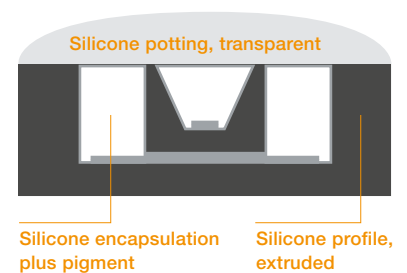
- Bonding, sealing and insulating of diverse electronic components in optical and non-optical applications
- Frame bonding of displays

Lighting & Optoelectronics



Applications

- Encapsulation of light engines
- Encapsulation of LED strips: body and top
- Bonding between the LED chips and base/housing
- Bonding, sealing solution for luminaire assembly



CONDENSATION- AND ADDITION-CURING SILICONE ELASTOMERS

Condensation-Curing

RTV-1 Silicone Elastomers

ELASTOSIL® RTV-1 silicone elastomers are one-component systems that cure at room temperature. They owe their popularity to the outstanding properties of the cured products, ease of processing and minimal investment.

To cure, RTV-1 silicone elastomers need moisture. The rate of curing of these silicones is limited by the rate of diffusion, typically 1 – 2 mm per day. RTV-1 silicone rubber grades are classified according to the by-products that split off during curing: acetic acid, amine, oxime or alcohol-curing.

Thanks to their ease of processing, ELASTOSIL® RTV-1 silicone elastomers are popular for applications involving only thin layers and tolerable curing times. However, these silicones sometimes require lengthy postcuring, which is not reconcilable with the short cycle times required of modern mass production. In such cases, fast-curing systems are needed.

Benefits at a Glance

- Rapid curing, even in combination with long pot life
- Reaction accelerated by raising the temperature
- Flowable and non-sag grades available

Condensation-Curing

RTV-2 Silicone Elastomers

The two components of the self-adhesive, condensation-curing ELASTOSIL® RTV-2 silicone elastomers are typically mixed in a ratio of 8 : 1 to 12 : 1. As the system cures, alcohol is eliminated. Our condensation-curing RTV-2 silicone elastomers typically have a pot life of about 10 minutes and take 70 minutes to set. The ultimate mechanical strength is reached after about six hours. These times can be varied within limits by varying the ratio of main component to catalyst. To ensure reliable processing, however, the pot life should not be less than two minutes.

It is not usual to accelerate curing by increasing the temperature. On the contrary, the temperature should not exceed 90 °C until the product has cured completely, as the silicone rubber could otherwise be destroyed.

Benefits at a Glance

- Very easy processing
- Low capital investment
- Very good adhesion to a large variety of substrates

Addition-Curing

RTV-2 Silicone Elastomers

Addition-curing ELASTOSIL® RTV-2 silicone elastomers cure via a completely different mechanism from that of condensation-curing systems: when the two components are mixed, the polymer, a platinum catalyst and the curing agent are brought into contact with each other. Unlike the condensation-curing RTV-2 silicone elastomers, the curing rate is controlled by the temperature and not the mixing ratio. No by-products are formed during curing.

The curing reaction can be accelerated as required by increasing the temperature. Even with pot lives as long as six months, curing times can be as short as 30 minutes at 140 °C or two minutes at 200 °C. The only limit on curing temperature is the heat resistance of the substrate to be bonded. The curing temperature should be at least 120 °C.

Benefits at a Glance

- Rapid curing at room temperature, even of thick layers
- Very good adhesion to a large variety of substrates
- Outstanding heat resistance

Addition-Curing

One-Component, Heat-Curing Silicone Elastomers

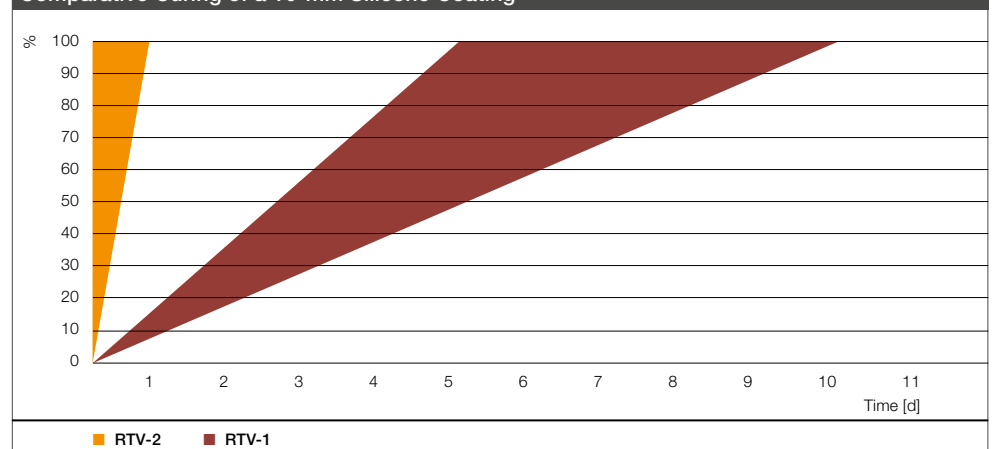
Addition-curing, one-component, heat-curing ELASTOSIL® silicone elastomers comprise the same components as the addition-curing RTV-2 silicone elastomers. Consequently, they cure by the same chemical reaction. They are preferable to the two-component addition-curing silicones if technical or financial reasons prevent the purchase of metering equipment for two-component products.

Their principal advantage is that they can be processed without the need for complicated mixing equipment, making them suitable for both short and long production runs.

Benefits at a Glance

- Low capital investment
- Suitable for short production runs
- Long pot lives and short curing times
- Reaction accelerated by increasing the temperature
- Flowable and non-sag types available

Comparative Curing of a 10-mm Silicone Coating



RTV SILICONE ELASTOMERS – PRODUCT SELECTION GUIDE

Bonding, Fixing, Sealing

Product	Properties	Color	Density [g/cm ³]	Viscosity [mPa s]	Skin Formation Time	Curing Time	Hardness [Shore A]	Tensile Strength DIN 53505 S1 [MPa]	Elongation at Break DIN 53505 S1 [%]	Dielectric Strength [kV/mm]	Volume Resistivity IEC 60093 [Ω cm]	Thermal Conductivity [W/(m K)]
1-Component Condensation-Curing												
ELASTOSIL® A 07	Amine-curing Solvent-borne Flowable	Transparent	1.02	9,000	3 min 23 °C/50% RH	12 h/mm 23 °C/50% RH	20	1.1	300	15	10 ⁺¹⁴	0.2
ELASTOSIL® A 33	Amine-curing Non-sag	Beige	1.16	Non-sag	20 min 23 °C/50% RH	12 h/mm 23 °C/50% RH	25	2.5	350	17	10 ⁺¹⁴	0.2
ELASTOSIL® A 234	Amine-curing Flowable UL 94 HB (150 °C)	White	1.21	35,000	20 min 23 °C/50% RH	12 h/mm 23 °C/50% RH	36	2.2	200	23	10 ⁺¹⁴	0.2
ELASTOSIL® E 4	Acetic-curing Low compression set	Transparent	1.03	Non-sag	15 min 23 °C/50% RH	24 h/mm 23 °C/50% RH	16	1.5	600	21	10 ⁺¹⁴	0.2
ELASTOSIL® E 10	Acetic-curing Excellent heat resistance Good mechanical properties	Red	1.10	10,000	15 min 23 °C/50% RH	24 h/mm 23 °C/50% RH	25	3	300	21	10 ⁺¹⁴	0.2
ELASTOSIL® E 41	Acetic-curing Flowable Solvent-borne	Transparent	1.06	65,000	20 min 23 °C/50% RH	24 h/mm 23 °C/50% RH	30	4.5	500	21	10 ⁺¹⁴	0.2
ELASTOSIL® E 43 ²	Acetic-curing Self-leveling	Black or transparent	1.09	350,000	15 min 23 °C/50% RH	24 h/mm 23 °C/50% RH	30	4.5	500	21	10 ⁺¹⁴	0.2
ELASTOSIL® E 47	Acetic-curing Excellent adhesion	Transparent	1.04	Non-sag	10 min 23 °C/50% RH	24 h/mm 23 °C/50% RH	35	4.5	500	21	10 ⁺¹⁴	0.2
ELASTOSIL® N 2189	Alkoxy-curing Oil-resistant UL 94 V-0	Black	1.20	Non-sag	15 min 23 °C/50% RH	24 h/mm 23 °C/50% RH	44	2.3	250	21	10 ⁺¹⁴	0.2
ELASTOSIL® N 2199	Alkoxy-curing Excellent adhesion	Transparent	1.05	Non-sag	20 min 23 °C/50% RH	24 h/mm 23 °C/50% RH	40	2.5	300	21	10 ⁺¹⁴	0.2
ELASTOSIL® N 9111	Neutral-curing Excellent adhesion	Black, white, gray	1.25	Non-sag	25 min 23 °C/50% RH	12 h/mm 23 °C/50% RH	35	2.5	500	21	10 ⁺¹⁴	0.2
2-Component Condensation-Curing¹												
ELASTOSIL® RT 772	Rapid curing at room temperature UL 94 HB (200 °C) Very good heat resistance	Gray	1.27	30,000	12 min ¹	2 h/23 °C	35	2.1	250	23	10 ⁺¹⁴	0.2
1-Component Addition-Curing												
SEMICOSIL® 987 GR	Thermal curing Thixotropic Suitable for FIPG	Gray	1.10	300,000 (D = 0.5 s ⁻¹) 30,000 (D = 25 s ⁻¹)	n.a.	1 h/130 °C 10 min/150 °C	55	5	200	23	10 ⁺¹⁴	0.2
SEMICOSIL® 989/1K	Thermal curing Very good adhesion Suitable for FIPG	Translucent	1.10	300,000 (D = 0.5 s ⁻¹) 30,000 (D = 25 s ⁻¹)	n.a.	1 h/130 °C 10 min/150 °C	55	5	200	23	10 ⁺¹⁴	0.2

¹ WACKER® CATALYST T 77 is used and processed in combination with 2-component condensation curing (10:1 mix) with pot life [min].

² Product also available as ELASTOSIL® E 43 N with food grade approval.

These figures are intended as a guide and should not be used in preparing product specifications.

Potting, Embedding

Product	Properties	Color	Density [g/cm ³]	Viscosity [mPa s]	Mixing Ratio	Pot Life	Curing Time	Hardness DIN 53505	Tensile Strength DIN 53504 S1 [N/mm ²]	Elongation at Break DIN 53504 S1 [%]	Tear Strength ASTM 624 B [N/mm]	Dielectric Strength [kV/mm]	Dielectric Constant DIN VDE 0303 50 Hz [ε _r]	Volume Resistivity IEC 60093 [Ω cm]	Tracking Resistance IEC 60587 CTI	Thermal Conductivity [W/(m K)]
2-Component Condensation-Curing¹																
ELASTOSIL® RT 563	General-use potting compound	Beige	1.27	3,500	100:4	40 min	8 h/23 °C ¹	55 Sh A	4.5	120	3.0	23	2.8	10 ⁺¹³	> 600	0.3
ELASTOSIL® RT K	General-use potting compound	Gray	1.22	7,000	100:4	150 min	7 h/23 °C ¹	45 Sh A	2.0	130	3.0	23	3.3	10 ⁺¹⁴	> 600	0.3
2-Component Addition-Curing																
WACKER SilGel® 612	Highly transparent Distinct tackiness Good damping properties	Transparent	0.96	1,000	1:1	2.5 h	8 h/23 °C ¹	75 ^P	n.a.	n.a.	n.a.	23	2.7	10 ⁺¹⁶		0.2
WACKER SilGel® 613	Very soft General purpose Soft Gel	Transparent	0.97	200	10:1*	60 min** 5 min***	4 h/23 °C** 10 min/100 °C** 20 min/23 °C*** 1 min/100 °C***	70 ^P	n.a.	n.a.	n.a.	23	2.7	10 ⁺¹⁵	> 600	0.2
ELASTOSIL® RT 601	General-use potting compound Highly transparent	Transparent	1.02	3,500	9:1	90 min	24 h/23 °C 10 min/100 °C	45 Sh A	7.0	100	3.0	23	2.8	10 ⁺¹⁵	> 600	0.2
ELASTOSIL® RT 602	General-use potting compound Good heat resistance	Beige	1.17	3,500	9:1	80 min	24 h/23 °C 10 min/100 °C	30 Sh A	1.5	130	n.a.	23	3.1	10 ⁺¹⁵	> 600	0.2
ELASTOSIL® RT 604	Highly transparent	Transparent	0.96	800	9:1	90 min	24 h/23 °C 8 min/100 °C	25 Sh A	n.a.	n.a.	n.a.	23	2.7	10 ⁺¹⁵	> 600	0.2
ELASTOSIL® RT 607	General-use potting compound Flame-retardant Good heat resistance	Reddish brown	1.43	10,000	9:1	80 min	24 h/23 °C 5 min/100 °C	55 Sh A	3.5	100	4.0	23	3.7	10 ⁺¹⁵	> 600	0.4
ELASTOSIL® RT 622	General-use potting compound Suitable for the manufacture of technical molded parts Excellent mechanical properties	Reddish brown	1.13	12,000	9:1	60 min	24 h/23 °C 10 min/100 °C	27 Sh A	6.5	550	30.0	23	3.2	10 ⁺¹⁵	> 600	0.2
2-Component Addition-Curing, Self-Adhesive																
ELASTOSIL® RT 745“S”	Low viscosity Low hardness	Brownish	0.96	1,000	1:1	8 h	60 min/80 °C 10 min/120 °C	35 Sh A	0.3	n.a.	n.a.	23	2.9	10 ⁺¹⁵	> 600	0.2

¹HAERTER T 40 is processed in combination with 2-component condensation curing (100:4 mix)

* Product used as Batch Kit System with
** ELASTOSIL® CAT PT
***ELASTOSIL® CAT PT-F

P = Penetration [mm/10] for soft gel
Sh 00 = Shore 00
Sh A = Shore A

These figures are intended as a guide and should not be used in preparing product specifications. Wacker Chemie AG offers an extensive portfolio in RTVs elastomers for special requirements. Those materials are available in larger order quantities. In case please contact your sales person.



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